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SELECTED DATA FOR HYDROTHERMAL-
CONVECTION SYSTEMS IN THE UNITED STATES
WITH ESTIMATED TEMPERATURES $\geq 90^{\circ}\text{C}$:
BACK-UP DATA FOR U.S. GEOLOGICAL SURVEY CIRCULAR 790

By

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Open-File Report 78-858

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INTRODUCTION

This report presents a compilation of data used by Brook and others (1979) in determining the accessible resource base for identified hydrothermal convection systems $\geq 90^{\circ}\text{C}$ in the United States (U.S. Geological Survey Circular 790, Assessment of Geothermal Resources of the United States — 1978). Geographic, geologic, chemical, isotopic, volumetric, and bibliographic data and calculated thermal energy contents are listed for all vapor-dominated and hot-water systems with estimated reservoir temperatures $\geq 90^{\circ}\text{C}$ and reservoir depths less than 3 km known to the authors in mid 1978. Systems with lower temperatures are discussed by Sammel (1979) in Circular 790. Much of the data is the same as that presented by Renner and others (1976), but numerous revisions have been made and additional information has been added to update the data base. Data presented here is stored in the U.S. Geological Survey's geothermal computer file GEOTHERM (Swanson, 1977).

Data for individual hydrothermal convection systems in each State are arranged geographically from north to south and west to east without regard to the type or temperature of the system. Locations of the systems and corresponding reference numbers are shown on map 1 accompanying U.S. Geological Survey Circular 790. All references are listed in a single bibliography at the end of this report.

EXPLANATION OF THE DATA SHEETS

The various entries contained in the data sheets are generally self-explanatory. Scientific notation is used throughout the report and is symbolized as follows: $\text{KM}^{**2} = \text{km}^2$; $\text{KM}^{**3} = \text{km}^3$; and $10^{**18} = 10^{18}$. All temperatures are in degrees Celsius ($^{\circ}\text{C}$). Individual entries are discussed below. Only entries containing information are displayed.

Field Name. — Either the name of the geothermal field, the principal hot spring, or a nearby geographic feature which identifies the hydrothermal convection system. Names are taken from published literature and topographic maps. Alternate names are given in parenthesis.

KGRA or Other Name. -- The name of the KGRA (Known Geothermal Resources Area) which includes the hydrothermal convection system, or other names which have been used for the system.

Circular Reference. -- An arbitrary number assigned to the system for bookkeeping and map location purposes. The circular reference corresponds to the number assigned to each system listed by Brook and others (1979) in Circular 790.

Geographic Locality

The geographic location of the spring, well, or field is given by state, county, latitude, longitude, the most detailed topographic map covering the area, township, range, section, quarter section, and the reference base and meridian. Longitude and latitude locations are given to the nearest tenth of a minute.

General Information

Waring Number. -- and Waring Figure. -- The figure and spring or well number assigned to the system by Waring (1965).

Elevation. -- Surface elevations were taken from USGS topographic maps and converted to meters from feet by multiplying by 0.3048.

Area of surface expression. -- Areal extent of hot springs, hot spring deposits, or surface alteration are given in square kilometers (km²). This area is not the result of geophysical measurements. Areas are not reported for single springs or wells or where the data is insufficient to indicate areal extent.

Surface activity. -- The type of surface activity related to the geothermal system: hot springs, geysers, fumaroles, and acid-sulfate springs.

Associated deposits. -- Lists the deposits associated with the spring or occurring in the area: usually travertine or sinter.

Number of springs. --, Spring temperature. --, and Discharge (L/MIN). --The number of thermal springs issuing in a system, their reported range of temperatures (in °C), and the total discharge (liters per minute) of all the thermal springs and wells in the system.

Number of wells. --, Well depths. --, and Maximum well temperature (°C). --These items list the number of thermal wells and their depths in meters. The maximum well temperature (in °C) includes the depth at which the maximum temperature was encountered if this depth differs from the maximum depth of the well.

Rock types. -- The dominant rock types in the area.

Geophysics. -- The types of geophysical information available in the area.

Chemistry

This section includes the sample source, collection date, chemical composition, isotopic composition, and discharge rate of the sampled spring or well. Chemical compositions are in milligrams per liter. Isotopic compositions for the water and the dissolved sulfate are expressed in the δ -notation (listed as DEL in the tables):

$$\delta = \frac{R_x - R_{std}}{R_{std}} \times 10^3, \quad (1)$$

where $R_x = (D/H)_x$ or $(^{18}O/^{16}O)_x$ of the sample and R_{std} is the corresponding ratio for Standard Mean Ocean Water (SMOW). Total alkalinity is reported as bicarbonate (HCO_3) or distributed as carbonate (CO_3) and bicarbonate (HCO_3) at the spring temperature and pH. Appreciable noncarbonate alkalinity is present in some of the high pH waters.

Geothermometers

The silica and cation geothermometers are calculated from equations given in Fournier (1975). The geothermal equations have all been derived using molal concentrations. However, chemical analyses are generally reported in terms of milligrams per liter which is a molarity concentration. The difference between molarity (moles of solute per 1000 milliliters of solution) is insignificant except in brines and was ignored. Molarity units (mg/L and moles/L) were used in the silica and cation geothermometers, respectively. Equations for the individual geothermometers are listed below:

Cation Geothermometers

Na-K-Ca geothermometer

$$t_{oC} = \frac{1647}{(\log (Na/K) + \beta \log (\sqrt{Ca/Na}) - 2.24)} - 273.15, \quad (2)$$

where $\beta = 1/3$ for water equilibrated above $100^\circ C$, and
 $\beta = 4/3$ for water equilibrated below $100^\circ C$.

Na-K geothermometer

$$t_{oC} = \frac{777}{(0.47 + \log (Na/K))} - 273.15 \quad (3)$$

Silica Geothermometers

Quartz adiabatic

$$t_{oC} = \frac{1522}{(5.75 - \log SiO_2)} - 273.15 \quad (4)$$

Quartz conductive

$$t_{oC} = \frac{1309}{(5.19 - \log SiO_2)} - 273.15 \quad (5)$$

Chalcedony

$$t_{oC} = \frac{1032}{(4.69 - \log SiO_2)} - 273.15 \quad (6)$$

Alpha-cristobalite

$$t_{oC} = \frac{1000}{(4.78 - \log SiO_2)} - 273.15 \quad (7)$$

Opal (i.e. amorphous-silica)

$$t_{oC} = \frac{731}{(4.52 - \log SiO_2)} - 273.15 \quad (8)$$

Sulfate-Water Isotope Geothermometers

The equations for the sulfate-water isotope geothermometers are discussed in some detail by McKenzie and Truesdell (1977). The calculations were carried out using the following equations:

$$\alpha_{\text{SO}_4-\text{H}_2\text{O}} = \frac{1000 + \delta^{18}\text{O}_{(\text{SO}_4)}}{1000 + \delta^{18}\text{O}_{(\text{H}_2\text{O})}} \quad (9)$$

and

$$1000 \ln \alpha_{\text{SO}_4-\text{H}_2\text{O}} = \left(\frac{288 \times 10^6}{T^2} \right) - 4.1 \quad (10)$$

where T is in Kelvin (K).

Conductive heat loss

Conductive heat loss was assumed in nonboiling springs and total condensed samples from steam wells. Temperatures may be calculated for these systems by using equations (9) and (10).

One-step steam loss

One-step steam loss occurs in geysers and steam wells with two phase (steam-water) discharge where only the water fraction is sampled. In order to use equations (9) and (10), the oxygen isotopic composition of the reservoir water must be calculated.

The oxygen isotopic composition of the reservoir water can be calculated from the equation

$$\frac{1000 + \delta^{18}\text{O}_{(\text{H}_2\text{O})r}}{1000 + \delta^{18}\text{O}_{(\text{H}_2\text{O})s}} = \eta + (1 - \eta)(1/\alpha_{1v}) = \alpha_{1v}(\eta - 1) \quad (11)$$

where

$\alpha^{18\text{O}}_{(\text{H}_2\text{O})r} = \alpha^{18\text{O}}$ value of the geothermal reservoir water

$\alpha^{18\text{O}}_{(\text{H}_2\text{O})s} = \alpha^{18\text{O}}$ value of surface water

η = fraction liquid = $(H_{vs} - H_{lr}) / (H_{vs} - H_{ls})$

H_{lr} = enthalpy of liquid water at the reservoir temperature

H_{ls} = enthalpy of liquid water at the spring temperature.

H_{vs} = enthalpy of steam at the spring temperature

$1v = (^{18}\text{O}/^{16}\text{O})_{\text{H}_2\text{O liquid}} / (^{18}\text{O}/^{16}\text{O})_{\text{H}_2\text{O vapor}}$.

Values of α_{1v} can be expressed over the range 3°C to 360°C by

$$1000 \ln \alpha_{1v} = -3.494 + 1.2051 (10^3/T) + 0.7664 (10^6/T^2), \quad (12)$$

where T is in Kelvin (K). The temperature used in equation (12) is the temperature of steam-water separation.

The value of $\alpha^{18\text{O}}_{(\text{H}_2\text{O})r}$ calculated from the above equations can then be used to calculate the $\alpha^{SO_4-H_2O}$ factor (equation 9) which is then used in the temperature dependent ^{18}O fractionation equation (10).

Continuous steam loss

The continuous steam-loss model should only be used in areas where steam has continuously separated from the thermal water as it rose to the surface. In such situations, fumaroles and steaming ground are physically separated from the hot springs.

The temperature of isotopic equilibrium is determined by iteration of the equations:

$$\ln \frac{1000 + \alpha^{18\text{O}}_{(\text{H}_2\text{O})r}}{1000 + \alpha^{18\text{O}}_{(\text{H}_2\text{O})s}} = \int_{H_{ls}}^{H_{lr}} (1 - 1/\alpha_{1v}) \frac{dH}{H_{vs} - H} \quad (13)$$

Reservoir Properties

This section lists values for the primary reservoir variables — temperature, area, and thickness — which are used to calculate the thermal energy content (that is, the accessible resource base) for each system. Minimum, maximum, and most likely values for each variable are a result of our judgment based on geology, geothermometry, geophysics, and (or) downhole measurements. A geothermal reservoir is a complex, heterogenous volume of rock and water. We assume that each of the values estimated for the geothermal reservoir represents an integrated value that is characteristic for the reservoir as a unit. That is, it is probable that an estimated value is no less than the minimum or no greater than the maximum when the entire reservoir is considered, even though higher or lower values, especially temperature, may be locally encountered. Minimum and maximum values thus are not total ranges of the reservoir variables. The most likely value is thought to be the most representative estimate for the entire reservoir. The mean and standard deviation (STD. DEV.) for each variable are calculated from the minimum, maximum, and most likely values.

Subsurface temperature ($^{\circ}\text{C}$). — Each temperature estimate is coded to indicate which geothermometer or other source was used. If no code is given, the temperature was subjectively estimated considering several lines of evidence. For alkaline waters with pH of 8 and above, the quartz conductive and chalcedony geothermometers were corrected to compensate for the effects of dissociated silicic acid (see discussion in Brook and others, 1979). If the quartz or chalcedony geothermometer was reduced by 10°C or more, the pH-corrected value was either used as an estimate or recorded in the comment section. This pH correction was not used where the spring or well discharged carbon dioxide. Magnesium corrections on the Na-K-Ca geothermometer were carried out using preliminary graphs provided by R.O. Fournier. Fournier and Potter (1978) have subsequently developed an equation for the correction. Values calculated from their equation may differ slightly from those reported here.

Depth to top (km). — Depth to the top of the reservoir is based on drill data where available. Otherwise, standard estimates of 0.5, 2.0, and 1.5 km are assumed.

Thickness (km). — Thickness estimates are based on drill data where available. Otherwise, standard estimates of 1.0, 2.5, and 1.5 are assumed for the minimum, maximum, and most likely, respectively. Base depth of the reservoir is considered to be 3 km unless drill data indicate otherwise.

Subsurface area (km²). -- Extent of the reservoir in the subsurface within the temperature limits defined for the reservoir. The area is generally determined from various geological and geophysical data which is given on the following line. If data was not available, standard estimates of 1, 3, and 2 km² were assumed for the minimum, maximum, and most likely, respectively.

Volume (km³). -- Mean volume is calculated from the mean thickness and mean subsurface area. The method of calculating the standard deviation is given by Nathenson (1978).

Thermal energy (10¹⁸ Joules). Thermal energy (Q) of each system is calculated from the equation:

$$Q = \rho c \cdot \bar{V} \cdot (\bar{T} - T_0) \quad (13)$$

where

ρc = volumetric specific heat of rock plus water
(= 2.7 J/cm³ - °C)

$\bar{V}$ = mean volume (converted to cm³)

$\bar{T}$ = mean temperature (°C)

T_0 = reference temperature (15°C).

The volumetric specific heat (ρc) is calculated assuming the rock specific heat to be 2.5 J/cm³-°C and the reservoir porosity to be 15 percent. The method of calculating the standard deviation is given in Nathenson (1978).

Comments

Comments about the springs, the geothermal system, thermal wells, geothermometers, unusual chemical constituents, and other miscellaneous items.

References

The principal references containing data or descriptions used to prepare the data sheets.

DATA SHEETS

Alaska

FIELD NAME..... OKPILAK SPRINGS
CIRCULAR REFERENCE..... 001

GEOGRAPHIC LOCALITY

STATE..... ALASKA
LATITUDE..... 69-18. N
LONGITUDE..... 144-02. W
MAPS..... MT. MICHELSON B-1 1163,360

GENERAL INFORMATION

SURFACE ACTIVITY..... HOT SPRING
SPRING TEMPERATURES (C)..... 48.5

CHEMISTRY

SAMPLE SOURCE.... MILLER

TEMP (C)	SI02	CA	MG	NA	K	HCO3	CO3	SO4	CL
48.5	56	9.8	0.1	120	4.5	85		200	31
F	B	PH 7.3		DEL 0 (18) SO4	DEL 0 (18) H2O	DEL D H2O			

GEOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 133
 NA-K-CA (4/3)..... 90
 NA-K..... 92

SILICA

ADIABATIC..... 107
 CONDUCTIVE..... 107
 CHALCEDONY..... 78
 CRISTOBALITE..... 57
 OPAL..... -9

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)

MINIMUM
 78 (D)

MAXIMUM
 107 (A)

MOST LIKELY
 90 (I)

MEAN
 92

STD. DEV.
 6

UNCORRECTED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE

B) QUARTZ CONDUCTIVE, PH-CORRECTED

C) QUARTZ ADIABATIC

D) CHALCEDONY

E) CHALCEDONY, PH-CORRECTED

F) CRISTOBALITE

G) AMORPHOUS SILICA

H) NA-K

I) NA-K-CA

J) NA-K-CA, MG-CORRECTED

K) SULFATE GEOTHERMOMETER

L) SURFACE TEMPERATURE

M) WELL TEMPERATURE

N) MIXING MODEL

O) RENNER AND OTHERS, 1976

DEPTH TO TOP (KM)

MINIMUM
 0.5

MAXIMUM
 2.0

MOST LIKELY
 1.5

MEAN
 1.7

STD. DEV.
 0.3

THICKNESS (KM)

1.0

2.5

1.5

2.0

0.4

SUBSURFACE AREA (KM**2)

1

3

2

2.0

0.4

BASED ON: STANDARD ESTIMATE

VOLUME (KM**3)..... 3.3

THERMAL ENERGY(10**18 J). 0.69

STD. DEV. = 0.9

STD. DEV. = 0.20

REFERENCES: MILLER, UNPUB. DATA

COMPILED BY: BROOK, C.

OKPILAK SPRINGS , ALASKA

FIELD NAME..... SERPENTINE SPRINGS (ARCTIC)
CIRCULAR REFERENCE..... 002

GEOGRAPHIC LOCALITY

STATE..... ALASKA
LATITUDE..... 65-51. N
LONGITUDE..... 164-42. W
MAPS..... BENDELEBEN D-6, 1:63,360

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
05N	25W	12	KATEEL RIVER

GENERAL INFORMATION

WAVING FIGURE..... 9
WAVING NUMBER..... 4
AREA OF SURFACE EXPRESSION (KM**2). 0.2
ELEVATION (M)..... 122
SURFACE ACTIVITY..... HOT SPRINGS
ASSOCIATED DEPOSITS..... SINTER, TRAVERTINE
NO. OF SPRINGS..... 2 GROUPS 0.8 KM APART
SPRING TEMPERATURES (C)..... 60 TO 77
DISCHARGE (L/MIN)..... 133
ROCK TYPES: GRANITE NEAR FAULT CONTACT WITH METASEDIMENTS

CHEMISTRY

SAMPLE SOURCE..... MILLER AND OTHERS, 1975
FLOW (L/MIN)..... 132

TEMP(C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
77	90	75	0.35	800.	41	57	1.3	1	1450
F	B	PH		DEL 0(18) S04	DEL 0(18) H2O	DEL D H2O			
		7.91							

GEOOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 161
 NA-K-CA (4/3)..... 151
 NA-K..... 117

SILICA

ADIABATIC..... 128
 CONDUCTIVE..... 131
 CHALCEDONY..... 104
 CRISTOBALITE..... 81
 OPAL..... 12

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	104 (D)	161 (I)	131 (A)	132	12

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, HG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ON: STANDARD ESTIMATE					

VOLUME (KM**3)..... 3.3 STD. DEV. = 0.9
 THERMAL ENERGY(10**18 J). 1.05 STD. DEV. = 0.31

REFERENCES: WARING, 1917, 1965; SAINSBURY AND OTHERS, 1969; MILLER, 1973; MILLER AND OTHERS, 1975

COMPILED BY: BROOK, C.

SERPENTINE SPRINGS (ARCTIC) , ALASKA

FIELD NAME..... PILGRIM (KRUGAMEPA) HOT SPRINGS
 KGRA OR OTHER NAME..... PILGRIM SPRINGS KGRA
 CIRCULAR REFERENCE..... 003

GEOGRAPHIC LOCALITY

STATE..... ALASKA
 LATITUDE..... 65-06. N
 LONGITUDE..... 164-55. W
 MAPS..... BENDELEBEN A-6, 1163,360

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
04S	31W	36 SE OF SE	KATEEL RIVER

GENERAL INFORMATION

WAKING FIGURE..... 9
 WAKING NUMBER..... 6
 AREA OF SURFACE EXPRESSION (KM**2). 0.2
 ELEVATION (M)..... 5
 SURFACE ACTIVITY..... HOT SPRINGS
 NO. OF SPRINGS..... SEVERAL
 SPRING TEMPERATURES (C)..... 55 TO 88
 DISCHARGE (L/MIN)..... LT 50
 ROCK TYPES: QUATERNARY ALLUVIUM OVERLYING GRANITIC-METAMORPHIC COMPLEX
 GEOPHYSICS: AEROMAGNETIC

CHEMISTRY

SAMPLE SOURCE.... MILLER AND OTHERS, 1975
 FLOW (L/MIN)..... 38

TEMP (C)	SI02	CA	MG	NA	K	HCO3	CO3	SO4	CL
55	100	530	1.4	1450	61	30.1		24	3346
F	B	PH		DEL 0 (18) SO4		DEL 0 (18) H2O		DEL 0 H2O	
4.7		6.75				-14.91		-121.9	

GEOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 146
 NA-K-CA (4/3)..... 120
 NA-K..... 101

SILICA

ADIABATIC..... 133
 CONDUCTIVE..... 137
 CHALCEDONY..... 110
 CRISTOBALITE..... 87
 OPAL..... 17

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)

MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
110 (D)	146 (I)	137 (A)	131	8

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, HG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4

BASED ON: STANDARD ESTIMATE

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J),	1.04	STD. DEV. = 0.30

COMMENTS: 0.25 KM**2 AREA PERMANENTLY THAWED. THERMAL WATER USED IN BATH HOUSES AND FOR AGRICULTURE.

REFERENCES: WARING, 1917, 1965; SAINSBURY AND OTHERS, 1969; MILLER, 1973; MILLER AND OTHERS, 1975; RENNER AND OTHERS, 1976

COMPILED BY: BROOK, C.

PILGRIM (KRUZGAMEPA) HOT SPRINGS, ALASKA

FIELD NAME..... LAVA CREEK
CIRCULAR REFERENCE..... 004

GEOGRAPHIC LOCALITY

STATE..... ALASKA
LATITUDE..... 65-13. N
LONGITUDE..... 162-54. W
MAPS..... BENDELEBEN A-2, 1163,360

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
03S	21W		KATEEL RIVER

GENERAL INFORMATION

ELEVATION (M)..... 244
SURFACE ACTIVITY..... HOT SPRING
SPRING TEMPERATURES (C)..... 50 TO 65
ROCK TYPES: QUARTZ MONZONITE NEAR CONTACT WITH PRECAMBRIAN MIGMATITE

CHEMISTRY

SAMPLE SOURCE.... MILLER AND OTHERS, 1975
COLLECTION DATE.. 1974/00/00

TEMP(C)	SiO2	CA	MG	NA	K	HCO3	CO3	SO4	CL
50	84	2.0	LT 0.1	79	1.8	120.9	5	53	5.9
F	B	PH		DEL 0(18) SO4	DEL 0(18) H2O	DEL D H2O			
		8.6							

GEOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 117
 NA-K-CA (4/3)..... 90
 NA-K..... 59

SILICA

ADIABATIC..... 125
 CONDUCTIVE..... 128
 CHALCEDONY..... 100
 CRISTOBALITE..... 77
 OPAL..... 8

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)

MINIMUM 90 (E,I)	MAXIMUM 128 (A)	MOST LIKELY 90 (E,I)	MEAN 103	STD. DEV. 9
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UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ON: STANDARD ESTIMATE					

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J). 0.79		STD. DEV. = 0.24

REFERENCES: MILLER AND OTHERS, 1975

COMPILED BY: BROOK, C.

LAVA CREEK, ALASKA

FIELD NAME..... CLEAR CREEK
CIRCULAR REFERENCE..... 005

GEOGRAPHIC LOCALITY

STATE..... ALASKA
LATITUDE..... 64-51. N
LONGITUDE..... 162-18. W
MAPS..... SOLOMON D-1, 1163,360

GENERAL INFORMATION

ELEVATION (M)..... 183
SURFACE ACTIVITY..... HOT SPRINGS
NO. OF SPRINGS..... 2
SPRING TEMPERATURES (C)..... 60 TO 67
DISCHARGE (L/MIN)..... 1000
ROCK TYPES: QUARTZ MONZONITE

CHEMISTRY

SAMPLE SOURCE.... MILLER AND OTHERS, 1975

TEMP (C) SI02 CA MG NA K HCO3 CO3 SO4 CL
60 83 2.0 LT 0.1 55 1.6 10.2 27 4.2

F B PH DEL O(18) SO4 DEL O(18) H2O DEL O H2O
8.3

GEOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 122
 NA-K-CA (4/3)..... 82
 NA-K..... 74

SILICA

ADIABATIC..... 124
 CONDUCTIVE..... 127
 CHALCEDONY..... 99
 CRISTOBALITE..... 76
 OPAL..... 8

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)

MINIMUM
 82 (I)

MAXIMUM
 127 (A)

MOST LIKELY
 99 (D)

MEAN
 103

STD. DEV.
 9

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ON: STANDARD ESTIMATE					

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J). 0.79		STD. DEV. = 0.24

COMMENTS: HIGH FLOW RATE SUGGESTS THAT SUBSURFACE TEMPERATURES MAY BE NEARER MINIMUM TEMPERATURE.

REFERENCES: MILLER, 1973; MILLER AND OTHERS, 1972, 1975; RENNER AND OTHERS, 1976

COMPILED BY: BROOK, C.

CLEAR CREEK , ALASKA

FIELD NAME..... SOUTH
CIRCULAR REFERENCE..... 006

GEOGRAPHIC LOCALITY

STATE..... ALASKA
LATITUDE..... 66-09. N
LONGITUDE..... 157-07. W
MAPS..... SHUNGNAK 11250,000

TOWNSHIP RANGE SECTION
10N 06E

BASE & MERIDIAN
KATEEL RIVER

GENERAL INFORMATION

ELEVATION (M)..... 244
NO. OF SPRINGS..... SEVERAL
SPRING TEMPERATURES (C)..... 50
ROCK TYPES: QUARTZ MONZONITE

CHEMISTRY

SAMPLE SOURCE.... MILLER AND OTHERS, 1975

TEMP(C)	SI02	CA	MG	NA	K	HCO3	CO3	SO4	CL
50	65	5.9	0.01	83	2.1			122	6

GEOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	115
NA-K-CA (4/3).....	72
NA-K.....	65
SILICA	
ADIABATIC.....	113
CONDUCTIVE.....	114
CHALCEDONY.....	86
CRISTOBALITE.....	64
OPAL.....	-3

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	72 (I)	114 (A)	86 (D)	91	9

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ON: STANDARD ESTIMATE					

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J). 0.68		STD. DEV. = 0.21

REFERENCES: MILLER AND OTHERS, 1975

COMPILED BY: BROOK, C.

SOUTH , ALASKA

FIELD NAME..... DULRI
CIRCULAR REFERENCE..... 007

GEOGRAPHIC LOCALITY

STATE..... ALASKA
LATITUDE..... 65-16. N
LONGITUDE..... 155-16. W
MAPS..... MELOZITNA B-5, 1:63,360

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
03S	18E	067	KATEEL RIVER

GENERAL INFORMATION

SURFACE ACTIVITY..... HOT SPRINGS
NO. OF SPRINGS..... SEVERAL
ROCK TYPES: HORNFELSIC GRAYWACKE AND MUDSTONE

CHEMISTRY

SAMPLE SOURCE.... USGS FILE DATA
COLLECTION DATE.. 1974/09/24

TEMP (C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
52	82	15	LT 1	200	12	80		280	44
F	B	PH		DEL 0(18) S04	DEL 0(18) H2O	DEL 0 H2O			
22	2.3	8.3							

GEOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 159
 NA-K-CA (4/3)..... 123
 NA-K..... 131

SILICA

ADIABATIC..... 124
 CONDUCTIVE..... 126
 CHALCEDONY..... 99
 CRISTOBALITE..... 76
 OPAL..... 7

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)

MINIMUM
 99 (D)

MAXIMUM
 159 (I)

MOST LIKELY
 126 (A)

MEAN
 128

STD. DEV.
 12

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE

B) QUARTZ CONDUCTIVE, PH-CORRECTED

C) QUARTZ ADIABATIC

D) CHALCEDONY

E) CHALCEDONY, PH-CORRECTED

F) CRISTOBALITE

G) AMORPHOUS SILICA

H) NA-K

I) NA-K-CA

J) NA-K-CA, MG-CORRECTED

K) SULFATE GEOTHERMOMETER

L) SURFACE TEMPERATURE

M) WELL TEMPERATURE

N) MIXING MODEL

O) RENNER AND OTHERS, 1976

DEPTH TO TOP (KM) MINIMUM 0.5
 THICKNESS (KM) 1.0
 SUBSURFACE AREA (KM**2) 1
 BASED ON: STANDARD ESTIMATE

MAXIMUM 2.0
 MOST LIKELY 1.5
 2.5 1.5
 3 2

MEAN
 STD. DEV.
 1.7 0.3
 2.0 0.4

VOLUME (KM**3)..... 3.3
 THERMAL ENERGY(10**18 J). 1.02

STD. DEV. = 0.9
 STD. DEV. = 0.31

COMMENTS: MAY BE A MIXED WATER

REFERENCES: MILLER AND OTHERS, 1975

COMPILED BY: BROOK, C.

DULBI, ALASKA

FIELD NAME..... MELOZI (MELOZITNA) HOT SPRINGS
CIRCULAR REFERENCE..... 008

GEOGRAPHIC LOCALITY

STATE..... ALASKA
LATITUDE..... 65-08. N
LONGITUDE..... 154-40. W
MAPS..... MELOZITNA A-4, 1:63,360

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
04S	20E	23	KATEEL RIVER

GENERAL INFORMATION

WARNING FIGURE..... 9
WARNING NUMBER..... 10
ELEVATION (M)..... 275
SURFACE ACTIVITY..... HOT SPRINGS
NO. OF SPRINGS..... ONE MAIN SPRING
SPRING TEMPERATURES (C)..... 55 TO 56
DISCHARGE (L/MIN)..... 498
ROCK TYPES: QUARTZ MONZONITE

CHEMISTRY

SAMPLE SOURCE.... MILLER AND OTHERS, 1975
FLOW (L/MIN)..... 498
COLLECTION DATE.. 1959/00/00

TEMP(C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
56	78	11	2.8			32	31	61	92

GEOOTHERMOMETERS (C)

SILICA

ADIABATIC.....	121
CONDUCTIVE.....	124
CHALCEDONY.....	96
CRISTOBALITE.....	73
OPAL.....	5

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SURFACE TEMP (C)	92 (D)	124 (A)	124 (A)	113	8

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ON: STANDARD ESTIMATE					

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J). 0.88		STD. DEV. = 0.26

COMMENTS: H2S ODOR

REFERENCES: WARING, 1917, 1965; MILLER AND OTHERS, 1975

COMPILED BY: BROOK, C.

MELOZI (MELOZITNA) HOT SPRINGS, ALASKA

FIELD NAME..... LITTLE MELOZITNA HOT SPRINGS
CIRCULAR REFERENCE..... 009

GEOGRAPHIC LOCALITY

STATE..... ALASKA
LATITUDE..... 65-28. N
LONGITUDE..... 153-20. W
MAPS..... MELOZITNA B-1, 1163,360

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
01N	27E	29 NW OF SW	KATEEL RIVER

GENERAL INFORMATION

WARING FIGURE..... 9
WARING NUMBER..... 11
ELEVATION (M)..... 275
SURFACE ACTIVITY..... HOT SPRINGS
NO. OF SPRINGS..... 5
SPRING TEMPERATURES (C)..... 38
ROCK TYPES: GRANITE

CHEMISTRY

SAMPLE SOURCE.... WARING, 1917

TEMP (C)	SiO2	CA	MG	NA	K	HC03	C03	S04	CL
38	80								

GEOTHERMOMETERS (C)

SILICA

ADIABATIC.....	122
CONDUCTIVE.....	125
CHALCEDONY.....	97
CRISTOBALITE.....	74
OPAL.....	6

RESERVOIR PROPERTIES

SUBSURFACE TEMP (C)

MINIMUM

97 (D)

MAXIMUM

125 (A)

MOST LIKELY

125 (A)

MEAN

116

STD. DEV.

7

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE

B) QUARTZ CONDUCTIVE, PH-CORRECTED

C) QUARTZ ADIABATIC

D) CHALCEDONY

E) CHALCEDONY, PH-CORRECTED

F) CRISTOBALITE

G) AMORPHOUS SILICA

H) NA-K

I) NA-K-CA

J) NA-K-CA, MG-CORRECTED

K) SULFATE GEOTHERMOMETER

L) SURFACE TEMPERATURE

M) WELL TEMPERATURE

N) MIXING MODEL

O) RENNER AND OTHERS, 1976

MINIMUM

0.5

MAXIMUM

2.0

MOST LIKELY

1.5

MEAN

1.7

STD. DEV.

0.3

DEPTH TO TOP (KM)

THICKNESS (KM)

SUBSURFACE AREA (KM**2)

BASED ON: STANDARD ESTIMATE

1.0

1

2.5

3

1.5

2

1.7

2.0

0.3

0.4

VOLUME (KM**3)..... 3.3

THERMAL ENERGY(10**18 J). 0.91

STD. DEV. = 0.9

STD. DEV. = 0.26

COMMENTS: H2S ODOR. CHEMICAL ANALYSIS MAY BE UNRELIABLE

REFERENCES: WARING, 1917, 1965; MILLER AND OTHERS, 1975

COMPILED BY: BROOK, C.

LITTLE MELOZITNA HOT SPRINGS, ALASKA

FIELD NAME..... REED RIVER HOT SPRING
CIRCULAR REFERENCE..... 010

GEOGRAPHIC LOCALITY

STATE..... ALASKA
LATITUDE..... 67-17. N
LONGITUDE..... 154-55. W
MAPS..... SURVEY PASS 1:250,000

GENERAL INFORMATION

SURFACE ACTIVITY..... HOT SPRING
SPRING TEMPERATURES (C)..... 50
ROCK TYPES: GRANITIC ROCK INTRUDING LIMESTONE

CHEMISTRY

SAMPLE SOURCE..... MILLER, UNPUB. DATA

TEMP(C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
50	82	24	1.1	160	12	360		50	15
F	B	PH		DEL 0(18) S04	DEL 0(18) H2O	DEL 0(18) H2O		DEL D H2O	
8.2		7.8							

GEOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	163
NA-K-CA (4/3).....	108
NA-K.....	153
SILICA	
ADIABATIC.....	124
CONDUCTIVE.....	126
CHALCEDONY.....	99
CRISTOBALITE.....	76
OPAL.....	7

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	99 (D)	126 (A)	126 (A)	117	6

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE APEA (KM**2)	1	3	2	2.0	0.4
BASED ON: STANDARD ESTIMATE					

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J). 0.92		STD. DEV. = 0.26

COMMENTS: NA-K-CA TEMPERATURES PROBABLY UNRELIABLE BECAUSE OF CARBONATE BEDROCK.

REFERENCES: MILLER, UNPUB. DATA, MULL AND OTHERS, 1976

COMPILED BY: BROOK, C.

REED RIVER HOT SPRING , ALASKA

FIELD NAME..... KANUTI
CIRCULAR REFERENCE..... 011

GEOGRAPHIC LOCALITY

STATE..... ALASKA
LATITUDE..... 66-20. N
LONGITUDE..... 150-48. W
MAPS..... BETTLES, 1:1250,000

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
18N	15W	36	FAIRBANKS

GENERAL INFORMATION

ELEVATION (M)..... 290
SURFACE ACTIVITY..... HOT SPRINGS
NO. OF SPRINGS..... SEVERAL
SPRING TEMPERATURES (C)..... 66
ROCK TYPES: MAFIC VOLCANIC ROCKS COVERED BY ALLUVIUM

CHEMISTRY

SAMPLE SOURCE..... MILLER AND OTHERS, 1975

TEMP (C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
66		2.7	0.3	111	3.7	169		21	28

GEO THERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 136
 NA-K-CA (4/3)..... 114
 NA-K..... 84

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)

MINIMUM
 85 (H)

MAXIMUM
 120 (J)

MOST LIKELY
 120 (J)

MEAN
 108

STD. DEV.
 8

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ON: STANDARD ESTIMATE					

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J). 0.84		STD. DEV. = 0.25

COMMENTS: STRONG H2S ODOR. ONLY A PARTIAL CHEMICAL ANALYSIS IS AVAILABLE.

REFERENCES: MILLER AND OTHERS, 1975

COMPILED BY: BROOK, C.

KANUTI, ALASKA

FIELD NAME..... TOLOVANA
CIRCULAR REFERENCE..... 012

GEOGRAPHIC LOCALITY

STATE..... ALASKA
LATITUDE..... 65-16. N
LONGITUDE..... 148-50. W
MAPS..... LIVENGOOD B-4, 1163,360

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
05N	06W	07 SE	FAIRBANKS

GENERAL INFORMATION

WAKING FIGURE.....	9
WAKING NUMBER.....	17
ELEVATION (M).....	297
SURFACE ACTIVITY.....	HOT SPRINGS
NO. OF SPRINGS.....	SEVERAL
SPRING TEMPERATURES (C).....	52 TO 60
DISCHARGE (L/MIN).....	SMALL
ROCK TYPES: MUOSTONE	

CHEMISTRY

SAMPLE SOURCE.... ANDERSON, 1970

TEMP (C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
52	75	82	1.2	321	23	49		40	615
F	B	PH		DEL 0(18) S04		DEL 0(18) H2O		DEL D H2O	
		7.7							

GEOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 162
 NA-K-CA (4/3)..... 110
 NA-K..... 148

SILICA

ADIABATIC..... 120
 CONDUCTIVE..... 122
 CHALCEDONY..... 93
 CRISTOBALITE..... 71
 UPAL..... 3

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	93 (D)	162 (I)	122 (A)	126	14

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
R) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4

BASED ON: STANDARD ESTIMATE

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J).....	1.00	STD. DEV. = 0.31

COMMENTS: GEOTHERMOMETERS ARE QUESTIONABLE DUE TO SMALL FLOW OF SPRING.

REFERENCES: WARING, 1917, 1965; ANDERSON, 1970; CHAPMAN AND OTHERS, 1971; MILLER AND OTHERS, 1975

COMPILED BY: BROOK, C.

TOLOVANA, ALASKA

FIELD NAME..... MANLEY (BAKER) HOT SPRINGS.
CIRCULAR REFERENCE..... 013

GEOGRAPHIC LOCALITY

STATE..... ALASKA
LATITUDE..... 65-00. N
LONGITUDE..... 150-38. W
MAPS..... TANANA A-2; 1163,360

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
02N	15W	17 NE	FAIRBANKS

GENERAL INFORMATION

WARNING FIGURE..... 9
WARNING NUMBER..... 14
ELEVATION (M)..... 107
SURFACE ACTIVITY..... HOT SPRINGS
NO. OF SPRINGS..... 3
SPRING TEMPERATURES (C)..... 56 TO 59
DISCHARGE (L/MIN)..... 550
ROCK TYPES: BLACK HORNFELS INTRUDED BY GRANITE

CHEMISTRY

SAMPLE SOURCE.... MILLER AND OTHERS, 1975

TEMP (C)	SiO2	CA	MG	NA	K	HCO3	CO3	SO4	CL
59	65	4	1	130	4.5	89.6	0.4	54	134
F	B	Ph		DEL 0 (18) SO4	DEL 0 (18) H2O	DEL 0 H2O			
8.5		7.7			-18.09	-141.9			

GEOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 137
 NA-K-CA (4/3)..... 113
 NA-K..... 86

SILICA

ADIABATIC..... 113
 CONDUCTIVE..... 114
 CHALCEDONY..... 86
 CRISTOBALITE..... 64
 OPAL..... -3

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)

MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
83 (J)	114 (A)	86 (D)	94	7

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4

BASED ON: STANDARD ESTIMATE

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J). 0.71		STD. DEV. = 0.21

COMMENTS: WATER USED FOR BATH HOUSE AND IRRIGATION, WARING (1917) REPORTS ABOUT 0.25 KM**2 UNDER CULTIVATION.

REFERENCES: WARING, 1917, 1965; MILLER AND OTHERS, 1975

COMPILED BY: BROOK, C.

MANLEY (HAKER) HOT SPRINGS, ALASKA

FIELD NAME..... CHENA
CIRCULAR REFERENCE..... 014

GEOGRAPHIC LOCALITY

STATE..... ALASKA
LATITUDE..... 65-03. N
LONGITUDE..... 146-03. W
MAPS..... CIRCLE A-5, 1163,360

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
03N	08E	26 SW OF SE	FAIRBANKS

GENERAL INFORMATION

WAKING FIGURE..... 9
WAKING NUMBER..... 18
ELEVATION (M)..... 396
SURFACE ACTIVITY..... HOT SPRINGS
ASSOCIATED DEPOSITS..... SULFUR
NO. OF SPRINGS..... 10
SPRING TEMPERATURES (C)..... 22 TO 67
DISCHARGE (L/MIN)..... 830
ROCK TYPES: GRANITIC ROCK, SCHIST

CHEMISTRY

SAMPLE SOURCE.... MILLER, 1973
FLOW (L/MIN)..... 830

TEMP(C)	SI02	CA	MG	NA	K	HC03	CO3	S04	CL
57	85	1.3	0.13	110	3.3	115	14	68	29
F	B	PH		DEL 0(18) S04		DEL 0(18) H2O		DEL D H2O	
18.6		9.1				-19.30		-153.0	

GEOOTHERMOMETERS (C)

CATION

NA-K-CA (1/3).....	137
NA-K-CA (4/3).....	129
NA-K.....	76

SILICA

ADIABATIC.....	125
CONDUCTIVE.....	128
CHALCEDONY.....	101
CRISTOBALITE.....	78
OPAL.....	9

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)

MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
67 (E)	137 (I)	97 (B)	100	14

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ON: STANDARD ESTIMATE					

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J). 0.77		STD. DEV. = 0.25

COMMENTS: TEMPERATURE ESTIMATED FROM THE NA-K-CA GEOTHERMOMETER MAY BE TOO HIGH. HIGH FLOW RATE SUGGESTS THAT SUBSURFACE TEMPERATURE MAY BE NEARER TO THE MINIMUM ESTIMATE. SULFUR DEPOSITION. WARING (1965) REPORTS THAT THE WATER IS USED FOR BATHING AND IRRIGATION.

REFERENCES: WARING, 1917, 1965; MILLER, 1973; RENNER AND OTHERS, 1976

COMPILED BY: BROOK, C.

CHENA , ALASKA

FIELD NAME..... CIRCLE
CIRCULAR REFERENCE..... 015

GEOGRAPHIC LOCALITY

STATE..... ALASKA
LATITUDE..... 65-29. N
LONGITUDE..... 144-39. W
MAPS..... CIRCLE B-2, 1163,360

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
08N	15E	34	FAIRBANKS

GENERAL INFORMATION

WAVING FIGURE..... 9
WAVING NUMBER..... 19
ELEVATION (M)..... 274
SURFACE ACTIVITY..... HOT SPRINGS
ASSOCIATED DEPOSITS..... SINTER, TRAVERTINE, SULFUR, ALUM
NO. OF SPRINGS..... 11
SPRING TEMPERATURES (C)..... 38 TO 57
DISCHARGE (L/MIN)..... 494
ROCK TYPES: SCHIST AND INTRUDED GRANITE

CHEMISTRY

SAMPLE SOURCE.... MILLER, 1973
FLOW (L/MIN)..... 494

TEMP (C)	SI02	CA	MG	NA	K	HCO3	CO3	SO4	CL
54	95	20.8	0.3	230	9.8,	185		96	249
F	B	PH		DEL 0 (18) SO4	DEL 0 (18) H2O	DEL 0 H2O			
9.7	1.1	7.6			-20.6	-162.1			

GEOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 143
 NA-K-CA (4/3)..... 108
 NA-K..... 102

SILICA

ADIABATIC..... 130
 CONDUCTIVE..... 134
 CHALCEDONY..... 107
 CRISTOBALITE..... 84
 OPAL..... 14

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	107 (D)	143 (I)	134 (A)	128	8

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ON: STANDARD ESTIMATE					

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J).	1.02	STD. DEV. = 0.29

COMMENTS: WARING (1965) REPORTS THAT THE WATER IS USED FOR BATHING AND IRRIGATION.

REFERENCES: WARING, 1917, 1965; MILLER, 1973

COMPILED BY: BROOK, C.

CIRCLE, ALASKA

FIELD NAME..... GREAT SITKIN ISLAND
CIRCULAR REFERENCE..... 016

GEOGRAPHIC LOCALITY

STATE..... ALASKA
LATITUDE..... 52-04. N
LONGITUDE..... 176-05. W
MAPS..... ADAK 1:250,000

GENERAL INFORMATION

WAVING FIGURE..... 9
WAVING NUMBER..... 34
AREA OF SURFACE EXPRESSION (KH*2). 0.1
ELEVATION (M)..... 610
SURFACE ACTIVITY..... FUMARoles, HOT SPRINGS
NO. OF SPRINGS..... 12
SPRING TEMPERATURES (C)..... 88 TO 99
ROCK TYPES: ANDESITE, BASALT

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	100 (O)	200 (O)	125 (O)	142	21

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ON: STANDARD ESTIMATE					

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J).	1.14	STD. DEV. = 0.38

COMMENTS: NO WATER CHEMISTRY. AREA OF HOLOCENE VOLCANISM.

REFERENCES: WARING, 1917, 1965; BYERS AND BRANNOCK, 1949; SIMONS AND MATHEWSON, 1955; MILLER, 1973; RENNER AND OTHERS, 1976

COMPILED BY: BROOK, C.

GREAT SITKIN ISLAND , ALASKA

FIELD NAME..... HOT SPRINGS COVE
KGRA OR OTHER NAME..... GEYSER SPRING BASIN KGRA
CIRCULAR REFERENCE..... 017

GEOGRAPHIC LOCALITY

STATE..... ALASKA
LATITUDE..... 53-14. N
LONGITUDE..... 168-21. W
MAPS..... UMNAK 1:250,000

GENERAL INFORMATION

WAVING FIGURE..... 9
WAVING NUMBER..... 43
AREA OF SURFACE EXPRESSION (KM**2), 0.01
ELEVATION (M)..... 60
SURFACE ACTIVITY..... HOT SPRINGS, GEYSERS
NO. OF SPRINGS..... 5
SPRING TEMPERATURES (C)..... 35 TO 89
DISCHARGE (L/MIN)..... 360
ROCK TYPES: ANDESITE, ARGILLITE, KERATOPHYRE, DIABASE

CHEMISTRY

SAMPLE SOURCE..... BYERS AND BRANNOCK, 1949

TEMP(C)	SiO2	CA	MG	NA	K	HCO3	CO3	SO4	CL
89	110	170	1.2	680	32	71		49	1250
F	B	PH		DEL O(18) SO4	DEL O(18) H2O	DEL D H2O			
0.7		6.86			-8.99	-67.2			

GEOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	148
NA-K-CA (4/3).....	114
NA-K.....	110
SILICA	
ADIABATIC.....	137
CONDUCTIVE.....	143
CHALCEDONY.....	116
CRISTOBALITE.....	92
OPAL.....	22

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	143 (A)	200 (N)	148 (I)	164	13

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4

BASED ON: SPRING DISTRIBUTION

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**16 J). 1.34		STD. DEV. = 0.39

COMMENTS: LOCATED NEAR OKMOK CALDERA. THERMAL SPRINGS ALSO OCCUR AT BEACH 1 KM TO NORTH.

REFERENCES: WARING, 1917, 1965; BYERS, 1959; BYERS AND BRANNOCK, 1949; BEIKMAN, 1975

COMPILED BY: BROOK, C.

HOT SPRINGS COVE, ALASKA

FIELD NAME..... GEYSER BIGHT
KGRA OR OTHER NAME..... GEYSER SPRING BASIN KGRA
CIRCULAR REFERENCE..... 018

GEOGRAPHIC LOCALITY

STATE..... ALASKA
LATITUDE..... 53-13. N
LONGITUDE..... 168-28. W
MAPS..... UHNAK 1:250,000

GENERAL INFORMATION

WARNING FIGURE..... 9
WARNING NUMBER..... 41
AREA OF SURFACE EXPRESSION (KM**2). 3.5
ELEVATION (M)..... 60-305
SURFACE ACTIVITY..... HOT SPRINGS, FUMARoles, GEYSER
ASSOCIATED DEPOSITS..... SINTER
NO. OF SPRINGS..... 22
SPRING TEMPERATURES (C)..... 53 TO 102
DISCHARGE (L/MIN)..... 4200
ROCK TYPES: ANDESITE

CHEMISTRY

SAMPLE SOURCE.... MILLER, UNPUB. DATA

TEMP (C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
102	255	20	LT 0.1	480	32	52		170	640
F	B	PH		DEL 0(18) S04		DEL 0(18) H2O		DEL 0 H2O	
1.2	50	8.3		-4.05		-8.06			

GEOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	177
NA-K-CA (4/3).....	174
NA-K.....	141
SILICA	
ADIABATIC.....	182
CONDUCTIVE.....	197
CHALCEDONY.....	179
CRISTOBALITE.....	148
OPAL.....	73
SULFATE	
CONDUCTIVE.....	322
ONE-STEP STEAM LOSS....	264
CONTINUOUS STEAM LOSS..	282

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	177 (I)	264 (K)	182 (C)	208	20

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	4	10	5	6.3	1.3
BASED ON: SPRING DISTRIBUTION					

VOLUME (KM**3).....	10.6	STD. DEV. = 3.0
THERMAL ENERGY(10**18 J).	5.49	STD. DEV. = 1.66

COMMENTS: 3 THERMAL AREAS IN ZONE 2 KM LONG. FUMARoles LOCATED AT HIGHER ELEVATIONS.

REFERENCES: WARING, 1917, 1965; BYERS, 1959; BYERS AND BRANNOCK, 1949; BEIKMAN, 1975; MILLER, UNPUB. DATA

COMPILED BY: BROOK, C.

GEYSER HIGHT, ALASKA

FIELD NAME..... HOT SPRING ON UMNAK ISLAND
KGRA OR OTHER NAME..... GEYSER SPRING BASIN KGRA
CIRCULAR REFERENCE..... 019

GEOGRAPHIC LOCALITY

STATE..... ALASKA
LATITUDE..... 53-14. N
LONGITUDE..... 168-18. W
MAPS..... UMNAK 1:250,000

GENERAL INFORMATION

WARNING FIGURE..... 9
WARNING NUMBER..... 42
ELEVATION (M)..... 25
SURFACE ACTIVITY..... HOT SPRING
NO. OF SPRINGS..... 1
SPRING TEMPERATURES (C)..... 65
ROCK TYPES: ARGILLITE, KERATOPHYRE, DIABASE

CHEMISTRY

SAMPLE SOURCE.... MILLER, UNPUR. DATA

TEMP (C)	SI02	CA	MG	NA	K	HCO3	CO3	S04	CL
65	93	220	2.8	460	16	77	LT 1	150	960
F	R	PH		DEL 0(18) S04	DEL 0(18) H2O	DEL 0 H2O			
0.8	36	6.4			-8.48	-68.4			

GEO THERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 127
 NA-K-CA (4/3)..... 78
 NA-K..... 87

SILICA

ADIABATIC..... 129
 CONDUCTIVE..... 133
 CHALCEDONY..... 106
 CRISTOBALITE..... 83
 OPAL..... 13

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)

MINIMUM 78 (I)	MAXIMUM 133 (A)	MOST LIKELY 106 (D)	MEAN 106	STD. DEV. 11
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UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, HG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5		
SUBSURFACE AREA (KM**2)	1	3	2	1.7	0.3
BASED ON: STANDARD ESTIMATE				2.0	0.4

VOLUME (KM**3)..... 3.3
 THERMAL ENERGY(10**18 J). 0.82

STD. DEV. = 0.9
 STD. DEV. = 0.25

COMMENTS: LOCATED ABOUT 2.5 KM SOUTHEAST OF HOT SPRINGS COVE THERMAL AREA. THE 2 AREAS MAY BE RELATED.

REFERENCES: WARING, 1965; BEIKMAN, 1975; MILLER, UNPUB, DATA

COMPILED BY: BROOK, C.

HOT SPRING ON UMNAK ISLAND, ALASKA

FIELD NAME..... HOT SPRINGS BAY (AKUTAN ISLAND)
CIRCULAR REFERENCE..... 020

GEOGRAPHIC LOCALITY

STATE..... ALASKA
LATITUDE..... 54-10. N
LONGITUDE..... 165-50. W
MAPS..... UNIMAK 11250:000

GENERAL INFORMATION

WAVING FIGURE..... 9
WAVING NUMBER..... 46
SURFACE ACTIVITY..... HOT SPRINGS, FUMARoles
NO. OF SPRINGS..... 4
SPRING TEMPERATURES (C)..... 67 TO 84
ROCK TYPES: BASALT, ANDESITE

CHEMISTRY

SAMPLE SOURCE.... HYERS AND BARTH, 1953

TEMP(C) SI02 CA MG NA K HC03 CO3 S04 CL
83 128 9.9 1.4 288 21 192 39 350

F B PH DEL O(18) S04 DEL O(18) H2O DEL D H2O
7.0

CHALCEDONY..... 126
CRISTOBALITE..... 101
OPAL..... 30

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	126 (D)	151 (A)	136 (J)	138	5

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ON: STANDARD ESTIMATE					

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J).	1.10	STD. DEV. = 0.31

COMMENTS: LOCATED NEAR ACTIVE AKUTAN VOLCANO

REFERENCES: WARING 1917, 1965; BYERS AND BARTH, 1953; BEIKMAN, 1975

COMPILED BY: BROOK, C.

HOT SPRINGS BAY (AKUTAN ISLAND) , ALASKA

FIELD NAME..... EAST OF COLD BAY
CIRCULAR REFERENCE..... 021

GEOGRAPHIC LOCALITY

STATE..... ALASKA
LATITUDE..... 55-13. N
LONGITUDE..... 162-29. W
MAPS..... COLD BAY 1:250,000

GENERAL INFORMATION

ELEVATION (M)..... NEAR SEA LEVEL
SURFACE ACTIVITY..... HOT SPRINGS
SPRING TEMPERATURES (C)..... 54
ROCK TYPES: ANDESITE

CHEMISTRY

SAMPLE SOURCE.... MILLER, 1973

TEMP (C)	SI02	CA	MG	NA	K	HCO3	CO3	SO4	CL
54	68	229	7	780	34	694			1390
F	B	PH		DEL 0 (18) SO4	DEL 0 (18) H2O	DEL D H2O			
		7.5							

GEO THERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	144
NA-K-CA (4/3).....	110
NA-K.....	104
SILICA	
ADIABATIC.....	115
CONDUCTIVE.....	117
CHALCEDONY.....	88
CRISTOBALITE.....	66
OPAL.....	-1

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	88 (D)	144 (I)	117 (A)	116	11

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5		
SUBSURFACE AREA (KM**2)	1	3	2	1.7	0.3
BASED ON: STANDARD ESTIMATE				2.0	0.4

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J). 0.91		STD. DEV. = 0.28

COMMENTS: AREA OF HOLOCENE VOLCANISM.

REFERENCES: MILLER, 1973; BEIKMAN, 1975

COMPILED BY: BROOK, C.

EAST OF COLD BAY, ALASKA

FIELD NAME..... NORTH END OF TENAKEE INLET
CIRCULAR REFERENCE..... 022

GEOGRAPHIC LOCALITY

STATE..... ALASKA
LATITUDE..... 58-02. N
LONGITUDE..... 136-01. W
MAPS..... MT. FAIRWEATHER A-1, 1163,360

TOWNSHIP RANGE SECTION BASE & MERIDIAN
44S 57E 247 COPPER RIVER

GENERAL INFORMATION

WARING FIGURE..... 9
WARING NUMBER..... 64
ELEVATION (M)..... 85
SURFACE ACTIVITY..... HOT SPRINGS
ASSOCIATED DEPOSITS..... TRAVERTINE
NO. OF SPRINGS..... 12
SPRING TEMPERATURES (C)..... 27 TO 82
DISCHARGE (L/MIN)..... 38
ROCK TYPES: DIORITE, GRANITE

CHEMISTRY

SAMPLE SOURCE.... WARING, 1917
FLOW (L/MIN)..... 38

TEMP(C)	SI02	CA	MG	NA	K	HCO3	CO3	SO4	CL
82	119	21	2.3	137	4.1	48		226	33

GEOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 120
 NA-K-CA (4/3)..... 72
 NA-K..... 76

SILICA

ADIABATIC..... 141
 CONDUCTIVE..... 147
 CHALCEDONY..... 122
 CRISTOBALITE..... 97
 OPAL..... 26

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)

MINIMUM
 120 (I)

MAXIMUM
 147 (A)

MOST LIKELY
 122 (D)

MEAN
 130

STD. DEV.
 6

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE

B) QUARTZ CONDUCTIVE, PH-CORRECTED

C) QUARTZ ADIABATIC

D) CHALCEDONY

E) CHALCEDONY, PH-CORRECTED

F) CRISTOBALITE

G) AMORPHOUS SILICA

H) NA-K

I) NA-K-CA

J) NA-K-CA, HG-CORRECTED

K) SULFATE GEOTHERMOMETER

L) SURFACE TEMPERATURE

M) WELL TEMPERATURE

N) MIXING MODEL

O) RENNER AND OTHERS, 1976

DEPTH TO TOP (KM) MINIMUM 0.5
 THICKNESS (KM) 1.0
 SUBSURFACE AREA (KM**2) 1
 BASED ON: STANDARD ESTIMATE

MAXIMUM 2.0
 MOST LIKELY 1.5
 2.5
 1.5
 3 2

MEAN 1.7
 2.0
 STD. DEV. 0.3
 0.4

VOLUME (KM**3)..... 3.3
 THERMAL ENERGY(10**18 J). 1.03

STD. DEV. = 0.9
 STD. DEV. = 0.29

REFERENCES: WARING, 1917, 1965; MILLER, 1973

COMPILED BY: BROOK, C.

NORTH END OF TENAKEE INLET, ALASKA

FIELD NAME..... HOONIAH HOT SPRINGS (WHITE SULPHUR SPRINGS)
CIRCULAR REFERENCE..... 023

GEOGRAPHIC LOCALITY

STATE..... ALASKA
LATITUDE..... 57-48. N
LONGITUDE..... 136-20. W
MAPS..... SITKA D-8 1:63,360

TOWNSHIP RANGE SECTION
47S 56E 09

BASE & MERIDIAN
COPPER RIVER

GENERAL INFORMATION

WAKING FIGURE..... 9
WAKING NUMBER..... 65
ELEVATION (M)..... 12
SURFACE ACTIVITY..... HOT SPRINGS
ASSOCIATED DEPOSITS..... TRAVERTINE
NO. OF SPRINGS..... 3
SPRING TEMPERATURES (C)..... 29 TO 44
DISCHARGE (L/MIN)..... 114
ROCK TYPES: SCHIST

CHEMISTRY

SAMPLE SOURCE.... WARING, 1917
FLOW (L/MIN)..... 114

TEMP (C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
44	98	85				18		35	42

GEOOTHERMOMETERS (C)

SILICA

ADIABATIC.....	132
CONDUCTIVE.....	136
CHALCEDONY.....	109
CRISTOBALITE.....	85
OPAL.....	16

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	109 (D)	136 (A)	136 (A)	127	6

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ON: STANDARD ESTIMATE					

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J). 1.01		STD. DEV. = 0.29

COMMENTS: WATER USED FOR BATHING.

REFERENCES: WARING, 1917, 1965; MILLER, 1973 ,

COMPILED BY: BROOK, C.

HOONIAH HOT SPRINGS (WHITE SULPHUR SPRINGS) , ALASKA

FIELD NAME..... NEAR FISH BAY
CIRCULAR REFERENCE..... 024

GEOGRAPHIC LOCALITY

STATE..... ALASKA
LATITUDE..... 57-22. N
LONGITUDE..... 135-23. W
MAPS..... SITKA 8-5 1:63,360

GENERAL INFORMATION

WARING FIGURE..... 9
WARING NUMBER..... 68
ELEVATION (M)..... NEAR SEA LEVEL
SURFACE ACTIVITY..... HOT SPRINGS
NO. OF SPRINGS..... 24
SPRING TEMPERATURES (C)..... 17 TO 47
DISCHARGE (L/MIN)..... 95
ROCK TYPES: FAULTED SCHIST

CHEMISTRY

SAMPLE SOURCE.... WARING, 1917

TEMP (C)	SI02	CA	MG	NA	K	HC03	CO3	SO4	CL
47	110	13	2.4			43		24	45

GEOOTHERMOMETERS (C)

SILICA

ADIABATIC.....	137
CONDUCTIVE.....	143
CHALCEDONY.....	116
CRISTOBALITE.....	92
OPAL.....	22

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	70	143 (A)	143 (A)	119	17

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ON: STANDARD ESTIMATE					

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J),	0.93	STD. DEV. = 0.31

COMMENTS: MINIMUM TEMPERATURE VALUE IS ESTIMATED. WATER USED FOR BATHING.

REFERENCES: WARING, 1917, 1965; MILLER, 1973

COMPILED BY: BROOK, C.

NEAR FISH BAY , ALASKA

FIELD NAME..... GODDARD HOT SPRINGS (SITKA)
CIRCULAR REFERENCE..... 025

GEOGRAPHIC LOCALITY

STATE..... ALASKA
LATITUDE..... 56-50. N
LONGITUDE..... 135-22. W
MAPS..... PORT ALEXANDER D-5 1163,360

TOWNSHIP RANGE SECTION BASE & MERIDIAN
58S 64E COPPER RIVER

GENERAL INFORMATION

WATERING FIGURE..... 9
WATERING NUMBER..... 70
ELEVATION (M)..... NEAR SEA LEVEL
SURFACE ACTIVITY..... HOT SPRINGS
NO. OF SPRINGS..... 3
SPRING TEMPERATURES (C)..... 51 TO 65
DISCHARGE (L/MIN)..... 49
ROCK TYPES: GRANITE CUT BY DIABASE DIKES

CHEMISTRY

SAMPLE SOURCE.... MILLER, 1973
FLOW (L/MIN)..... 49

TEMP(C)	SI02	CA	MG	NA	K	HCO3	CO3	SO4	CL
67	120	380	1	1500	61	8		110	2780
F	B	PH		DEL 0(18) SO4		DEL 0(18) H2O		DEL 0 H2O	
1.4		7.4				-11.10		-82.8	

GEOOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 147
 NA-K-CA (4/3)..... 129
 NA-K..... 98

SILICA

ADIABATIC..... 141
 CONDUCTIVE..... 148
 CHALCEDONY..... 122
 CRISTOBALITE..... 97
 OPAL..... 26

RESERVOIR PROPERTIES SURFACE TEMP (C)

MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
122 (D)	148 (A,I)	148 (A,I)	139	6

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4

BASED ON: STANDARD ESTIMATE

VOLUME (KM**3).....	3.3	STD. DEV. =	0.9
THERMAL ENERGY(10**18 J). 1.12		STD. DEV. =	0.32

COMMENTS: BATHING RESORT

REFERENCES: WARING, 1917, 1965; MILLER, 1973

COMPILED BY: BROOK, C.

GOUDARD HOT SPRINGS (SITKA) , ALASKA

FIELD NAME..... SHAKES SPRINGS (CHIEF SHAKES)
CIRCULAR REFERENCE..... 026

GEOGRAPHIC LOCALITY

STATE..... ALASKA
LATITUDE..... 56-43, N
LONGITUDE..... 132-02, W
MAPS..... PETERSBURG C-1, 1163,360

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
59S	85E	28 SW OF SW	COPPER RIVER

GENERAL INFORMATION

WAKING FIGURE..... 9
WAKING NUMBER..... 73
ELEVATION (M)..... 30
SURFACE ACTIVITY..... HOT SPRINGS
NO. OF SPRINGS..... SEVERAL
SPRING TEMPERATURES (C)..... 52
DISCHARGE (L/MIN)..... 380
ROCK TYPES: GRANITE

CHEMISTRY

SAMPLE SOURCE.... WAKING, 1917
FLOW (L/MIN)..... 380

TEMP(C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
52	108	13	0.2	87	9.2	43		142	6.5

GEOOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 175
 NA-K-CA (4/3)..... 105
 NA-K..... 190

SILICA

ADIABATIC..... 136
 CONDUCTIVE..... 142
 CHALCEDONY..... 115
 CRISTOBALITE..... 91
 OPAL..... 21

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)

MINIMUM
 115 (D)

MAXIMUM
 175 (I)

MOST LIKELY
 142 (A)

MEAN
 144

STD. DEV.
 12

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE
 B) QUARTZ CONDUCTIVE, PH-CORRECTED
 C) QUARTZ ADIABATIC
 D) CHALCEDONY
 E) CHALCEDONY, PH-CORRECTED

F) CRISTOBALITE
 G) AMORPHOUS SILICA
 H) NA-K
 I) NA-K-CA
 J) NA-K-CA, MG-CORRECTED

K) SULFATE GEOTHERMOMETER
 L) SURFACE TEMPERATURE
 M) WELL TEMPERATURE
 N) MIXING MODEL
 O) RENNER AND OTHERS, 1976

DEPTH TO TOP (KM) MINIMUM 0.5
 THICKNESS (KM) 1.0
 SUBSURFACE AREA (KM**2) 1
 BASED ON: STANDARD ESTIMATE

MAXIMUM 2.0
 2.5
 3

MOST LIKELY 1.5
 1.5
 2

MEAN 1.7
 2.0

STD. DEV. 0.3
 0.4

VOLUME (KM**3)..... 3.3
 THERMAL ENERGY (10**18 J), 1.16

STD. DEV. = 0.9
 , STD. DEV. = 0.34

COMMENTS: CHEMICAL DATA MAY NOT BE RELIAHLE. USED IN BATH HOUSE.

REFERENCES: WARING, 1917, 1965; MILLER, 1973

COMPILED BY: BROOK, C.

SHAKES SPRINGS (CHIEF SHAKES) , ALASKA

FIELD NAME..... BAILEY BAY HOT SPRINGS
CIRCULAR REFERENCE..... 027

GEOGRAPHIC LOCALITY

STATE..... ALASKA
LATITUDE..... 55-59.0 N
LONGITUDE..... 131-39.5 W
MAPS..... KETCHIKAN D-5, 1163,360

TOWNSHIP RANGE SECTION BASE & MERIDIAN
68S 89E 09 SE OF SW COPPER RIVER

GENERAL INFORMATION

WAVING FIGURE..... 9
WAVING NUMBER..... 76
AREA OF SURFACE EXPRESSION (KM**2)..... 145
ELEVATION (M)..... NEAR SEA LEVEL
SURFACE ACTIVITY..... HOT SPRINGS
NO. OF SPRINGS..... 9
SPRING TEMPERATURES (C)..... 63 TO 88
DISCHARGE (L/MIN)..... 314
ROCK TYPES: GRANITE

CHEMISTRY

SAMPLE SOURCE.... USGS FILE DATA

TEMP(C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
88	160	2	0	78	4.2	118		44	47
F	R	PH		DEL 0(18) S04	DEL 0(18) H2O	DEL 0 H2O			
		7.22							

GEOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 155
 NA-K-CA (4/3)..... 122
 NA-K..... 121

SILICA

ADIABATIC..... 156
 CONDUCTIVE..... 165
 CHALCEDONY..... 142
 CRISTOBALITE..... 115
 OPAL..... 42

RESERVOIR PROPERTIES

SUBSURFACE TEMP (C)

MINIMUM

155 (I)

MAXIMUM

165 (A)

MOST LIKELY

165 (A)

MEAN

162

STD. DEV.

2

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE

B) QUARTZ CONDUCTIVE, PH-CORRECTED

C) QUARTZ ADIABATIC

D) CHALCEDONY

E) CHALCEDONY, PH-CORRECTED

F) CRISTOBALITE

G) AMORPHOUS SILICA

H) NA-K

I) NA-K-CA

J) NA-K-CA, MG-CORRECTED

K) SULFATE GEOTHERMOMETER

L) SURFACE TEMPERATURE

M) WELL TEMPERATURE

N) MIXING MODEL

O) RENNER AND OTHERS, 1976

DEPTH TO TOP (KM)

MINIMUM

0.5

MAXIMUM

2.0

MOST LIKELY

1.5

MEAN

1.7

STD. DEV.

0.3

THICKNESS (KM)

1.0

2.5

1.5

1.7

0.3

SUBSURFACE AREA (KM**2)

1

3

2

2.0

0.4

BASED ON: STANDARD ESTIMATE

VOLUME (KM**3)..... 3.3

STD. DEV. = 0.9

THERMAL ENERGY (10**18 J). 1.32

STD. DEV. = 0.37

COMMENTS: WATER USED FOR BATHING.

REFERENCES: WARING, 1917, 1965; MILLER, 1973

COMPILED BY: BROOK, C.

BAILEY BAY HOT SPRINGS, ALASKA

FIELD NAME..... BELL ISLAND HOT SPRINGS
CIRCULAR REFERENCE..... 028

GEOGRAPHIC LOCALITY

STATE..... ALASKA
LATITUDE..... 55-56. N
LONGITUDE..... 131-34. W
MAPS..... KETCHIKAN Q-5, 1163,360

TOWNSHIP RANGE SECTION BASE & MERIDIAN
68S 90E 31 COPPER RIVER

GENERAL INFORMATION

WAKING FIGURE..... 9
WAKING NUMBER..... 79
ELEVATION (M)..... NEAR SEA LEVEL
SURFACE ACTIVITY..... HOT SPRINGS
NO. OF SPRINGS..... 5
SPRING TEMPERATURES (C)..... 43 TO 72
DISCHARGE (L/MIN)..... 38
ROCK TYPES: GRANITE CUT BY PEGMATITE DIKES

CHEMISTRY

SAMPLE SOURCE..... USGS FILE DATA

TEMP (C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
72	125	10	0	197	6.6	53		79	189
F	B	PH		DEL 0(18) S04		DEL 0(18) H2O		DEL D H2O	
		8.95							

GEOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 135
 NA-K-CA (4/3)..... 110
 NA-K..... 84

SILICA

ADIABATIC..... 143
 CONDUCTIVE..... 150
 CHALCEDONY..... 125
 CRISTOBALITE..... 100
 OPAL..... 29

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)

MINIMUM 93 (E)	MAXIMUM 150 (A)	MOST LIKELY 135 (I)	MEAN 126	STD. DEV. 12
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UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4

BASED ON: STANDARD ESTIMATE

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J). 1.00		STD. DEV. = 0.30

REFERENCES: WARING, 1917, 1965; MILLER, 1973

COMPILED BY: BROOK, C.

BELL ISLAND HOT SPRINGS , ALASKA

Arizona

FIELD NAME..... POWER RANCHES INC. WELLS
CIRCULAR REFERENCE..... 029

GEOGRAPHIC LOCALITY

STATE..... ARIZONA
COUNTY..... MARICOPA
LATITUDE..... 33-17.1 N
LONGITUDE..... 111-41.2 W
MAPS..... HIGLEY 1124,000

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
02S	06E	01 SW	GILA AND SALT RIVER

GENERAL INFORMATION

ELEVATION (M)..... 409
SURFACE ACTIVITY..... NONE, FOUND BY DRILLING
DISCHARGE (L/MIN)..... 19000
NO. OF WELLS..... 2
WELL DEPTHS (M)..... 2808 TO 3188
MAXIMUM WELL TEMP (C)..... 184 AT DEPTH (M) 3188
ROCK TYPES: ALLUVIUM OVERLYING ANDESITE (?) OR GRANITE (?)

RESERVOIR PROPERTIES
SUBSURFACE TEMP (C)

MINIMUM
150

MAXIMUM
180

MOST LIKELY
165

MEAN
165

STD. DEV.
6

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE

F) CRISTOBALITE

K) SULFATE GEOTHERMOMETER

H) QUARTZ CONDUCTIVE, PH-CORRECTED

G) AMORPHOUS SILICA

L) SURFACE TEMPERATURE

C) QUARTZ ADIABATIC

H) NA-K

M) WELL TEMPERATURE

D) CHALCEDONY

I) NA-K-CA

N) MIXING MODEL

E) CHALCEDONY, PH-CORRECTED

J) NA-K-CA, MG-CORRECTED

O) RENNER AND OTHERS, 1976

DEPTH TO TOP (KM)

MINIMUM
2.0

MAXIMUM
2.5

MOST LIKELY
2.0

MEAN

STD. DEV.

THICKNESS (KM)

0.5

1.0

1.0

0.8

0.1

SUBSURFACE AREA (KM**2)

2

6

2

3.3

0.9

BASED ON: WELL DISTRIBUTION

VOLUME (KM**3)..... 2.8

STD. DEV. = 0.9

THERMAL ENERGY(10**10 J). 1.12

STD. DEV. = 0.36

COMMENTS: TWO WELLS ABOUT 1 KM APART AND ABOUT 3 KM DEEP: BOTTOM HOLE TEMPERATURES OF 163 AND 184 C.

REFERENCES: RENNER AND OTHERS, 1976; HAHMAN AND OTHERS, 1978

COMPILED BY: BROOK, C.

POWER RANCHES INC. WELLS, ARIZONA

FIELD NAME..... EAGLE CREEK
CIRCULAR REFERENCE..... 030

GEOGRAPHIC LOCALITY

STATE..... ARIZONA
COUNTY..... GREENLEE
LATITUDE..... 33-02.8 N
LONGITUDE..... 109-26.4 W
MAPS..... CLIFTON 1162.500

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
04S	20E	35 NW OF NE	GILA AND SALT RIVER

GENERAL INFORMATION

WARNING FIGURE..... 2
WARNING NUMBER..... 167
ELEVATION (M)..... 1122
SURFACE ACTIVITY..... WARM SPRINGS
NO. OF SPRINGS..... 2
SPRING TEMPERATURES (C)..... 32 TO 36
DISCHARGE (L/MIN)..... LT 10 L/MIN
ROCK TYPES: TERTIARY (?) BASALT
GEOPHYSICS: GRAVITY, MAGNETIC

CHEMISTRY

SAMPLE SOURCE.... MARINER AND OTHERS, 1977
FLOW (L/MIN)..... LOW
COLLECTION DATE.. 1974/12/00

TEMP (C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
35	64	16	2.1	190	7.8	283		45	120
F	B	PH		DEL 0 (18)	S04	DEL 0 (18)	H2O	DEL 0	H2O
10	0.12	8.24				-12.01		-89.0	

GEOOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 140
 NA-K-CA (4/3)..... 104
 NA-K..... 99

SILICA

ADIAHATIC..... 113
 CONDUCTIVE..... 114
 CHALCEDONY..... 85
 CRISTOBALITE..... 63
 UPAL..... -4

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)

MINIMUM
 85 (D)

MAXIMUM
 114 (A)

MOST LIKELY
 85 (D)

MEAN
 95

STD. DEV.
 7

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE

B) QUARTZ CONDUCTIVE, PH-CORRECTED

C) QUARTZ ADIAHATIC

D) CHALCEDONY

E) CHALCEDONY, PH-CORRECTED

F) CRISTOBALITE

G) AMORPHOUS SILICA

H) NA-K

I) NA-K-CA

J) NA-K-CA, MG-CORRECTED

K) SULFATE GEOTHERMOMETER

L) SURFACE TEMPERATURE

M) WELL TEMPERATURE

N) MIXING MODEL

O) RENNER AND OTHERS, 1976

DEPTH TO TOP (KM)

MINIMUM
 0.5

MAXIMUM
 2.0

MOST LIKELY
 1.5

MEAN

STD. DEV.

THICKNESS (KM)

1.0

2.5

1.5

1.7

0.3

SUBSURFACE AREA (KM**2)

1

3

2

2.0

0.4

BASED ON: STANDARD ESTIMATE

VOLUME (KM**3)..... 3.3

STD. DEV. = 0.9

THERMAL ENERGY (10**18 J)..... 0.72

STD. DEV. = 0.21

COMMENTS: GEOTHERMOMETERS MAY BE UNRELIABLE BECAUSE OF VERY LOW FLOW RATE. EQUILIBRIUM WITH AMORPHOUS SILICA POSSIBLE AT SURFACE TEMPERATURE. SUPERSATURATED WITH CALCITE. TEMPERATURE OF RESERVOIR MAY BE LOWER THAN REPORTED HERE.

REFERENCES: LINDGREN, 1905; SAUCK AND SUMNER, 1970; WEST AND SUMNER, 1973; RENNER AND OTHERS, 1976; MARINER AND OTHERS, 1977A

COMPILED BY: BROOK, C.

EAGLE CREEK, ARIZONA

FIELD NAME..... NORTH OF CLIFTON
CIRCULAR REFERENCE..... 031

GEOGRAPHIC LOCALITY

STATE..... ARIZONA
COUNTY..... GREENLEE
LATITUDE..... 33-04.7 N
LONGITUDE..... 109-18.2 W
MAPS..... CLIFTON 1162,500

TOWNSHIP RANGE SECTION BASE & MERIDIAN
04S 30E 18 SW OF SW GILA AND SALT RIVER

GENERAL INFORMATION

ELEVATION (M)..... 1068
SURFACE ACTIVITY..... HOT SPRINGS
ASSOCIATED DEPOSITS..... NONE
NO. OF SPRINGS..... 2
SPRING TEMPERATURES (C)..... 44 TO 59
ROCK TYPES: QUARTZITE OVERLYING GRANITE
GEOPHYSICS: GRAVITY, MAGNETIC

CHEMISTRY

SAMPLE SOURCE.... MARINER AND OTHERS, 1977
FLOW (L/MIN).... VERY LOW
COLLECTION DATE.. 1974/12/00

TEMP(C)	SI02	CA	HG	NA	K	HCO3	CO3	SO4	CL
59	95	740	20	2600	170	145		68	5500
F	n	PH		DEL 0(18) SO4		DEL 0(18) H2O		DEL D H2O	
2.8	1.2	7.07				-10.95		-84.0	

GEOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 174
 NA-K-CA (4/3)..... 165
 NA-K..... 139

SILICA

ADIABATIC..... 130
 CONDUCTIVE..... 134
 CHALCEDONY..... 107
 CRISTOBALITE..... 84
 OPAL..... 14

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)

MINIMUM
 107 (D)

MAXIMUM
 164 (N,J)

MOST LIKELY
 164 (N,J)

MEAN
 145

STD. DEV.
 13

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE

B) QUARTZ CONDUCTIVE, PH-CORRECTED

C) QUARTZ ADIABATIC

D) CHALCEDONY

E) CHALCEDONY, PH-CORRECTED

F) CRISTOBALITE

G) AMORPHOUS SILICA

H) NA-K

I) NA-K-CA

J) NA-K-CA, MG-CORRECTED

K) SULFATE GEOTHERMOMETER

L) SURFACE TEMPERATURE

M) WELL TEMPERATURE

N) MIXING MODEL

O) RENNER AND OTHERS, 1976

DEPTH TO TOP (KM) MINIMUM
 THICKNESS (KM) 0.5
 SUBSURFACE AREA (KM**2) 1.0
 BASED ON: STANDARD ESTIMATE 1

MAXIMUM
 2.0
 2.5
 3

MOST LIKELY
 1.5
 1.5
 2

MEAN
 1.7
 2.0

STD. DEV.
 0.3
 0.4

VOLUME (KM**3)..... 3.3
 THERMAL ENERGY(10**18 J). 1.17

STD. DEV. = 0.9
 STD. DEV. = 0.35

COMMENTS: WATER MAY BE PRECIPITATING CALCITE. PROBABLY A MIXED WATER. WARM SPRINGS (39 C) IN CLIFTON KGRA 3 KM TO SOUTH MAY BE PART OF THIS SYSTEM.

REFERENCES: LINDGREN, 1905; SAUCK AND SUMNER, 1970; WEST AND SUMNER, 1973; MARINER AND OTHERS, 1977A; J.P. CALZIA, UNPUB, MAP; RENNER AND OTHERS, 1976

COMPILED BY: BROOK, C.

NORTH OF CLIFTON, ARIZONA

FIELD NAME..... GILLARD HOT SPRINGS
KGRA OR OTHER NAME..... GILLARD HOT SPRINGS KGRA
CIRCULAR REFERENCE..... 032

GEOGRAPHIC LOCALITY

STATE..... ARIZONA
COUNTY..... GREENLEE
LATITUDE..... 32-58.5 N
LONGITUDE..... 109-21.0 W
MAPS..... GUTHRIE 1162,500

TOWNSHIP RANGE SECTION BASE & MERIDIAN
05S 29E 27 NE OF NE GILA AND SALT RIVER

GENERAL INFORMATION

ELEVATION (M)..... 1025
SURFACE ACTIVITY..... HOT SPRINGS
NO. OF SPRINGS..... 5
SPRING TEMPERATURES (C)..... 82
ROCK TYPES: TERTIARY BASALT AND INTERBEDDED FANGLOMERATE
GEOPHYSICS: GRAVITY, MAGNETIC

CHEMISTRY

SAMPLE SOURCE..... MARINER AND OTHERS, 1977
COLLECTION DATE.. 1974/12/00

TEMP (C)	SI02	CA	MG	NA	K	HCO3	CO3	SO4	CL
82	95	22	0.8	450	14	216		180	490
F	B	PH		DEL 0 (18) SO4		DEL 0 (18) H2O		DEL 0 H2O	
11	0.41	7.35		-0.31		-10.87		-86.5	

GEOOTHERMOMETERS (C)

CATION

NA-K-CA (1/3).....	138
NA-K-CA (4/3).....	130
NA-K.....	79

SILICA

ADIABATIC.....	130
CONDUCTIVE.....	134
CHALCEDONY.....	107
CRISTOBALITE.....	84
OPAL.....	14

SULFATE

CONDUCTIVE.....	169
ONE-STEP STEAM LOSS....	157
CONTINUOUS STEAM LOSS..	159

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)

MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
107 (D)	169 (K)	134 (A)	137	13

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5		
SUBSURFACE AREA (KM**2)	1	3	2	1.7	0.3
BASED ON: STANDARD ESTIMATE				2.0	0.4

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J). 1.09		STD. DEV. = 0.33

REFERENCES: HEM, 1950; SAUCK AND SUMNER, 1970; WEST AND SUMNER, 1973; MARINER AND OTHERS, 1977A; RENNER AND OTHERS, 1976

COMPILED BY: BROOK, C. AND MARINER, R.

GILLARD HOT SPRINGS , ARIZONA

FIELD NAME..... SAN SIMON WELL
CIRCULAR REFERENCE..... 033

GEOGRAPHIC LOCALITY

STATE..... ARIZONA
COUNTY..... COCHISE
LATITUDE..... 32-24.0 N
LONGITUDE..... 109-18.0 W
MAPS..... MARTIN WELL 1:24,000

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
12S	30E	08 SE	GILA AND SALT RIVER

GENERAL INFORMATION

SURFACE ACTIVITY..... NONE. FOUND BY DRILLING
NO. OF WELLS..... 1
MAXIMUM WELL TEMP (C)..... 1951
ROCK TYPES: ALLUVIUM OVERLYING GRANITIC (?) ROCKS

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	125	145	134 (M)	135	4

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	1.5	2.0	2.0		
THICKNESS (KM)	1.0	1.5	1.0	1.2	0.1
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4

BASED ON: STANDARD ESTIMATE

VOLUME (KM**3).....	2.3	STD. DEV. = 0.5
THERMAL ENERGY(10**18 J).	0.75	STD. DEV. = 0.17

COMMENTS: REPORTED LOCATION MAY BE IN ERROR. MINIMUM AND MAXIMUM TEMPERATURES ARE SUBJECTIVE ESTIMATES.

REFERENCES: SWANBERG AND OTHERS, 1977

COMPILED BY: MARINER, R. AND HROOK, C.

SAN SIMON WELL, ARIZONA

California

FIELD NAME..... FORT BIDWELL AREA
CIRCULAR REFERENCE..... 034

GEOGRAPHIC LOCALITY

STATE..... CALIFORNIA
COUNTY..... MODOC
LATITUDE..... 41-51.8 N
LONGITUDE..... 120-09.6 W

TOWNSHIP RANGE SECTION
46N 16E 17 NW OF NE

BASE & MERIDIAN
MT DIABLO

GENERAL INFORMATION

WARNING FIGURE..... 8
WARNING NUMBER..... 12
ELEVATION (M)..... 1414
SURFACE ACTIVITY..... HOT SPRINGS
NO. OF SPRINGS..... 5
SPRING TEMPERATURES (C)..... 36 TO 45
ROCK TYPES: TERTIARY RHYOLITE

CHEMISTRY

SAMPLE SOURCE.... REED, 1975
FLOW (L/MIN).... 400
COLLECTION DATE.. 1973/06/26

TEMP (C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
45.1	82	4.2	0.1	110	9.5	131		86	31
F	R	PH		DEL 0(18) S04	DEL 0(18) H2O	DEL 0 H2O			
2.2	0.61	7.85							

GEOOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 179
 NA-K-CA (4/3)..... 141
 NA-K..... 167

SILICA

ADIABATIC..... 124
 CONDUCTIVE..... 126
 CHALCEDONY..... 99
 CRISTOBALITE..... 76
 OPAL..... 7

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	99 (D)	179 (I)	126 (A)	135	17

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4

BASED ON: STANDARD ESTIMATE

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY (10**18 J).....	1.08	STD. DEV. = 0.34

COMMENTS: LOW SURFACE TEMPERATURE AND HIGH FLOW RATE SUGGESTS THAT SURFACE TEMPERATURES MAY BE NEARER TO MINIMUM ESTIMATE OR THAT THE WATER MAY BE MIXED.

REFERENCES: DUFFIELD AND FOURNIER, 1974; REED, 1975

COMPILED BY: BROOK, C.

FORT BIDWELL AREA, CALIFORNIA

FIELD NAME..... SURPRISE VALLEY AREA
KGRA OR OTHER NAME..... LAKE CITY-SURPRISE VALLEY KGRA
CIRCULAR REFERENCE..... 035

GEOGRAPHIC LOCALITY

STATE..... CALIFORNIA
COUNTY..... MODOC
LATITUDE..... 41-40.0 N
LONGITUDE..... 120-12.0 W
MAPS..... CEDARVILLE 1162,500

TOWNSHIP RANGE SECTION BASE & MERIDIAN
44N 15E 24 SW OF NE MT, DIABLO

GENERAL INFORMATION

WARNING FIGURE..... 8
WARNING NUMBER..... 14-18
AREA OF SURFACE EXPRESSION (KM**2). 1
ELEVATION (M)..... 1366
SURFACE ACTIVITY..... HOT SPRINGS (VIOLENT MUD ERUPTION IN 1951)
ASSOCIATED DEPOSITS..... SINTER
NO. OF SPRINGS..... MORE THAN 15 IN 4 GROUPS
SPRING TEMPERATURES (C)..... 62 TO 98
DISCHARGE (L/MIN)..... 1350
NO. OF WELLS..... 8
WELL DEPTHS (M)..... 28 TO 2085
MAXIMUM WELL TEMP (C)..... 160 AT DEPTH (M) 1155
ROCK TYPES: ALLUVIUM OVERLYING TERTIARY RHYOLITE
GEOPHYSICS: GRAVITY, MAGNETIC, RESISTIVITY, AMT

CHEMISTRY

SAMPLE SOURCE.... REED, 1975 (SEYFERTH HOT SPRINGS)
FLOW (L/MIN)..... 500
COLLECTION DATE.. 1973/07/26

TEMP (C)	SI02	CA	MG	NA	K	HCO3	CO3	SO4	CL
85	110	28	LT 0.1	300	9.0	63	0	370	220
F	H	PH		DEL 0 (18) SO4	DEL 0 (18) H2O	DEL 0 H2O			
5.4	7.6	7.66		-5.62	-14.05	-121.2			

GEOOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	129
NA-K-CA (4/3).....	101
NA-K.....	76
SILICA	
ADIABATIC.....	137
CONDUCTIVE.....	143
CHALCEDONY.....	116
CRISTOBALITE.....	92
OPAL.....	22
SULFATE	
CONDUCTIVE.....	205
ONE-STEP STEAM LOSS....	185
CONTINUOUS STEAM LOSS..	189

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	129 (I)	185	143 (A)	152	12

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	40	250	95	128.3	44.5

BASED ON: ESTIMATES OF RENNER AND OTHERS (1976) AND WATER QUALITY HAZARD AREA

VOLUME (KM**3).....	213.9	STD. DEV. = 85.3
THERMAL ENERGY(10**18 J).	79.31	STD. DEV. = 32.50

COMMENTS: SYSTEM INCLUDES MUD VOLCANO AREA, SEYFERTH HOT SPRINGS, LEONARDS HOT SPRINGS, AND HOT SPRINGS MOTEL. WATER CHEMISTRY FOR THE 4 SPRING GROUPS IS SIMILAR AND SUGGESTS A SINGLE SYSTEM. REPORTED WELL TEMPERATURE IS FROM THE MUD VOLCANO AREA. WATER QUALITY AREA IS DEFINED BY HIGH BORON CONCENTRATIONS.

REFERENCES: WHITE, 1955; WARING, 1965; DUFFIELD AND FOURNIER, 1974; REED, 1975; CALIFORNIA DEPARTMENT OF WATER RESOURCES, 1963; CHAPMAN AND BISHOP, 1968

COMPILED BY: HROOK, C.

SURPRISE VALLEY AREA, CALIFORNIA

FIELD NAME..... WEST VALLEY RESERVOIR HOT SPRING
CIRCULAR REFERENCE..... 036

GEOGRAPHIC LOCALITY

STATE..... CALIFORNIA
COUNTY..... MODOC
LATITUDE..... 41-11.5 N
LONGITUDE..... 120-23.1 W
MAPS..... TULE MOUNTAIN 1124,000

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
39N	14E	29 NW OF NE	MT. DIABLO

GENERAL INFORMATION

ELEVATION (M)..... 1460
SURFACE ACTIVITY..... HOT SPRING
NO. OF SPRINGS..... 17
SPRING TEMPERATURES (C)..... 77.3
DISCHARGE (L/MIN)..... 12
ROCK TYPES: BASALT

CHEMISTRY

SAMPLE SOURCE..... REED, 1975
FLOW (L/MIN)..... 12
COLLECTION DATE.. 1973/07/24

TEMP (C)	SI02	CA	MG	NA	K	HC03	CO3	SO4	CL
77.3	130	19	LT 0.1	330	11	63	0	510	150
F	B	PH		DEL 0 (18) SO4	DEL 0 (18) H2O	DEL 0 H2O			
4.0	4.5	7.79			-14.13	-118.5			

GEOOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 138
 NA-K-CA (4/3)..... 120
 NA-K..... 84

SILICA

ADIABATIC..... 145
 CONDUCTIVE..... 152
 CHALCEDONY..... 127
 CRISTOBALITE..... 102
 OPAL..... 31

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	138 (I)	152 (A)	138 (I)	143	3

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ON: STANDARD ESTIMATE					

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J).....	1.15	STD. DEV. = 0.32

REFERENCES: REED, 1975

COMPILED BY: BROOK, C.

WEST VALLEY RESERVOIR HOT SPRING, CALIFORNIA

FIELD NAME..... BASSETT HOT SPRING
CIRCULAR REFERENCE..... 037

GEOGRAPHIC LOCALITY

STATE..... CALIFORNIA
COUNTY..... LASSEN
LATITUDE..... 41-08.7 N
LONGITUDE..... 121-06.6 W
MAPS..... HIERER 1162,500

TOWNSHIP	RANGE	SECTION	HASE & MERIDIAN
38N	07E	12 NW OF SE	MT. DIAHLO

GENERAL INFORMATION

WARNING FIGURE..... 8
WARNING NUMBER..... 28
ELEVATION (M)..... 1265
SURFACE ACTIVITY..... HOT SPRING
NO. OF SPRINGS..... 17
SPRING TEMPERATURES (C)..... 70
DISCHARGE (L/MIN)..... 200
ROCK TYPES: SANDSTONE OVERLYING BASALT (?)

CHEMISTRY

SAMPLE SOURCE.... REED, 1975
FLOW (L/MIN)..... 200
COLLECTION DATE.. 1973/08/14

TEMP (C)	SI02	CA	MG	NA	K	HC03	CO3	SO4	CL
79	64	30	LT 0.1	220	3.2	30	1	370	93
F	B	PH		DEL 0 (18) SO4	DEL 0 (18) H2O	DEL 0 H2O			
2.0	2.5	8.53			-14.67	-116.2			

GEOOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 96
 NA-K-CA (4/3)..... 62
 NA-K..... 33

SILICA

ADIAHATIC..... 115
 CONDUCTIVE..... 117
 CHALCEDONY..... 88
 CRISTOHALITE..... 66
 OPAL..... -1

RESERVOIR PROPERTIES

SUBSURFACE TEMP (C)

MINIMUM

88 (D)

MAXIMUM

117 (A)

MOST LIKELY

88 (D)

MEAN

98

STD. DEV.

7

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, HG-CORRECTED	O) RENNER AND OTHERS, 1976

8
6

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ON: STANDARD ESTIMATE					

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J).....	0.74	STD. DEV. = 0.22

REFERENCES: WARING, 1965; REED, 1975

COMPILED BY: BROOK, C.

BASSETT HOT SPRING, CALIFORNIA

FIELD NAME..... KELLY HOT SPRING
CIRCULAR REFERENCE..... 038

GEOGRAPHIC LOCALITY

STATE..... CALIFORNIA
COUNTY..... MODOC
LATITUDE..... 41-27.5 N
LONGITUDE..... 120-50.0 W
MAPS..... CADDY 1162,500

TOWNSHIP RANGE SECTION BASE & MERIDIAN
42N 10E 29 NE OF NW MT. DIABLO

GENERAL INFORMATION

WAVING FIGURE..... 8
WAVING NUMBER..... 8
ELEVATION (M)..... 1326
SURFACE ACTIVITY..... HOT SPRING
NO. OF SPRINGS..... 1
SPRING TEMPERATURES (C)..... 91.5
DISCHARGE (L/MIN)..... 1250
NO. OF WELLS..... 2
WELL DEPTHS (M)..... 978 TO 1035
MAXIMUM WELL TEMP (C)..... 116 AT DEPTH (M) 1035
ROCK TYPES: PLIOCENE (?) PYROCLASTICS AND BASALT FLOWS
GEOPHYSICS: GRAVITY

CHEMISTRY

SAMPLE SOURCE.... REED, 1975
FLOW (L/MIN)..... 1250
COLLECTION DATE.. 1973/07/23

TEMP(C)	SI02	CA	MG	NA	K	HC03	CO3	S04	CL
91.5	110	20	LT 0.1	250	6.5	45	1	300	160
F	B	PH		DEL 0(18) S04	DEL 0(18) H2O	DEL 0 H2O			
2.1	3.8	8.08		-4.73	-13.54	-115.1			

GEOOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	123
NA-K-CA (4/3).....	95
NA-K.....	67
SILICA	
ADIAHATIC.....	137
CONDUCTIVE.....	143
CHALCEDONY.....	116
CRISTOBALITE.....	92
OPAL.....	22
SULFATE	
CONDUCTIVE.....	198
ONE-STEP STEAM LOSS....	181
CONTINUOUS STEAM LOSS..	185

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	95 (I)	143 (A)	116 (D,M)	118	10

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIAHATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.9	2.0	1.0		
THICKNESS (KM)	1.0	2.5	1.5		
SUBSURFACE AREA (KM**2)	1	3	2	1.7	0.3
BASED ON: STANDARD ESTIMATE				2.0	0.4

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J),	0.93	STD. DEV. = 0.27

COMMENTS: CHALCEDONY TEMPERATURE (MOST LIKELY) CORRESPONDS TO MAXIMUM REPORTED WELL TEMPERATURE. HIGH TEMPERATURE CALCULATED FROM THE SULFATE GEOTHERMOMETER. TEMPERATURES MAY BE INACCURATE. MIXING CALCULATIONS WITH A LOW SILICA (30 MG/L) COLD WATER (10 C) INDICATE A POSSIBLE TEMPERATURE OF 185 C. HOWEVER, PROOF OF MIXING IS NOT AVAILABLE.

REFERENCES: DUFFIELD AND FOURNIER, 1974; REED, 1975; CHAPMAN AND OTHERS, 1978

COMPILED BY: BROOK, C.

KELLY HOT SPRING, CALIFORNIA

FIELD NAME..... BIG BEND HOT SPRINGS
CIRCULAR REFERENCE..... 039

GEOGRAPHIC LOCALITY

STATE..... CALIFORNIA
COUNTY..... SHASTA
LATITUDE..... 41-01.3 N
LONGITUDE..... 121-55.1 W
MAPS..... BIG BEND 1162,500

TOWNSHIP RANGE SECTION BASE & MERIDIAN
37N 01W 36 SW OF NE MT. DIABLO

GENERAL INFORMATION

WARNING FIGURE..... 8
WARNING NUMBER..... 24
ELEVATION (M)..... 512
SURFACE ACTIVITY..... HOT SPRINGS
NO. OF SPRINGS..... 6
SPRING TEMPERATURES (C)..... 38 TO 82
DISCHARGE (L/MIN)..... 341
ROCK TYPES: QUARTZ DIORITE DIKE IN SEDIMENTARY STRATA

CHEMISTRY

SAMPLE SOURCE.... BERKSTRESSER, 1968
FLOW (L/MIN)..... 37.8

TEMP (C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
82	73	88	0.6	565	20	40		276	850
F	B	PH		DEL 0(18) S04	DEL 0(18) H2O	DEL 0 H2O			
1.2	32	8.1							

GEOOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 137
 NA-K-CA (4/3)..... 110
 NA-K..... 88

SILICA

ADIABATIC..... 118
 CONDUCTIVE..... 120
 CHALCEDONY..... 92
 CRISTOBALITE..... 70
 OPAL..... 2

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)

MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
92 (D)	137 (I)	120 (A)	116	9

UNCODER TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ONI STANDARD ESTIMATE					

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J). 0.91		STD. DEV. = 0.27

REFERENCES: WARING, 1965; BERKSTRESSER, 1968

COMPILED BY: BROOK, C.

BIG BEND HOT SPRINGS, CALIFORNIA

FIELD NAME..... LASSEN
KGRA OR OTHER NAME..... LASSEN VOLCANIC NATIONAL PARK
CIRCULAR REFERENCE..... 040

GEOGRAPHIC LOCALITY

STATE..... CALIFORNIA
COUNTY..... SHASTA, PLUMAS, TEHAMA
LATITUDE..... 40-26.0 N
LONGITUDE..... 121-26.0 W
MAPS..... LASSEN VOLCANIC NATIONAL PARK AND VICINITY 1162,500

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
30N	05E	21 SW	MT. DIABLO

GENERAL INFORMATION

WAVING FIGURE..... 8
WAVING NUMBER..... 25-27, 34-38
AREA OF SURFACE EXPRESSION (KM**2). 2
ELEVATION (M)..... 1830
SURFACE ACTIVITY..... HOT SPRINGS, FUMARoles, ROCK ALTERATION
NO. OF SPRINGS..... ABOUT 75
SPRING TEMPERATURES (C)..... 50 TO 95
DISCHARGE (L/MIN)..... 735
ROCK TYPES: ANDESITE, DACITE, RHYOLITE

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)	MINIMUM 215	MAXIMUM 255	MOST LIKELY 240	MEAN 237	STD. DEV. 8
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UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTORALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	10	70	47	42.3	12.4

BASED ON: RENNER ET AL, 1976 (DISTRIBUTION OF VENT AREAS)

VOLUME (KM**3).....	70.6	STD. DEV. = 24.8
THERMAL ENERGY(10**18 J).	42.23	STD. DEV. = 14.92

COMMENTS: PROBABLY THE ONLY MAJOR VAPOR-DOMINATED SYSTEM IN THE U.S. OUTSIDE OF THE GEYSERS. GEOTHERMOMETERS ARE NOT APPLICABLE BECAUSE OF ACID-SULFATE SPRING WATERS. TEMPERATURE ESTIMATES BASED ON COMPARISON WITH THE GEYSERS AS SURFACE EXPRESSIONS AND LOW-CL WATERS ARE SIMILAR TO THE GEYSERS. AREA WITHDRAWN FROM COMMERCIAL EXPLORATION OR DEVELOPMENT BECAUSE OF NATIONAL PARK STATUS.

REFERENCES: DAY AND ALLEN, 1924, 1925; WILLIAMS, 1932; WARING, 1965; RENNER AND OTHERS, 1976; BOWEN, 1978

COMPILED BY: BROOK, C.

LASSEN, CALIFORNIA

FIELD NAME..... MORGAN SPRINGS-GROWLER SPRINGS AREA
KGRA OR OTHER NAME..... LASSEN KGRA
CIRCULAR REFERENCE..... 041

GEOGRAPHIC LOCALITY

STATE..... CALIFORNIA
COUNTY..... TEHAMA
LATITUDE..... 40-23.0 N
LONGITUDE..... 121-31.0 W
MAPS..... LASSEN VOLCANIC NATIONAL PARK AND VICINITY 1162,500I LASSEN PEAK, 1162,500

TOWNSHIP RANGE SECTION BASE & MERIDIAN
29N 04E 11 MT. DIABLO

GENERAL INFORMATION

WAKING FIGURE..... 8
WAKING NUMBER..... 33
AREA OF SURFACE EXPRESSION (KM**2). 3
ELEVATION (M)..... 1495
SURFACE ACTIVITY..... HOT SPRINGS
ASSOCIATED DEPOSITS..... SINTER
NO. OF SPRINGS..... 25
SPRING TEMPERATURES (C)..... 32 TO 95
DISCHARGE (L/MIN)..... 350
ROCK TYPES: DACITE, ANDESITE

CHEMISTRY

SAMPLE SOURCE.... J. THOMPSON, UNPUB. DATA

TEMP(C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
95	231	80	0.05	1450	203	65		73	2273
F	B	PH		DEL 0(18) S04		DEL 0(18) H2O		DEL D H2O	
		7.95		-3.58		-9.14			

GEOOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	230
NA-K-CA (4/3).....	254
NA-K.....	227
SILICA	
ADIABATIC.....	176
CONDUCTIVE.....	190
CHALCEDONY.....	170
CRISTOBALITE.....	141
OPAL.....	66
SULFATE	
CONDUCTIVE.....	272
ONE-STEP STEAM LOSS....	235
CONTINUOUS STEAM LOSS..	245

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	176 (C)	245 (K)	230 (I)	217	15

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIARATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	2	8	5	5.0	1.2

BASED ON: SPRING DISTRIBUTION AND ESTIMATES OF RENNER ET AL, 1976

VOLUME (KM**3).....	8.3	STD. DEV. = 2.6
THERMAL ENERGY(10**18 J). 4.54		STD. DEV. = 1.46

COMMENTS: TWO GROUPS OF THERMAL SPRINGS ABOUT 1.2 KM APART. CHEMICAL ANALYSIS FROM GROWLER SPRINGS. WATER CHEMISTRY OF BOTH SPRINGS IS SIMILAR. SO4 GEOTHERMOMETER FOR MORGAN SPRING GIVES 234 C. SILICA GEOTHERMOMETERS MAY BE UNRELIABLE. SYSTEM MAY BE LARGER AND IS PROBABLY RELATED TO THE ADJACENT LASSEN VAPOR-DOMINATED SYSTEM.

REFERENCES: WARING, 1965; RENNER AND OTHERS, 1976

COMPILED BY: BROOK, C.

MORGAN SPRINGS-GROWLER SPRINGS AREA , CALIFORNIA

FIELD NAME..... WENDEL-AMEDEE AREA
 KGRA OR OTHER NAME..... WENDEL-AMEDEE KGRA, HONEY LAKE
 CIRCULAR REFERENCE..... 042

GEOGRAPHIC LOCALITY

STATE..... CALIFORNIA
 COUNTY..... LASSEN
 LATITUDE..... 40-18.0 N
 LONGITUDE..... 120-11.0 W
 MAPS..... WENDEL 1162,500; LITCHFIELD 1162,500

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
24N	16E	08	MT. DIABLO

GENERAL INFORMATION

WAKING FIGURE..... 8
 WAKING NUMBER..... 30, 31
 AREA OF SURFACE EXPRESSION (KM**2). 1.0
 ELEVATION (M)..... 1231
 SURFACE ACTIVITY..... HOT SPRINGS
 ASSOCIATED DEPOSITS..... TRAVERTINE
 NO. OF SPRINGS..... 10
 SPRING TEMPERATURES (C)..... 71 TO 96
 DISCHARGE (L/MIN)..... 3596
 NO. OF WELLS..... 6
 WELL DEPTHS (M)..... 58 TO 1538
 MAXIMUM WELL TEMP (C)..... 107 AT DEPTH (M) 338
 ROCK TYPES: PLIOCENE BASALT

CHEMISTRY

SAMPLE SOURCE.... MARINER AND OTHERS, 1976
 FLOW (L/MIN)..... 1200

TEMP (C)	SI02	CA	MG	NA	K	HCO3	CO3	S04	CL
95.5	125	20	LT 0.1	280	8.0	53		340	185
F	B	PH		DEL 0 (18) S04	DEL 0 (18) H2O	DEL D H2O			
4.2	5.6	8.26			-14.09	-118.8			

GEOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 128
 NA-K-CA (4/3)..... 104
 NA-K..... 73

SILICA

ADIABATIC..... 143
 CONDUCTIVE..... 150
 CHALCEDONY..... 125
 CRISTOBALITE..... 100
 OPAL..... 29

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	107 (M)	143 (C)	128 (I)	126	7

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.3	2.0	1.0		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	4	10	5	6.3	1.3

BASED ON: WELL AND SPRING DISTRIBUTION AND GEOLOGY

VOLUME (KM**3)..... 10.6 STD. DEV. = 3.0
 THERMAL ENERGY(10**10 J), 3.16 STD. DEV. = 0.92

COMMENTS: CHEMICAL ANALYSIS AND TEMPERATURE CALCULATIONS FOR WENDEL HOT SPRINGS. CHEMICAL COMPOSITION OF AMEDEE HOT SPRINGS IS SIMILAR. WELL TEMPERATURES MAY BE HIGHER THAN REPORTED HERE (107 C). FLOW RATE AND ISOTOPIC DATA FROM REED (1975).

REFERENCES: WARING, 1965; KOENIG, 1970; REED, 1975; MARINER AND OTHERS, 1976; USGS FILE DATA

COMPILED BY: BROOK, C.

WENDEL-AMEDEE AREA, CALIFORNIA

FIELD NAME..... SIERRA VALLEY AREA
CIRCULAR REFERENCE..... 043

GEOGRAPHIC LOCALITY

STATE..... CALIFORNIA
COUNTY..... PLUMAS, SIERRA
LATITUDE..... 39-42.7 N
LONGITUDE..... 120-19.3 W
MAPS..... PORTOLA 1162,500; SIERRAVILLE 1162,500

TOWNSHIP RANGE SECTION BASE & MERIDIAN
22N 15E 32 MT. DIABLO

GENERAL INFORMATION

WARNING FIGURE..... 8
WARNING NUMBER..... 41A
ELEVATION (M)..... 1487
SURFACE ACTIVITY..... NONE. FOUND BY DRILLING
NO. OF WELLS..... 8
WELL DEPTHS (M)..... 997 TO 680
ROCK TYPES: LACUSTRINE DEPOSITS OVERLYING RHYOLITE TUFF AND BRECCIAL GRANITE BASEMENT

CHEMISTRY

SAMPLE SOURCE.... REED, 1975
FLOW (L/MIN)..... 50
COLLECTION DATE.. 1973/06/20

TEMP(C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
94.2	98	39	0.1	450	13	50	1	370	540
F	B	PH		DEL O(18) S04	DEL O(18) H2O	DEL D H2O			
2.6	8.8	7.97			-13.93	-117.8			

GEOOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 131
 NA-K-CA (4/3)..... 112
 NA-K..... 74

SILICA

ADIABATIC..... 132
 CONDUCTIVE..... 136
 CHALCEDONY..... 109
 CRISTOBALITE..... 85
 UPAL..... 16

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)

MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
109 (D)	136 (A)	131 (I)	125	6

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.1	1.0	0.5		
THICKNESS (KM)	0.5	1.5	1.0	1.0	0.2
SUBSURFACE AREA (KM**2)	4	16	10	10.0	2.4

BASED ON: WELL DISTRIBUTION AND GEOLOGY

VOLUME (KM**3).....	10.0	STD. DEV. = 3.2
THERMAL ENERGY(10**18 J).....	2.98	STD. DEV. = 0.98

COMMENTS: AREA INCLUDES MARBLE HOT SPRINGS (WELLS). 1 GEOTHERMAL TEST WELL; OTHER 7 WELLS ARE ARTESIAN AND USED FOR STOCK WATERING. SURFACE TEMPERATURES RANGE FROM 39 TO 94 C. TOTAL DISCHARGE EXCEEDS 240 L/MIN.

REFERENCES: REED, 1975

COMPILED BY: BROOK, C.

SIERRA VALLEY AREA, CALIFORNIA

FIELD NAME..... WILBUR SPRINGS AREA
CIRCULAR REFERENCE..... 044

GEOGRAPHIC LOCALITY

STATE..... CALIFORNIA
COUNTY..... COLUSA
LATITUDE..... 39-02.2 N
LONGITUDE..... 122-25.2 W
MAPS..... WILBUR SPRINGS 1162,500

TOWNSHIP RANGE SECTION BASE & MERIDIAN
14N 05W 28 MT. DIABLO

GENERAL INFORMATION

WAVING FIGURE..... 8
WAVING NUMBER..... 66-69
ELEVATION (M)..... 412
SURFACE ACTIVITY..... HOT SPRINGS, SULFUR FUMING
ASSOCIATED DEPOSITS..... TRAVERTINE AT SOME SPRINGS
NO. OF SPRINGS..... 20 IN 4 GROUPS
SPRING TEMPERATURES (C)..... 18 TO 67
DISCHARGE (L/MIN)..... LT 100
NO. OF WELLS..... 2
WELL DEPTHS (M)..... 374 TO 1146
MAXIMUM WELL TEMP (C)..... 141 AT DEPTH (M) 1132
ROCK TYPES: SERPENTINITE, CHERT, GRAYWACKE, ALTERED BASALT

CHEMISTRY

SAMPLE SOURCE.... BARNES AND OTHERS, 1973; WHITE AND OTHERS, 1973
FLOW (L/MIN)..... 60
COLLECTION DATE.. 1969/12/02

TEMP(C)	SI02	CA	MG	NA	K	HCO3	CO3	SO4	CL
55	200	2.8	38	8500	440	7130		390	9700
F	H	PH		DEL 0(18) SO4	DEL 0(18) H2O	DEL 0 H2O			
2.5	310	6.87			+4.90	-24.8			

GEOOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	240
NA-K-CA (4/3).....	781
NA-K.....	118
SILICA	
ADIABATIC.....	168
CONDUCTIVE.....	180
CHALCEDONY.....	159
CRISTOBALITE.....	130
OPAL.....	56

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	141 (M)	150	141 (M)	144	2

UNCODEN TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, HG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.0		
THICKNESS (KM)	1.0	2.0	1.5	1.5	0.2
SUBSURFACE AREA (KM**2)	4	15	6	8.3	2.4

BASED ON: DISTRIBUTION OF THERMAL SPRINGS AND HG MINERALIZATION

VOLUME (KM**3).....	12.5	STD. DEV. = 4.0
THERMAL ENERGY(10**18 J). 4.35		STD. DEV. = 1.40

COMMENTS: WATER BELIEVED TO BE IN PART CONNATE. GEOTHERMOMETRY IS NOT RELIABLE BECAUSE OF NEAR-SURFACE REACTION BETWEEN WATER AND SERPENTINE. MAXIMUM TEMPERATURE IS ESTIMATED.

REFERENCES: WARING, 1965; BARNES AND OTHERS, 1973; WHITE AND OTHERS, 1973

COMPILED BY: BROOK, C.

WILBUR SPRINGS AREA , CALIFORNIA

FIELD NAME..... CHALK MOUNTAIN AREA
KGRA OR OTHER NAME..... GEYSERS-CALISTOGA KGRA
CIRCULAR REFERENCE..... 045

GEOGRAPHIC LOCALITY

STATE..... CALIFORNIA
LATITUDE..... 39-04.8 N
LONGITUDE..... 122-35.0 W
MAPS..... CLEARLAKE OAKS 1162,500

TOWNSHIP RANGE SECTION BASE & MERIDIAN
14N 07W 12 SW MT. DIABLO

GENERAL INFORMATION

WAKING FIGURE..... 8
WAKING NUMBER..... 51A
AREA OF SURFACE EXPRESSION (KM*2)..... 0.3
ELEVATION (M)..... 366
SURFACE ACTIVITY..... WARM SPRINGS, FUMARoles
ASSOCIATED DEPOSITS..... TRAVERTINE
NO. OF SPRINGS..... 3
SPRING TEMPERATURES (C)..... 20 TO 24
DISCHARGE (L/MIN)..... 11
ROCK TYPES: ALTERED DACITE

CHEMISTRY

SAMPLE SOURCE.... THOMPSON AND OTHERS, 1978
FLOW (L/MIN)..... 0.4
COLLECTION DATE.. 1976/06/26

TEMP (C)	SI02	CA	MG	NA	K	HC03	CO3	S04	CL
24	91	66	495	1600	196	3300		32	2410
F	B	PH		DEL 0 (18) S04		QEL 0 (18) H2O		DEL 0 H2O	
		6.6							

GEOOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 225
 NA-K-CA (4/3)..... 263
 NA-K..... 209

SILICA

ADIABATIC..... 128
 CONDUCTIVE..... 132
 CHALCEDONY..... 105
 CRISTOBALITE..... 81
 OPAL..... 12

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)

MINIMUM
 105 (D)

MAXIMUM
 128 (C)

MOST LIKELY
 105 (D)

MEAN
 113

STD. DEV.
 5

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ON: STANDARD ESTIMATE					

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J).	0.88	STD. DEV. = 0.25

COMMENTS: PRESENCE OF SULFUR FUMING AND HYDROTHERMALLY ALTERED ROCK SUGGESTS A HYDROTHERMAL SYSTEM EVEN THOUGH SURFACE TEMPERATURES ARE QUITE LOW. GEOTHERMOMETRY IS PROBABLY NOT RELIABLE BECAUSE OF LOW FLOW RATE, HIGH MG AND HCO3, AND LIKELYHOOD OF NEAR-SURFACE WATER-ROCK REACTIONS. TEMPERATURES MAY BE HIGHER OR LOWER THAN REPORTED HERE. MAY HAVE HEAT SOURCE IN THE CLEAR LAKE VOLCANIC FIELD.

REFERENCES: THOMPSON AND OTHERS, 1978; WARING, 1965

COMPILED BY: BROOK, C.

CHALK MOUNTAIN AREA , CALIFORNIA

FIELD NAME..... SULPHUR BANK MINE (HOT BOLATA)
 KGRA OR OTHER NAME..... GEYSERS-CALISTOGA KGRA
 CIRCULAR REFERENCE..... 046

GEOGRAPHIC LOCALITY

STATE..... CALIFORNIA
 COUNTY..... LAKE
 LATITUDE..... 39-01.0 N
 LONGITUDE..... 122-39.0 W
 MAPS..... CLEARLAKE OAKS 1162,500

TOWNSHIP 13N RANGE 07W SECTION 05 SW BASE & MERIDIAN MT. DIABLO

GENERAL INFORMATION

WAKING FIGURE..... 8
 WAKING NUMBER..... 57
 AREA OF SURFACE EXPRESSION (KM²)..... 0.5
 ELEVATION (M)..... 396
 SURFACE ACTIVITY..... HOT SPRINGS, FUMARoles
 ASSOCIATED DEPOSITS..... CINNABAR AND SULFUR
 NO. OF SPRINGS..... 10
 SPRING TEMPERATURES (C)..... 28 TO 69
 NO. OF WELLS..... 4
 WELL DEPTHS (M)..... 161 TO 1215
 MAXIMUM WELL TEMP (C)..... 186 AT DEPTH (M) 427
 ROCK TYPES: ALTERED QUATERNARY BASALT FLOWS OVERLYING FRANCISCAN ROCKS
 GEOPHYSICS: GRAVITY, MAGNETIC, RESISTIVITY

CHEMISTRY

SAMPLE SOURCE.... BERKSTRESSER, 1968

TEMP (C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
99	203	26	23	1340	44	2600		680	900
F	B	PH		DEL 0 (18) S04		DEL 0 (18) H2O		DEL D H2O	
1.4	828	8.1				+4.58		-26.6	

GEOOTHERMOMETERS (C)

CATION

NA-K-CA (1/3).....	156
NA-K-CA (4/3).....	201
NA-K.....	83

SILICA

ADIABATIC.....	169
CONDUCTIVE.....	181
CHALCEDONY.....	160
CRISTOBALITE.....	131
OPAL.....	57

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)

MINIMUM
186 (M)

MAXIMUM
210

MOST LIKELY
186 (M)

MEAN
194

STD. DEV.
6

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE

F) CRISTOBALITE

B) QUARTZ CONDUCTIVE, PH-CORRECTED

G) AMORPHOUS SILICA

C) QUARTZ ADIABATIC

H) NA-K

D) CHALCEDONY

I) NA-K-CA

E) CHALCEDONY, PH-CORRECTED

J) NA-K-CA, MG-CORRECTED

K) SULFATE GEOTHERMOMETER

L) SURFACE TEMPERATURE

M) WELL TEMPERATURE

N) MIXING MODEL

O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.4	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5		
SUBSURFACE AREA (KM**2)	2	6	4	1.7	0.3
BASED ON: ESTIMATES OF RENNER ET AL (1976)				4.0	0.8

VOLUME (KM**3).....	6.7	STD. DEV. = 1.9
THERMAL ENERGY(10**18 J). 3.22		STD. DEV. = 0.91

COMMENTS: BELIEVED TO BE MIXTURE OF METEORIC AND METAMORPHIC WATERS. GEOTHERMOMETRY IS NOT RELIABLE.
MAXIMUM TEMPERATURE BASED ON COMPARISON TO CLEAR LAKE VOLCANIC FIELD TO WHICH SULPHUR BANK MAY BE RELATED.
ISOTOPIC DATA FROM WHITE AND OTHERS (1973).

REFERENCES: WARING, 1965; STANLEY AND OTHERS, 1973; WHITE AND OTHERS, 1973; CHAPMAN, 1975; BERKSTRESSER, 1968; RENNER AND OTHERS, 1976

COMPILED BY: BROOK, C.

SULPHUR BANK MINE (HOT BOLATA), CALIFORNIA

FIELD NAME..... CLEAR LAKE VOLCANIC FIELD AREA
 KGRA OR OTHER NAME..... GEYSERS-CALISTOGA KGRA
 CIRCULAR REFERENCE..... 047

GEOGRAPHIC LOCALITY

STATE..... CALIFORNIA
 COUNTY..... LAKE
 LATITUDE..... 38-55.0 N
 LONGITUDE..... 122-43.0 W
 MAPS..... CLEARLAKE HIGHLANDS 1124,000 I KELSEYVILLE 1124,000

GENERAL INFORMATION

WAKING FIGURE..... 8
 WAKING NUMBER..... 55, 56, 58, 59
 ELEVATION (M)..... 760
 SURFACE ACTIVITY..... HOT SPRINGS, FUMARoles
 ASSOCIATED DEPOSITS..... SULFUR
 NO. OF SPRINGS..... SEVERAL IN 4 OR 5 MAIN GROUPS
 SPRING TEMPERATURES (C)..... 30 TO 52
 DISCHARGE (L/MIN)..... GREATER THAN 2000
 NO. OF WELLS..... 2
 MAXIMUM WELL TEMP (C)..... 210 AT DEPTH (M) 2000
 ROCK TYPES: QUATERNARY RHYOLITE, DACITE, BASALT
 GEOPHYSICS: GRAVITY, MAGNETIC, RESISTIVITY

CHEMISTRY

SAMPLE SOURCE.... GOFF AND OTHERS, 1977 (HOWARD SPRING)
 FLOW (L/MIN)..... 250

TEMP (C)	SI02	CA	MG	NA	K	HCO3	CO3	SO4	CL
42	160	32	320	240	23	1660		2	460
F	H	PH		DEL O (18) SO4		DEL O (18) H2O		DEL D H2O	
LT 0.1	39	6.58				-7.26		-57.8	

GEOOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	180
NA-K-CA (4/3).....	132
NA-K.....	179
SILICA	
ADIABATIC.....	156
CONDUCTIVE.....	165
CHALCEDONY.....	142
CRISTOBALITE.....	115
OPAL.....	42

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	165 (A)	210 (N)	195 (N)	190	9

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	10	100	40	50.0	18.7

BASED ON: GEOLOGY, SPRING DISTRIBUTION, AND GRAVITY

VOLUME (KM**3).....	83.3	STD. DEV. =	35.3
THERMAL ENERGY(10**18 J),	39.37	STD. DEV. =	16.86

COMMENTS: GEOTHERMOMETRY MAY NOT BE RELIABLE FOR THIS AND OTHER SURFACE WATERS IN THE CLEAR LAKE AREA BECAUSE OF HIGH CO2 AND MG CONCENTRATIONS AND LIKELYHOOD OF WATER REACTING WITH SERPENTINITE. MAXIMUM AND MOST LIKELY TEMPERATURES ARE REPORTED BY GOFF AND OTHERS (1977). MAXIMUM CORRESPONDS TO THEIR CALCULATED WELL TEMPERATURE (210). TEMPERATURES AS HIGH AS 270 C (UNCONFIRMED HEARSAY) SUPPOSEDLY OCCUR AT ABOUT 3000 M IN ANOTHER WELL. ALTHOUGH THE AREA MAY BE LARGER, THERE IS NO EVIDENCE THAT THE VOLCANIC FIELD IS UNDERLAIN BY A SINGLE HYDROTHERMAL SYSTEM. RATHER, THERE MAY BE SEVERAL ISOLATED SYSTEMS SEPARATED BY HOT, DRY ROCK. AREA ALONG KONOCTI BAY FAULT ZONE MAY BE MOST LIKELY TARGET.

REFERENCES: WARING, 1965; STANLEY AND OTHERS, 1973; CHAPMAN, 1975; HEARN AND OTHERS, 1976; GOFF AND OTHERS, 1977; IYER AND OTHERS, 1978

COMPILED BY: BROOK, C.

CLEAR LAKE VOLCANIC FIELD AREA, CALIFORNIA

FIELD NAME..... THE GEYSERS
KGRA OR OTHER NAME..... GEYSERS-CALISTOGA KGRA
CIRCULAR REFERENCE..... 048

GEOGRAPHIC LOCALITY

STATE..... CALIFORNIA
COUNTY..... SONOMA AND LAKE
LATITUDE..... 38-48.0 N
LONGITUDE..... 122-48.0 W
MAPS..... GEYSERS 1124,000

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
11N	09W	13 NE	MT. DIABLO

GENERAL INFORMATION

WAKING FIGURE..... 8
WAKING NUMBER..... 62, 63, 72, 73, 74
AREA OF SURFACE EXPRESSION (KM**2), 1
ELEVATION (M)..... 550
SURFACE ACTIVITY..... FUMARoles, HOT SPRINGS, ROCK ALTERATION
NO. OF SPRINGS..... 20
SPRING TEMPERATURES (C)..... 20 TO 101
DISCHARGE (L/MIN)..... 100
NO. OF WELLS..... MORE THAN 210
WELL DEPTHS (M)..... 60 TO 2900
MAXIMUM WELL TEMP (C)..... 240 AT DEPTH (M) 1200
ROCK TYPES: FRANCISCAN ASSEMBLAGE (SERPENTINE, GRAYWACKE, GREENSTONE)
GEOPHYSICS: GRAVITY, MAGNETIC, RESISTIVITY, MICROEARTHQUAKE, SEISMIC NOISE

RESERVOIR PROPERTIES
SUBSURFACE TEMP (C)

MINIMUM
215

MAXIMUM
255

MOST LIKELY
240

MEAN
237

STD. DEV.
8

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.04	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	60	120	120	100.0	14.1

BASED ON: WELL DISTRIBUTION, GRAVITY SURVEY, GEOLOGY

VOLUME (KM**3)..... 166.7 STD. DEV. = 39.3
THERMAL ENERGY (10**18 J). 99.75 STD. DEV. = 23.85

COMMENTS: VAPOR-DOMINATED SYSTEM. WATER CHEMISTRY NOT APPLICABLE TO GEOTHERMOMETER CALCULATIONS. TEMPERATURES BASED ON AND EXTRAPOLATED FROM TEMPERATURE-DEPTH CURVES (HITE AND FEHLBERG, 1976). OVER 200 WELLS HAVE BEEN DRILLED SINCE THE 1950'S. RESERVOIR PROBABLY CONTINUES DEEPER THAN 3 KM. CURRENT INSTALLED GENERATING CAPACITY IS 663 MW. HEAT PRODUCTION ABOUT 80 TIMES ESTIMATED NATURAL HEAT FLOW. TOTAL GENERATING CAPACITY OF FIELD IS ESTIMATED IN EXCESS OF 1800 MW BY YEAR 2000.

REFERENCES: ALLEN AND DAY, 1927; CHAPMAN, 1975; HITE AND FEHLBERG, 1976; ISHERWOOD, 1976; MCLAUGHLIN AND STANLEY, 1976; REED AND CAMPBELL, 1976; GOFF AND OTHERS, 1977; RENNER AND OTHERS, 1976; PACIFIC GAS AND ELECTRIC CO., 1977; IYER AND OTHERS, 1978; SMITH AND OTHERS, 1978

COMPILED BY: BROOK, C.

THE GEYSERS, CALIFORNIA

FIELD NAME..... SKAGGS HOT SPRINGS
CIRCULAR REFERENCE..... 049

GEOGRAPHIC LOCALITY

STATE..... CALIFORNIA
COUNTY..... SONOMA
LATITUDE..... 38-41.5 N
LONGITUDE..... 123-01.5 W
MAPS..... SKAGGS SPRINGS 1124,000

TOWNSHIP RANGE SECTION BASE & MERIDIAN
10N 11W 25NW OF NE MT. DIABLO

GENERAL INFORMATION

WAVING FIGURE..... 8
WAVING NUMBER..... 71
ELEVATION (M)..... 98
SURFACE ACTIVITY..... HOT SPRINGS
NO. OF SPRINGS..... 3
SPRING TEMPERATURES (C)..... 49 70 57
DISCHARGE (L/MIN)..... 57
ROCK TYPES: FRANCISCAN SEDIMENTARY ROCKS

CHEMISTRY

SAMPLE SOURCE.... BERKSTRESSER, 1968
FLOW (L/MIN)..... 15

TEMP (C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
56	124	14	4.5	945	29	2470		5	54
F	D	PH		DEL 0(18) S04	DEL 0(18) H2O	DEL D H2O			
		7.2							

GEO THERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 152
 NA-K-CA (4/3)..... 194
 NA-K..... 78

SILICA

ADIABATIC..... 143
 CONDUCTIVE..... 150
 CHALCEDONY..... 124
 CRISTOBALITE..... 99
 OPAL..... 28

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)

MINIMUM
 95 (J)

MAXIMUM
 150 (A)

MOST LIKELY
 95 (J)

MEAN
 113

STD. DEV.
 13

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE

B) QUARTZ CONDUCTIVE, PH-CORRECTED

C) QUARTZ ADIABATIC

D) CHALCEDONY

E) CHALCEDONY, PH-CORRECTED

F) CRISTOBALITE

G) AMORPHOUS SILICA

H) NA-K

I) NA-K-CA

J) NA-K-CA, MG-CORRECTED

K) SULFATE GEOTHERMOMETER

L) SURFACE TEMPERATURE

M) WELL TEMPERATURE

N) MIXING MODEL

O) RENNER AND OTHERS, 1976

DEPTH TO TOP (KM)

MINIMUM
 0.5

MAXIMUM
 2.0

MOST LIKELY
 1.5

MEAN

STD. DEV.

THICKNESS (KM)

1.0

2.5

1.5

1.7

0.3

SUBSURFACE AREA (KM**2)

1

3

2

2.0

0.4

BASED ON: STANDARD ESTIMATE

VOLUME (KM**3)..... 3.3

STD. DEV. = 0.9

THERMAL ENERGY(10**18 J). 0.88

STD. DEV. = 0.28

COMMENTS: GEOTHERMOMETRY MAY BE INACCURATE DUE TO LOW FLOW RATE.

REFERENCES: WARING, 1965; BERKSTRESSER, 1968

COMPILED BY: BROOK, C.

SKAGGS HOT SPRINGS, CALIFORNIA

FIELD NAME..... CALISTOGA HOT SPRINGS
KGRA OR OTHER NAME..... GEYSERS-CALISTOGA KGRA
CIRCULAR REFERENCE..... 050

GEOGRAPHIC LOCALITY

STATE..... CALIFORNIA
COUNTY..... NAPA
LATITUDE..... 38-34.9 N
LONGITUDE..... 122-34.4 W
MAPS..... CALISTOGA 1124,000

TOWNSHIP RANGE SECTION BASE & MERIDIAN
09N 06W 31 NW OF SW MT. DIABLO

GENERAL INFORMATION

WARNING FIGURE..... 8
WARNING NUMBER..... 81
ELEVATION (M)..... 107
SURFACE ACTIVITY..... HOT SPRINGS
ASSOCIATED DEPOSITS..... SILICA DEPOSITS IN WELL PIPES
NO. OF SPRINGS..... 4
SPRING TEMPERATURES (C)..... 52 TO 78
DISCHARGE (L/MIN)..... 30
NO. OF WELLS..... SEVERAL
WELL DEPTHS (M)..... 46(?) TO 610
MAXIMUM WELL TEMP (C)..... 137 AT DEPTH (M) 610(?)
ROCK TYPES: FAULTED TUFF (PLIOCENE?)

CHEMISTRY

SAMPLE SOURCE..... THOMPSON AND OTHERS, 1978
FLOW (L/MIN)..... 80
COLLECTION DATE.. 1976/09/25

TEMP (C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
100	150	25		193	8.7	184		13	206
F	B	PH		DEL 0(18) S04		DEL 0(18) H2O		DEL 0 H2O	
		8.4							

GEOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 141
 NA-K-CA (4/3)..... 97
 NA-K..... 107

SILICA

ADIABATIC..... 153
 CONDUCTIVE..... 161
 CHALCEDONY..... 137
 CRISTOBALITE..... 111
 OPAL..... 39

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)

MINIMUM
 137 (M.D)

MAXIMUM
 153 (C)

MOST LIKELY
 141 (I)

MEAN
 144

STD. DEV.
 3

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE

B) QUARTZ CONDUCTIVE, PH-CORRECTED

C) QUARTZ ADIABATIC

D) CHALCEDONY

E) CHALCEDONY, PH-CORRECTED

F) CRISTOBALITE

G) AMORPHOUS SILICA

H) NA-K

I) NA-K-CA

J) NA-K-CA, MG-CORRECTED

K) SULFATE GEOTHERMOMETER

L) SURFACE TEMPERATURE

M) WELL TEMPERATURE

N) MIXING MODEL

O) RENNER AND OTHERS, 1976

DEPTH TO TOP (KM)

MINIMUM
 0.6

MAXIMUM
 1.5

MOST LIKELY
 1.0

MEAN

STD. DEV.

THICKNESS (KM)

1.0

2.5

1.5

1.7

0.3

SUBSURFACE AREA (KM**2)

2

6

4.5

4.2

0.8

BASED ON: WELL DISTRIBUTION AND ESTIMATES OF RENNER ET AL (1976)

VOLUME (KM**3)..... 6.9

STD. DEV. = 1.9

THERMAL ENERGY(10**18 J), 2.41

STD. DEV. = 0.67

COMMENTS: 3 WELLS DRILLED BY CALISTOGA POWER CO.1 DEEPEST ABOUT 610 MI NOW ABANDONED. OTHER WELLS USED FOR BATHING AND HEALTH RESORTS. CHEMICAL ANALYSIS FROM GEYSERING WELL 3 KM NORTHWEST OF MAIN DEVELOPED AREA WHERE WATER CHEMISTRY AND ESTIMATED SUBSURFACE TEMPERATURES ARE SIMILAR.

REFERENCES: WARING, 1965; MCNITT, 1963; KOENIG, 1970; RENNER AND OTHERS, 1976; THOMPSON AND OTHERS, 1978

COMPILED BY: BROOK, C.

CALISTOGA HOT SPRINGS , CALIFORNIA

FIELD NAME..... GROVERS HOT SPRINGS
CIRCULAR REFERENCE..... 051

GEOGRAPHIC LOCALITY

STATE..... CALIFORNIA
COUNTY..... ALPINE
LATITUDE..... 38-41.9 N
LONGITUDE..... 119-51.6 W
MAPS..... MARKLEEVILLE 1162,500

TOWNSHIP RANGE SECTION BASE & MERIDIAN
10N 19E 24 SW MT. DIABLO

GENERAL INFORMATION

WARNING FIGURE..... 8
WARNING NUMBER..... 113
AREA OF SURFACE EXPRESSION (KM**2). 0.1
ELEVATION (M)..... 1800
SURFACE ACTIVITY..... HOT SPRINGS
NO. OF SPRINGS..... 2 MAIN SPRINGS AND SEVERAL SEEPS
SPRING TEMPERATURES (C)..... 53 TO 64
DISCHARGE (L/MIN)..... 400
ROCK TYPES: FAULT CONTACT BETWEEN PLIOCENE ANDESITE FLOWS AND MESOZOIC GRANITE

CHEMISTRY

SAMPLE SOURCE.... MARINER AND OTHERS, 1977

TEMP (C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
64	100	31	1.9	440	13	776		160	190
F	0	PH		DEL 0 (18) S04		DEL 0 (18) H2O		DEL 0 H2O	
4.2	3.1	6.79				-15.62		-115.4	

GEOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	133
NA-K-CA (4/3).....	117
NA-K.....	75
SILICA	
ADIABATIC.....	133
CONDUCTIVE.....	137
CHALCEDONY.....	110
CRISTOBALITE.....	87
OPAL.....	17

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	110 (D)	137 (A)	130 (J)	126	6

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ON: STANDARD ESTIMATE					

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J). 1.00		STD. DEV. = 0.28

COMMENTS: STATE PARK. WATER USED FOR BATHING.

REFERENCES: MARINER AND OTHERS, 1977; FETH AND OTHERS, 1964; CURTIS, 1951

COMPILED BY: BROOK, C.

GROVERS HOT SPRINGS • CALIFORNIA

FIELD NAME..... FALES HOT SPRINGS
CIRCULAR REFERENCE..... 052

GEOGRAPHIC LOCALITY

STATE..... CALIFORNIA
COUNTY..... MONO
LATITUDE..... 38-20.0 N
LONGITUDE..... 119-24.0 W
MAPS..... FALES HOT SPRINGS 1:24,000

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
06N	23E	24 SE	MT. DIABLO

GENERAL INFORMATION

WARING FIGURE..... 8
WARING NUMBER..... 114
AREA OF SURFACE EXPRESSION (KM*2). 0.1
ELEVATION (M)..... 2236
SURFACE ACTIVITY..... HOT SPRINGS
ASSOCIATED DEPOSITS..... TRAVERTINE
NO. OF SPRINGS..... 20
SPRING TEMPERATURES (C)..... 36 TO 61
DISCHARGE (L/MIN)..... MORE THAN 1000
NO. OF WELLS..... 1
WELL DEPTHS (M)..... 126
ROCK TYPES: PLIOCENE ANDESITE OVERLYING GRANITIC ROCKS

CHEMISTRY

SAMPLE SOURCE.... MARINER AND OTHERS, 1977

TEMP(C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
61	114	41	10	560	37	1130		260	160
F	H	PH		DEL 0(18) S04		DEL 0(18) H2O		DEL 0 H2O	
4.7	8.2	6.55		-4.29		-17.46		-132.8	

GEOTHERMOMETERS (C)

CATION

NA-K-CA (1/3).....	173
NA-K-CA (4/3).....	159
NA-K.....	140

SILICA

ADIABATIC.....	139
CONDUCTIVE.....	145
CHALCEDONY.....	119
CRISTOBALITE.....	94
OPAL.....	24

SULFATE

CONDUCTIVE.....	134
ONE-STEP STEAM LOSS....	125
CONTINUOUS STEAM LOSS..	126

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)

MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
84 (J)	145 (A)	119 (D)	116	12

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ON: STANDARD ESTIMATE					

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J). 0.91		STD. DEV. = 0.28

COMMENTS: CO2-CHARGED WATER. TRAVERTINE MAY BE PRECIPITATING. GEOTHERMOMETRY MAY BE INACCURATE.

REFERENCES: VARING, 1965; MARINER AND OTHERS, 1977B

COMPILED BY: HROOK, C.

FALES HOT SPRINGS , CALIFORNIA

FIELD NAME..... BUCKEYE HOT SPRING
CIRCULAR REFERENCE..... 053

GEOGRAPHIC LOCALITY

STATE..... CALIFORNIA
COUNTY..... MONO
LATITUDE..... 38-14.3 N
LONGITUDE..... 119-19.6 W
MAPS..... MATTERHORN PEAK 1162,500

TOWNSHIP RANGE SECTION BASE & MERIDIAN
04N 24E 04 NE MT. DIABLO

GENERAL INFORMATION

WARNING FIGURE..... 8
WARNING NUMBER..... 115
ELEVATION (M)..... 2100
SURFACE ACTIVITY..... HOT SPRING
ASSOCIATED DEPOSITS..... TRAVERTINE
SPRING TEMPERATURES (C)..... 60 TO 64
DISCHARGE (L/MIN)..... 400
ROCK TYPES: TILL OVERLYING QUARTZ MONZONITE

CHEMISTRY

SAMPLE SOURCE..... MARINER AND OTHERS, 1977

TEMP (C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
60	75	22	4.2	310	10	429		340	28
F	B	PH		DEL 0(18) S04	DEL 0(18) H2O	DEL D H2O			
9.1	1.1	7.33			-17.66	-137.9			

GEOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 134
 NA-K-CA (4/3)..... 111
 NA-K..... 81

SILICA

ADIABATIC..... 120
 CONDUCTIVE..... 122
 CHALCEDONY..... 93
 CRISTOBALITE..... 71
 OPAL..... 3

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	87 (J)	122 (A)	93 (D)	101	8

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ON: STANDARD ESTIMATE					

VOLUME (KM**3)..... 3.3 STD. DEV. = 0.9
 THERMAL ENERGY(10**18 J). 0.77 STD. DEV. = 0.23

REFERENCES: WARING, 1965; CHESTERMAN, 1975; MARINER AND OTHERS, 1977B

COMPILED BY: BROOK, C.

RUCKEYE HOT SPRING, CALIFORNIA

FIELD NAME..... TRAVERTINE HOT SPRINGS AREA
CIRCULAR REFERENCE..... 054

GEOGRAPHIC LOCALITY

STATE..... CALIFORNIA
COUNTY..... MONO
LATITUDE..... 38-14.8 N
LONGITUDE..... 119-12.1 W
MAPS..... RODIE 1162,500

TOWNSHIP RANGE SECTION
05N 25E 34 SW

BASE & MERIDIAN
MT. DIABLO

GENERAL INFORMATION

WAVING FIGURE..... 8
WAVING NUMBER..... 116, 117
AREA OF SURFACE EXPRESSION (KM**2). 0.2
ELEVATION (M)..... 2059
SURFACE ACTIVITY..... HOT SPRINGS
ASSOCIATED DEPOSITS..... TRAVERTINE
NO. OF SPRINGS..... ABOUT 25 IN 2 GROUPS 2.5 KM APART
SPRING TEMPERATURES (C)..... 40 TO 69
DISCHARGE (L/MIN)..... 135
NO. OF WELLS..... 1
WELL DEPTHS (M)..... 300
ROCK TYPES: PLIOCENE ANDESITE AND BASALT

CHEMISTRY

SAMPLE SOURCE.... MARINER AND OTHERS, 1977

TEMP(C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
69	100	64	18	1100	55	1800		920	200
F	B	PH		DEL 0(18) S04	DEL 0(18) H2O	DEL 0 H2O			
4.5	9.9	6.73			-17.46	-139.3			

GEO THERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 167
 NA-K-CA (4/3)..... 176
 NA-K..... 115

SILICA

ADIAHATIC..... 133
 CONDUCTIVE..... 137
 CHALCEDONY..... 110
 CRISTOBALITE..... 87
 UPAL..... 17

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)

MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
87 (J)	137 (A)	110 (D)	111	10

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
0.5	2.0	1.5		
1.0	2.5	1.5		
1	3	2	1.7	0.3
			2.0	0.4

BASED ON: STANDARD ESTIMATE AND SPRING DISTRIBUTION

VOLUME (KM**3)..... 3.3
 THERMAL ENERGY(10**18 J). 0.87
 STD. DEV. = 0.9
 STD. DEV. = 0.26

COMMENTS: AREA INCLUDES THE HOT SPRINGS ABOUT 2.5 KM SOUTH. CHEMISTRY OF BOTH SPRINGS IS SIMILAR SUGGESTING A SINGLE SYSTEM.

REFERENCES: MARINER AND OTHERS, 1977B

COMPILED BY: BROOK, C.

TRAVERTINE HOT SPRINGS AREA . CALIFORNIA

FIELD NAME..... NORTH SHORE MONO LAKE (BLACK ROCK POINT HOT SPRING)
KGRA OR OTHER NAME..... MONO-LONG VALLEY KGRA
CIRCULAR REFERENCE..... 055

GEOGRAPHIC LOCALITY

STATE..... CALIFORNIA
COUNTY..... MONO
LATITUDE..... 38-02.4 N
LONGITUDE..... 119-04.8 W
MAPS..... BODIE 1162,500

TOWNSHIP RANGE SECTION BASE & MERIDIAN
02N 26E 11 MT. DIABLO

GENERAL INFORMATION

ELEVATION (M)..... 1964
SURFACE ACTIVITY..... HOT SPRINGS
ASSOCIATED DEPOSITS..... TRAVERTINE
SPRING TEMPERATURES (C)..... 66
DISCHARGE (L/MIN)..... 150
NO. OF WELLS..... 1 ABOUT 3 KM SOUTH
WELL DEPTHS (M)..... 743
MAXIMUM WELL TEMP (C)..... 57 AT DEPTH (M) 743
ROCK TYPES: QUATERNARY LAKE DEPOSITS AND PYROCLASTICS

CHEMISTRY

SAMPLE SOURCE..... MARINER AND OTHERS, 1977

TEMP (C)	SI02	CA	MG	NA	K	HC03	CO3	S04	CL
66	76	13	2.9	430	8.8	454		100	350
F	B	PH		DEL O(18) S04	DEL O(18) H2O	DEL D H2O			
4.8	7.7	7.68			-15.69	-126.9			

GEOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 123
 NA-K-CA (4/3)..... 125
 NA-K..... 52

SILICA

ADIABATIC..... 120
 CONDUCTIVE..... 122
 CHALCEDONY..... 94
 CRISTOHALITE..... 72
 UPAL..... 4

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)

MINIMUM
 85 (J)

MAXIMUM
 122 (A)

MOST LIKELY
 94 (D)

MEAN
 100

STD. DEV.
 8

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE

B) QUARTZ CONDUCTIVE, PH-CORRECTED

C) QUARTZ ADIABATIC

D) CHALCEDONY

E) CHALCEDONY, PH-CORRECTED

F) CRISTOBALITE

G) AMORPHOUS SILICA

H) NA-K

I) NA-K-CA

J) NA-K-CA, MG-CORRECTED

K) SULFATE GEOTHERMOMETER

L) SURFACE TEMPERATURE

M) WELL TEMPERATURE

N) MIXING MODEL

O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ON STANDARD ESTIMATE					

VOLUME (KM**3)..... 3.3 STD. DEV. = 0.9
 THERMAL ENERGY(10**18 J), 0.77 STD. DEV. = 0.23

COMMENTS: SPRINGS ARE COVERED AND INACCESSIBLE! SAMPLE FROM OUTFLOW PIPE 150 M FROM SOURCE.

REFERENCES: MARINER AND OTHERS, 1977B; AXTELL, 1972

COMPILED BY: BROOK, C.

NORTH SHORE MONO LAKE (BLACK ROCK POINT HOT SPRING, CALIFORNIA

FIELD NAME..... LONG VALLEY CALDERA
 KGRA OR OTHER NAME..... MONO-LONG VALLEY KGRA
 CIRCULAR REFERENCE..... 056

GEOGRAPHIC LOCALITY

STATE..... CALIFORNIA
 COUNTY..... MONO
 LATITUDE..... 37-40.0 N
 LONGITUDE..... 118-52.0 W
 MAPS..... MT. MORRISON 1162,500

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
035	28E	32	MT. DIABLO

GENERAL INFORMATION

WARNING FIGURE..... 8
 WARNING NUMBER..... 122-125
 AREA OF SURFACE EXPRESSION (KM**2). 10
 ELEVATION (M)..... 2165
 SURFACE ACTIVITY..... HOT SPRINGS, FUMARoles
 ASSOCIATED DEPOSITS..... SINTER
 NO. OF SPRINGS..... 40
 SPRING TEMPERATURES (C)..... 60 TO 94
 DISCHARGE (L/MIN)..... GREATER THAN 1300
 NO. OF WELLS..... 12
 WELL DEPTHS (M)..... 103 TO 2109
 MAXIMUM WELL TEMP (C)..... 181 AT DEPTH (M) 300
 ROCK TYPES: RHYOLITIC TUFFS, FLOWS, AND DOMES
 GEOPHYSICS: GRAVITY, MAGNETIC, HEAT FLOW, RESISTIVITY, AMT, MICROEARTHQUAKE, SEISMIC NOISE, P-WAVE DELAY

CHEMISTRY

SAMPLE SOURCE.... MARINER AND WILLEY, 1976

TEMP (C)	S102	CA	MG	NA	K	HC03	C03	S04	CL
94	340	0.9	0.1	390	45	416	16.6	130	280
F	B	PH	DEL 0 (18) S04		DEL 0 (18) H2O		DEL 0 H2O		
12	15	9.2	-7.59		-14.16		-115.8		

GEO THERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	238
NA-K-CA (4/3).....	344
NA-K.....	201
SILICA	
ADIABATIC.....	200
CONDUCTIVE.....	219
CHALCEDONY.....	205
CRISTOBALITE.....	172
OPAL.....	94
SULFATE	
CONDUCTIVE.....	245
ONE-STEP STEAM LOSS....	216
CONTINUOUS STEAM LOSS..	223

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	200	250	230	227	10

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.3	2.5	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	45	120	80	81.7	15.3

BASED ON: AMT AND MAGNETIC SURVEYS, GEOLOGY, WELL DATA, AND M. SOREY, (PERSONAL COMMUNICATION, 1978)

VOLUME (KM**3).....	136.1	STD. DEV. = 36.4
THERMAL ENERGY(10**18 J). 77.79		STD. DEV. = 21.15

COMMENTS: A DEEP (2109 M) TEST WELL IN THE EASTERN PART OF THE CALDERA HAD A MAXIMUM TEMPERATURE OF 72 C. HIGH-TEMPERATURE SYSTEM PROBABLY CONFINED TO THE WESTERN PART OF THE CALDERA WEST OF THE HILTON CREEK FAULT. ENTHALPHY-CHLORIDE RELATIONSHIPS INDICATE A POSSIBLE MAXIMUM TEMPERATURE OF 282 C.

REFERENCES: BAILEY AND OTHERS, 1976; MARINER AND WILLEY, 1976; HOOVER AND OTHERS, 1976; KANE AND OTHERS, 1976; WILLIAMS AND OTHERS, 1977; SMITH AND REX, 1977; FOURNIER, SOREY, AND OTHERS, 1978; STANLEY AND OTHERS, 1976

COMPILED BY: BROOK, C.

LONG VALLEY CALDERA , CALIFORNIA

FIELD NAME..... COSO AREA
KGRA OR OTHER NAME..... COSO HOT SPRINGS KGRA
CIRCULAR REFERENCE..... 057

GEOGRAPHIC LOCALITY

STATE..... CALIFORNIA
COUNTY..... INYO
LATITUDE..... 36-03.0 N
LONGITUDE..... 117-47.0 W
MAPS..... HAIWEE RESERVOIR 1162,500

TOWNSHIP RANGE SECTION BASE & MERIDIAN
22S 38E 04 MT. DIABLO

GENERAL INFORMATION

WARNING FIGURE..... 8
WARNING NUMBER..... 141A, 142
AREA OF SURFACE EXPRESSION (KM**2). 0.5
ELEVATION (M)..... 1098
SURFACE ACTIVITY..... HOT SPRINGS, FUMARoles
ASSOCIATED DEPOSITS..... SINTER
NO. OF SPRINGS..... 10
SPRING TEMPERATURES (C)..... 60 TO 97
DISCHARGE (L/MIN)..... SMALL
NO. OF WELLS..... 2
WELL DEPTHS (M)..... 114 TO 1477
MAXIMUM WELL TEMP (C)..... 189 AT DEPTH (M) 628
ROCK TYPES: RHYOLITE AND BASALT OVERLYING GRANITIC AND METAMORPHIC ROCKS
GEOPHYSICS: HEAT FLOW, MAGNETIC, GRAVITY, RESISTIVITY, AMT, MICROEARTHQUAKE, SEISMIC GROUND NOISE

CHEMISTRY

SAMPLE SOURCE.... AUSTIN AND PRINGLE, 1970
COLLECTION DATE.. 1968/03/00

TEMP(C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
142	154	74.4	1.0	1632	244			52.8	3042
F	B	PH		DEL O(18) S04	DEL O(18) H2O	DEL O H2O			
2.2	71.6	8.5		-1.94	-5.89				

GEOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	238
NA-K-CA (4/3).....	275
NA-K.....	236
SILICA	
ADIABATIC.....	154
CONDUCTIVE.....	163
CHALCEDONY.....	139
CRISTOBALITE.....	113
OPAL.....	40
SULFATE	
CONDUCTIVE.....	324
ONE-STEP STEAM LOSS....	285
CONTINUOUS STEAM LOSS..	296

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	190	240	230	220	11

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.1	2.0	0.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	17	40	25	27.3	4.8

BASED ON: RESISTIVITY, HEAT FLOW, MAGNETIC SURVEYS

VOLUME (KM**3).....	45.6	STD. DEV. = 11.7
THERMAL ENERGY(10**18 J),	25.21	STD. DEV. = 6.64

COMMENTS: AREA INCLUDES COSO HOT SPRINGS AND DEVIL'S KITCHEN FUMAROLIC AREA. CHEMICAL ANALYSIS FOR COSO WELL NO. 11 WATER BOILED DURING SAMPLING. FOURNIER AND OTHERS (1978) CALCULATE SUBSURFACE TEMPERATURES OF 240 TO 275 C USING ENTHALPY-CHLORIDE RELATIONS.

REFERENCES: WARING, 1965; AUSTIN AND PRINGLE, 1970; COMBS, 1975; COMBS AND ROTSTEIN, 1976; DUFFIELD AND HACON, 1977; FOURNIER, THOMPSON, AND OTHERS, 1978; FOX, 1978A, B; GALBRAITH, 1978; HULEN, 1978; U.S. GEOLOGICAL SURVEY, 1976

COMPILED BY: BROOK, C.

COSO AREA , CALIFORNIA

FIELD NAME..... RANDBURG AREA
KGRA OR OTHER NAME..... RANDBURG KGRA
CIRCULAR REFERENCE..... 058

GEOGRAPHIC LOCALITY

STATE..... CALIFORNIA
COUNTY..... SAN BERNARDINO
LATITUDE..... 35-23.0 N
LONGITUDE..... 117-32.2 W
MAPS..... KLINKER MOUNTAIN 1124,000

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
29S	41E	25 SE OF NW	MT. DIABLO

GENERAL INFORMATION

ELEVATION (M)..... 990
SURFACE ACTIVITY..... NONE. FOUND BY DRILLING
NO. OF WELLS..... 1
WELL DEPTHS (M)..... 235
MAXIMUM WELL TEMP (C)..... 115 AT DEPTH (M) 235
ROCK TYPES: ANDESITE OVERLYING QUARTZ MONZONITE AND SCHIST
GEOPHYSICS: HEAT FLOW (J. SASS, UNPUB.)

CHEMISTRY

SAMPLE SOURCE.... R. MARINER, UNPUB. DATA
COLLECTION DATE.. 1977/01/31

TEMP (C)	SiO2	CA	MG	NA	K	HCO3	CO3	SO4	CL
BOILING	LT 1	LT 0.5	LT 0.5	LT 0.5	LT 0.1	47		20	2
F	B	PH		DEL 0(18) SO4	DEL 0(18) H2O	DEL 0 H2O			
LT 0.1	LT 0.02	6.88							

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)	MINIMUM 115 (M)	MAXIMUM 250	MOST LIKELY 150	MEAN 172	STD. DEV. 29
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UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.2	2.0	1.0		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	4	8	5	5.7	0.8
BASED ON: HEAT FLOW SURVEY					

VOLUME (KM**3).....	9.4	STD. DEV. = 2.3
THERMAL ENERGY(10**18 J).	3.99	STD. DEV. = 1.22

COMMENTS: MAXIMUM AND MOST LIKELY TEMPERATURES ARE ESTIMATES. HOT WATER FLASHES IN BOREHOLE. CHEMICAL ANALYSIS OF STEAM CONDENSATE, GEOTHERMOMETRY NOT APPLICABLE. ISOTOPES UNRELIABLE BECAUSE OF REPEATED FLASHING. 15 MG/L NH3 AS (N).

REFERENCES: KOENIG, 1970; MOYLE, 1974

COMPILED BY: BROOK, C.

RANDSHURG AREA, CALIFORNIA

FIELD NAME..... TECOPA HOT SPRINGS
CIRCULAR REFERENCE..... 059

GEOGRAPHIC LOCALITY

STATE..... CALIFORNIA
COUNTY..... INYO
LATITUDE..... 35-53.2 N
LONGITUDE..... 116-14.2 W
MAPS..... TECOPA 1162,500

TOWNSHIP RANGE SECTION
21N 07E 28, 33

BASE & MERIDIAN
SAN BERNARDINO

GENERAL INFORMATION

WARNING FIGURE..... 8
WARNING NUMBER..... 146
ELEVATION (M)..... 415
SURFACE ACTIVITY..... HOT SPRINGS
NO. OF SPRINGS..... 2 OR MORE
SPRING TEMPERATURES (C)..... 42 TO 48
DISCHARGE (L/MIN)..... 15
ROCK TYPES: TUFFACEOUS LACUSTRINE DEPOSITS

CHEMISTRY

SAMPLE SOURCE.... R.H. MARINER, UNPUB. DATA
FLOW (L/MIN)..... GT 100
COLLECTION DATE.. 1977/01/31

TEMP(C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
48	100	2	0.22	885	17	686	13	580	545
F	H	PH		DEL 0(18) S04	DEL 0(18) H2O	DEL D H2O			
3.0	9.2	8.45							

GEOOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 145
 NA-K-CA (4/3)..... 241
 NA-K..... 48

SILICA

ADIABATIC..... 133
 CONDUCTIVE..... 137
 CHALCEDONY..... 110
 CRISTOBALITE..... 87
 OPAL..... 17

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)

MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
97 (E)	145 (I)	137 (A)	126	10

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5		
SUBSURFACE AREA (KM**2)	1	3	2	1.7	0.3
BASED ON: STANDARD ESTIMATE				2.0	0.4

VOLUME (KM**3)..... 3.3
 THERMAL ENERGY(10**18 J). 1.00

STD. DEV. = 0.9
 STD. DEV. = 0.30

COMMENTS: GEOTHERMOMETERS MAY BE UNRELIABLE BECAUSE OF LIKELYHOOD OF WATER REACTIONS WITH TUFFACEOUS LACUSTRINE DEPOSITS.

REFERENCES: WARING, 1965

COMPILED BY: BROOK, C.

TECOPA HOT SPRINGS, CALIFORNIA

FIELD NAME..... SCOVERN HOT SPRING
KGRA OR OTHER NAME..... NEILLS HOT SPRING (AGUA CALIENTE)
CIRCULAR REFERENCE..... 060

GEOGRAPHIC LOCALITY

STATE..... CALIFORNIA
COUNTY..... KERN
LATITUDE..... 35-37.1 N
LONGITUDE..... 118-28.4 W
MAPS..... LAKE ISABELLA SOUTH 1124,000

GENERAL INFORMATION

WAKING FIGURE..... 8
WAKING NUMBER..... 149
ELEVATION (M)..... 762
SURFACE ACTIVITY..... HOT SPRING
NO. OF SPRINGS..... 17
SPRING TEMPERATURES (C)..... 53.5
DISCHARGE (L/MIN)..... 435
ROCK TYPES: GRANITIC ROCKS

CHEMISTRY

SAMPLE SOURCE.... R. MARINER, UNPUB. DATA
COLLECTION DATE.. 1977/01/03

TEMP(C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
53.5	64	2.8	0.18	145	3.0	288	LT 1	8	38
F	B	PH		DEL 0(18) S04	DEL 0(18) H2O	DEL D H2O			
8.2	2.4	7.49							

GEO THERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 119
 NA-K-CA (4/3)..... 108
 NA-K..... 53

SILICA

ADIABATIC..... 113
 CONDUCTIVE..... 114
 CHALCEDONY..... 85
 CRISTOBALITE..... 63
 OPAL..... -4

RESERVOIR PROPERTIES

SUBSURFACE TEMP (C)

MINIMUM

85 (D)

MAXIMUM

119 (I)

MOST LIKELY

114 (A)

MEAN

106

STD. DEV.

7

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE

F) CRISTOBALITE

K) SULFATE GEOTHERMOMETER

B) QUARTZ CONDUCTIVE, PH-CORRECTED

G) AMORPHOUS SILICA

L) SURFACE TEMPERATURE

C) QUARTZ ADIABATIC

H) NA-K

M) WELL TEMPERATURE

D) CHALCEDONY

I) NA-K-CA

N) MIXING MODEL

E) CHALCEDONY, PH-CORRECTED

J) NA-K-CA, MG-CORRECTED

O) RENNER AND OTHERS, 1976

DEPTH TO TOP (KM) MINIMUM

0.5

MAXIMUM

2.0

MOST LIKELY

1.5

MEAN

1.7

STD. DEV.

0.3

THICKNESS (KM) 1.0

2.5

1.5

2.0

0.4

SUBSURFACE AREA (KM**2) 1

3

2

2.0

0.4

BASED ON: STANDARD ESTIMATE

VOLUME (KM**3)..... 3.3

STD. DEV. = 0.9

THERMAL ENERGY(10**18 J), 0.82

STD. DEV. = 0.24

COMMENTS: SPRING ISSUES FROM IRON STAND PIPE.

REFERENCES: WARING, 1965

COMPILED BY: BROOK, C.

SCOVERN HOT SPRING, CALIFORNIA

FIELD NAME..... SESPE HOT SPRINGS
KGRA OR OTHER NAME..... SESPE HOT SPRINGS KGRA
CIRCULAR REFERENCE..... 061

GEOGRAPHIC LOCALITY

STATE..... CALIFORNIA
COUNTY..... VENTURA
LATITUDE..... 34-35.7 N
LONGITUDE..... 118-59.9 W
MAPS..... DEVILS HEART PEAK 1124,000

TOWNSHIP RANGE SECTION BASE & MERIDIAN
06N 20W 21 SE OF SE SAN BERNARDINO

GENERAL INFORMATION

WAVING FIGURE..... 8
WAVING NUMBER..... 111
AREA OF SURFACE EXPRESSION (KM*2). 0.2
ELEVATION (M)..... 869
SURFACE ACTIVITY..... HOT SPRINGS
NO. OF SPRINGS..... 4
SPRING TEMPERATURES (C)..... 36 TO 90
DISCHARGE (L/MIN)..... 470
ROCK TYPES: FAULTED GRANITE

CHEMISTRY

SAMPLE SOURCE.... R. MARINER, UNPUB. DATA
COLLECTION DATE.. 1977/01/31

TEMP(C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
89	98	22	0.11	330	14	70	LT 1	290	290
F	B	PH		DEL 0(18) S04		DEL 0(18) H2O		DEL D H2O	
12	13	7.74		+5.72		-9.62			

GEOTHERMOMETERS (C)

CATION

NA-K-CA (1/3).....	148
NA-K-CA (4/3).....	126
NA-K.....	102

SILICA

ADIABATIC.....	132
CONDUCTIVE.....	136
CHALCEDONY.....	109
CRISTOBALITE.....	85
OPAL.....	16

SULFATE

CONDUCTIVE.....	111
ONE-STEP STEAM LOSS....	109
CONTINUOUS STEAM LOSS..	109

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)

MINIMUM
109 (D)

MAXIMUM
148 (I)

MOST LIKELY
136 (A)

MEAN
131

STD. DEV.
8

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE

B) QUARTZ CONDUCTIVE, PH-CORRECTED

C) QUARTZ ADIABATIC

D) CHALCEDONY

E) CHALCEDONY, PH-CORRECTED

F) CRISTOBALITE

G) AMORPHOUS SILICA

H) NA-K

I) NA-K-CA

J) NA-K-CA, MG-CORRECTED

K) SULFATE GEOTHERMOMETER

L) SURFACE TEMPERATURE

M) WELL TEMPERATURE

N) MIXING MODEL

O) RENNER AND OTHERS, 1976

DEPTH TO TOP (KM)	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
THICKNESS (KM)	0.5	2.0	1.5		
SUBSURFACE AREA (KM**2)	1.0	2.5	1.5	1.7	0.3
	1	3	2	2.0	0.4
BASED ON: STANDARD ESTIMATE					

VOLUME (KM**3).....	3.3
THERMAL ENERGY(10**14 J). 1.04	

STD. DEV. = 0.9
STD. DEV. = 0.30

REFERENCES: WARING, 1965; MOYLE, 1974

COMPILED BY: BROOK, C.

SESPE HOT SPRINGS, CALIFORNIA

FIELD NAME..... ARROWHEAD HOT SPRINGS
CIRCULAR REFERENCE..... 062

GEOGRAPHIC LOCALITY

STATE..... CALIFORNIA
COUNTY..... SAN BERNARDINO
LATITUDE..... 34-11.2 N
LONGITUDE..... 117-15.9 W
MAPS..... SAN BERNARDINO NORTH 1124.000

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
01N	04W	11 NE	SAN BERNARDINO

GENERAL INFORMATION

WAKING FIGURE..... 8
WAKING NUMBER..... 162
AREA OF SURFACE EXPRESSION (KM**2). 0.1
ELEVATION (M)..... 610
SURFACE ACTIVITY..... HOT SPRINGS
NO. OF SPRINGS..... SEVERAL IN 2 GROUPS
SPRING TEMPERATURES (C)..... 43 TO 86
DISCHARGE (L/MIN)..... 200
ROCK TYPES: FRACTURED GRANITE AND GNEISS

CHEMISTRY

SAMPLE SOURCE.... R. MARINER, UNPUB. DATA
COLLECTION DATE.. 1977/01/31

TEMP(C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
80.5	100	27	0.14	295	14	74	LT 1	520	76

F	H	PH	DEL 0(18) S04	DEL 0(18) H2O	DEL 0 H2O
9.0	2.8	7.72			

GEOOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 150
 NA-K-CA (4/3)..... 119
 NA-K..... 111

SILICA

ADIABATIC..... 133
 CONDUCTIVE..... 137
 CHALCEDONY..... 110
 CRISTOBALITE..... 87
 OPAL..... 17

RESERVOIR PROPERTIES

SUBSURFACE TEMP (C)

MINIMUM

110 (D)

MAXIMUM

150 (I)

MOST LIKELY

137 (A)

MEAN

132

STD. DEV.

8

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE

B) QUARTZ CONDUCTIVE, PH-CORRECTED

C) QUARTZ ADIABATIC

D) CHALCEDONY

E) CHALCEDONY, PH-CORRECTED

F) CRISTOBALITE

G) AMORPHOUS SILICA

H) NA-K

I) NA-K-CA

J) NA-K-CA, MG-CORRECTED

K) SULFATE GEOTHERMOMETER

L) SURFACE TEMPERATURE

M) WELL TEMPERATURE

N) MIXING MODEL

O) RENNER AND OTHERS, 1976

DEPTH TO TOP (KM) MINIMUM

0.5

MAXIMUM

2.0

MOST LIKELY

1.5

MEAN

1.7

STD. DEV.

0.3

THICKNESS (KM) 1.0

1.0

2.5

1.5

1.7

0.3

SUBSURFACE AREA (KM**2) 1

1

3

2

2.0

0.4

BASED ON: STANDARD ESTIMATE

VOLUME (KM**3)..... 3.3

3.3

STD. DEV. = 0.9

THERMAL ENERGY(10**18 J). 1.06

1.06

STD. DEV. = 0.31

REFERENCES: WARING, 1965

COMPILED BY: BROOK, C.

ARROWHEAD HOT SPRINGS , CALIFORNIA

FIELD NAME..... PILGER ESTATES HOT SPRINGS
CIRCULAR REFERENCE..... 063

GEOGRAPHIC LOCALITY

STATE..... CALIFORNIA
COUNTY..... RIVERSIDE
LATITUDE..... 33-26.0 N
LONGITUDE..... 115-41.1 W
MAPS..... FRINK NW 1124,000

TOWNSHIP RANGE SECTION BASE & MERIDIAN
0NS 12E 36 SAN BERNARDINO

GENERAL INFORMATION

WARNING FIGURE..... 8
WARNING NUMBER..... 176A
ELEVATION (M)..... 61
SURFACE ACTIVITY..... HOT WATER WELL
SPRING TEMPERATURES (C)..... 79 TO 82
DISCHARGE (L/MIN)..... MORE THAN 3000
NO. OF WELLS..... 1
WELL DEPTHS (M)..... 92
ROCK TYPES: ALLUVIUM OVERLYING TERTIARY INTRUSIVE ROCKS

CHEMISTRY

SAMPLE SOURCE.... HOYLE, 1974
COLLECTION DATE.. 1965/04/00

TEMP(C)	SI02	CA	MG	NA	K	HCO3	CO3	S04	CL
82	79	107	16	888	33	268		225	1360
F	B	PH		DEL 0(18) S04		DEL 0(18) H2O		DEL 0 H2O	
		7.7							

GEOOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 145
 NA-K-CA (4/3)..... 132
 NA-K..... 92

SILICA

ADIABATIC..... 122
 CONDUCTIVE..... 124
 CHALCEDONY..... 96
 CRISTOBALITE..... 74
 OPAL..... 6

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)

MINIMUM
 96 (D)

MAXIMUM
 124 (A)

MOST LIKELY
 96 (J)

MEAN
 105

STD. DEV.
 7

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE

B) QUARTZ CONDUCTIVE, PH-CORRECTED

C) QUARTZ ADIABATIC

D) CHALCEDONY

E) CHALCEDONY, PH-CORRECTED

F) CRISTOBALITE

G) AMORPHOUS SILICA

H) NA-K

I) NA-K-CA

J) NA-K-CA, MG-CORRECTED

K) SULFATE GEOTHERMOMETER

L) SURFACE TEMPERATURE

M) WELL TEMPERATURE

N) MIXING MODEL

O) RENNER AND OTHERS, 1976

DEPTH TO TOP (KM)

MINIMUM
 0.5

MAXIMUM
 2.0

MOST LIKELY
 1.5

MEAN

STD. DEV.

THICKNESS (KM)

1.0

2.5

1.5

1.7

0.3

SUBSURFACE AREA (KM**2)

1

3

2

2.0

0.4

BASED ON STANDARD ESTIMATE

VOLUME (KM**3)..... 3.3

STD. DEV. = 0.9

THERMAL ENERGY (10**18 J), 0.81

STD. DEV. = 0.24

REFERENCES: WARING, 1965; MOYLE, 1974

COMPILED BY: BROOK, C.

PILGER ESTATES HOT SPRINGS, CALIFORNIA

FIELD NAME..... SALTON SEA AREA
KGRA OR OTHER NAME..... SALTON SEA KGRA
CIRCULAR REFERENCE..... 064

GEOGRAPHIC LOCALITY

STATE..... CALIFORNIA
COUNTY..... IMPERIAL
LATITUDE..... 33-12.0 N
LONGITUDE..... 115-36. W
MAPS..... NILAND 1:24,000; OBSIDIAN BUTTE 1:24,000

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
11S	13E	22	SAN BERNARDINO

GENERAL INFORMATION

WAKING FIGURE..... 8
WAKING NUMBER..... 182A
ELEVATION (M)..... -70
SURFACE ACTIVITY..... HOT SPRINGS AND FUMARoles NOW COVERED BY SALTON SEA. AREA IDENTIFIED
BY HEAT FLOW ANOMALY AND FOUND BY DRILLING.
NO. OF SPRINGS..... ORIGINALLY 4
SPRING TEMPERATURES (C)..... 72 TO 101
DISCHARGE (L/MIN)..... SMALL
NO. OF WELLS..... ABOUT 21
WELL DEPTHS (M)..... 700 TO 2400
MAXIMUM WELL TEMP (C)..... 360 AT DEPTH (M) 2135
ROCK TYPES: QUATERNARY DELTAIC SEDIMENTS INTRUDED BY RHYOLITE DOMES
GEOPHYSICS: GRAVITY, MAGNETIC, HEAT FLOW

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)	MINIMUM 300	MAXIMUM 340	MOST LIKELY 330	MEAN 323	STD. DEV. 8
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UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.35	1.2	0.5		
THICKNESS (KM)	1.5	2.3	2.0	1.9	0.2
SUBSURFACE AREA (KM**2)	23	104	54	60.3	16.7

BASED ON: ESTIMATES OF RENNER ET AL (1976) AND MAGNETIC ANOMALY

VOLUME (KM**3).....	116.6	STD. DEV. = 33.9
THERMAL ENERGY(10**18 J).	97.11	STD. DEV. = 28.33

COMMENTS: HYPERSALINE BRINE: GEOTHERMOMETRY QUESTIONABLE. DEPTH ESTIMATES FROM WELL DATA. THICKNESS ESTIMATES FROM RENNER ET AL (1976). RESERVOIR IS SEPARATED INTO AN UPPER, UNALTERED (?) PART AND A LOWER, ALTERED PART BY AN IMPERMEABLE AND CONTINUOUS SHALE LAYER. GEOTHERMAL LOOP EXPERIMENTAL FACILITY IS CURRENTLY BEING TESTED.

REFERENCES: HELGESON, 1968; MUFFLER AND WHITE, 1969; GRISCOM AND MUFFLER, 1971; ROBINSON, ELDERS, AND MUFFLER, 1976; QUONG, 1976; SCHROEDER, 1976; RENNER AND OTHERS, 1976; MORSE, 1977

COMPILED BY: BROOK, C.

SALTON SEA AREA, CALIFORNIA

FIELD NAME..... WESTMORLAND
CIRCULAR REFERENCE..... 064A

GEOGRAPHIC LOCALITY

STATE..... CALIFORNIA
COUNTY..... IMPERIAL
LATITUDE..... 33-05.0 N
LONGITUDE..... 115-39.0 W
MAPS..... CALIPATRIA SW AND WESTMORLAND 1:24,000

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
125	13E		SAN BERNARDINO

GENERAL INFORMATION

ELEVATION (M).....	-61	
SURFACE ACTIVITY.....	NONE.	FOUND BY DRILLING
NO. OF WELLS.....	6	
WELL DEPTHS (M).....	458	TO 2592
ROCK TYPES: DELTAIC SEDIMENTS		

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	200	235	215	217	7

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	1.0	1.5	1.1		
THICKNESS (KM)	1.0	2.0	1.6	1.5	0.2
SUBSURFACE AREA (KM**2)	45	135	60	80.0	19.7

BASED ON: ESTIMATES BASED ON PERSONAL COMMUN.

VOLUME (KM**3).....	122.7	STD. DEV. =	34.6
THERMAL ENERGY(10**18 J).	66.79	STD. DEV. =	19.00

COMMENTS: MOST LIKELY TEMPERATURE IS THE WEIGHTED AVERAGE OF 5 TEMPERATURES AT 1920 M DEPTH. SYSTEM MAY BE AN EXTENSION OF THE SALTON SEA FIELD.

REFERENCES: SMITH, J.L., ORAL COMMUNICATION, 1978

COMPILED BY: BROOK, C.

WESTMORLAND , CALIFORNIA

FIELD NAME..... BRAWLEY
 KGRA OR OTHER NAME..... BRAWLEY KGRA
 CIRCULAR REFERENCE..... 065

GEOGRAPHIC LOCALITY

STATE..... CALIFORNIA
 COUNTY..... IMPERIAL
 LATITUDE..... 33-03.0 N
 LONGITUDE..... 115-32.0 W
 MAPS..... WESTMORLAND 1124.000

TOWNSHIP RANGE SECTION
 13S 14E 15

BASE & MERIDIAN
 SAN BERNARDINO

GENERAL INFORMATION

ELEVATION (M)..... -46
 SURFACE ACTIVITY..... NONE. IDENTIFIED BY HEAT FLOW ANOMALY. FOUND BY DRILLING
 NO. OF WELLS..... ABOUT 6
 WELL DEPTHS (M)..... 1534 TO 4100
 MAXIMUM WELL TEMP (C)..... 262 AT DEPTH (M) 2406
 ROCK TYPES: SANDY DELTAIC SEDIMENTS
 GEOPHYSICS: RESISTIVITY, HEAT FLOW (TEMPERATURE GRADIENT), GRAVITY

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	230	280	250	253	10

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	1.5	2.2	1.9		
THICKNESS (KM)	1.0	1.5	1.5	1.3	0.1
SUBSURFACE AREA (KM**2)	13	40	24	25.7	5.5

BASED ON: TEMPERATURE GRADIENT CONTOURS AND D.E. WHITE, ORAL COMMUN., 1978

VOLUME (KM**3).....	34.2	STD. DEV. = 8.0
THERMAL ENERGY(10**18 J),	22.02	STD. DEV. = 5.25

COMMENTS: BRINE FLUID CONTAINING 59,000 PPM TDS. NO CHEMISTRY AVAILABLE. THICKNESS AND DEPTH ESTIMATES BASED ON LIMITED WELL DATA (R. BUTLER, PERSONAL COMMUN., 1978).

REFERENCES: U.S. BUREAU OF RECLAMATION, 1972; MEIDAV AND FURGERSON, 1972; DUTCHER AND OTHERS, 1972; RENNER AND OTHERS, 1976

COMPILED BY: BROOK, C.

BRAWLEY, CALIFORNIA

FIELD NAME..... GLAMIS (EAST BRAWLEY)
KGRA OR OTHER NAME..... GLAMIS KGRA
CIRCULAR REFERENCE..... 066

GEOGRAPHIC LOCALITY

STATE..... CALIFORNIA
COUNTY..... IMPERIAL
LATITUDE..... 32-58.0 N
LONGITUDE..... 115-11.0 W
MAPS..... GLAMIS NW 1124,000

TOWNSHIP RANGE SECTION
14S 17E 02

BASE & MERIDIAN
SAN BERNARDINO

GENERAL INFORMATION

ELEVATION (M)..... 37
SURFACE ACTIVITY..... NONE. IDENTIFIED BY HEAT FLOW ANOMALY
ROCK TYPES: SANDY DELTAIC SEDIMENTS
GEOPHYSICS: TEMPERATURE GRADIENT

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	105	170	120	132	14

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ON: TEMPERATURE GRADIENT ANOMALY					

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J),	1.05	STD. DEV. = 0.32

COMMENTS: TEMPERATURES ASSUMED TO BE SIMILAR TO THOSE ESTIMATED FOR THE DUNES AREA.

REFERENCES: U.S. BUREAU OF RECLAMATION, 1972; REX AND OTHERS, 1971

COMPILED BY: BROOK, C.

GLAMIS (EAST BRAWLEY) , CALIFORNIA

FIELD NAME..... GLAMIS EAST
KGRA OR OTHER NAME..... GLAMIS KGRA
CIRCULAR REFERENCE..... 067

GEOGRAPHIC LOCALITY

STATE..... CALIFORNIA
COUNTY..... IMPERIAL
LATITUDE..... 33-00.0 N
LONGITUDE..... 115-02.1 W
MAPS..... GLAMIS 1:24,000

TOWNSHIP RANGE SECTION
13S 18E 33

BASE & MERIDIAN
SAN BERNARDINO

GENERAL INFORMATION

ELEVATION (M)..... 107
SURFACE ACTIVITY..... NONE, IDENTIFIED BY HEAT FLOW ANOMALY
ROCK TYPES: SANDY DELTAIC SEDIMENTS
GEOPHYSICS: TEMPERATURE GRADIENT

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	105	170	120	132	14

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	5	3	3.0	0.8

BASED ON: RENNER ET AL (1976) AND TEMPERATURE GRADIENT CONTOURS

VOLUME (KM**3).....	5.0	STD. DEV. = 1.7
THERMAL ENERGY(10**18 J).	1.57	STD. DEV. = 0.56

COMMENTS: TEMPERATURES ASSUMED TO BE SIMILAR TO THOSE ESTIMATED FOR THE DUNES AREA.

REFERENCES: U.S. BUREAU OF RECLAMATION, 1972; REX AND OTHERS, 1971; RENNER AND OTHERS, 1976

COMPILED BY: BROOK, C.

GLAMIS EAST, CALIFORNIA

FIELD NAME..... EAST MESA
KGRA OR OTHER NAME..... EAST MESA KGRA
CIRCULAR REFERENCE..... 068

GEOGRAPHIC LOCALITY

STATE..... CALIFORNIA
COUNTY..... IMPERIAL
LATITUDE..... 32-47.0 N
LONGITUDE..... 115-15.0 W
MAPS..... HOLTVILLE EAST 1124,000

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
16S	17E	06 SE	SAN BERNARDINO

GENERAL INFORMATION

ELEVATION (M)..... 8
SURFACE ACTIVITY..... NONE, IDENTIFIED BY HEAT FLOW ANOMALY. FOUND BY DRILLING
NO. OF WELLS..... 20 OR MORE, SOME OF WHICH ARE INJECTION WELLS.
WELL DEPTHS (M)..... 915 TO 2772
MAXIMUM WELL TEMP (C)..... 204 AT DEPTH (M) 2355
ROCK TYPES: SANDY DELTAIC SEDIMENTS
GEOPHYSICS: HEAT FLOW, GRAVITY, RESISTIVITY, MICROEARTHQUAKE, SEISMIC NOISE

CHEMISTRY

SAMPLE SOURCE.... U.S. BUREAU OF RECLAMATION, 1977
COLLECTION DATE.. 1976/06/09

TEMP (C)	SI02	CA	MG	NA	K	HC03	CO3	SO4	CL
	320	1360	17.2	8100	1050	202	0.0	42.8	15850
F	B	PH		DEL 0(18) SO4	DEL 0(18) H2O	DEL 0 H2O			
		5.45							

GEOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 231
 NA-K-CA (4/3)..... 279
 NA-K..... 216

SILICA

ADIABATIC..... 196
 CONDUCTIVE..... 214
 CHALCEDONY..... 199
 CRISTOBALITE..... 166
 OPAL..... 90

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	165	200	180	182	7

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	1.8	2.0	1.8		
THICKNESS (KM)	1.0	1.2	1.2	1.1	0.0
SUBSURFACE AREA (KM**2)	16	40	40	32.0	5.7

BASED ON: WELL DISTRIBUTION, HEAT FLOW DATA; ALSO SWANBERG, 1976

VOLUME (KM**3).....	36.3	STD. DEV. = 6.6
THERMAL ENERGY(10**18 J).	16.32	STD. DEV. = 3.05

COMMENTS: BRINE FLUIDS, GEOTHERMOMETRY QUESTIONABLE. CHEMICAL ANALYSIS FOR UNFLASHED FLUID FROM WELLHEAD MESA 6-1. THICKNESS AND DEPTH ESTIMATES FROM WELL DATA. A 10 MW POWER PLANT IS UNDER CONSTRUCTION.

REFERENCES: U.S. BUREAU OF RECLAMATION, 1972, 1974, 1977; SWANBERG, 1976; BIEHLER, 1971; BARKMAN AND OTHERS, 1976; NARASIMHAN AND OTHERS, 1977; COMBS AND JARZABEK, 1978

COMPILED BY: BROOK, C.

EAST MESA , CALIFORNIA

FIELD NAME..... DUNES
KGRA OR OTHER NAME..... DUNES KGRA
CIRCULAR REFERENCE..... 069

GEOGRAPHIC LOCALITY

STATE..... CALIFORNIA
COUNTY..... IMPERIAL
LATITUDE..... 32-48.2 N
LONGITUDE..... 115-00.8 W
MAPS..... GLAMIS SE 1124,000

TOWNSHIP RANGE SECTION
155 19E 28

BASE & MERIDIAN
SAN BERNARDINO

GENERAL INFORMATION

ELEVATION (M)..... 75
SURFACE ACTIVITY..... NONE. IDENTIFIED BY ANOMALOUS HEAT FLOW.
NO. OF WELLS..... 1
WELL DEPTHS (M)..... 612
MAXIMUM WELL TEMP (C)..... 103 AT DEPTH (M) ABOUT 280
ROCK TYPES: SANDY DELTAIC SEDIMENTS
GEOPHYSICS: TEMPERATURE GRADIENT, GRAVITY, TELLURIC

CHEMISTRY

SAMPLE SOURCE.... COPLEN AND KOLESAR, 1974

TEMP(C)	SI02	CA	MG	NA	K	HC03	CO3	S04	CL
100	118	136	1.7	1262	103	76	0.04	178	2021
F	H	PH		DEL O(18) S04	DEL O(18) H2O	DEL D H2O			
		6.58			-10.77	-94			

GEOOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	189
NA-K-CA (4/3).....	185
NA-K.....	161
SILICA	
ADIABATIC.....	141
CONDUCTIVE.....	147
CHALCEDONY.....	121
CRISTOBALITE.....	96
OPAL.....	25

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	105	170	120	132	14

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.2	1.5	0.2		
THICKNESS (KM)	1.0	2.5	1.5		
SUBSURFACE AREA (KM**2)	3	8	5	1.7	0.3
				5.3	1.0

BASED ON: TEMPERATURE GRADIENT CONTOURS

VOLUME (KM**3).....	8.9	STD. DEV. = 2.4
THERMAL ENERGY (10**18 J),	2.80	STD. DEV. = 0.83

COMMENTS: CHEMICAL ANALYSIS FROM 104-116 M PERFORATION IN WELL DWR#1. CALCITE-WATER OXYGEN ISOTOPE EQUILIBRIUM INDICATES 117 C (COPLIN, 1973). CALCITE MAY BE PRECIPITATING IN SUBSURFACE.

REFERENCES: REX AND OTHERS, 1971; U.S. BUREAU OF RECLAMATION, 1972; COPLIN, 1973; COPLIN AND KOLESAR, 1974; COMBS AND WILT, 1976.

COMPILED BY: BROOK, C.

DUNES , CALIFORNIA

FIELD NAME..... BORDER
KGRA OR OTHER NAME..... EAST MESA KGRA
CIRCULAR REFERENCE..... 070

GEOGRAPHIC LOCALITY

STATE..... CALIFORNIA
COUNTY..... IMPERIAL
LATITUDE..... 32-44.0 N
LONGITUDE..... 115-07.0 W
MAPS..... MIDWAY WELL 1124,000

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
16S	18E	28 NW	SAN BERNARDINO

GENERAL INFORMATION

ELEVATION (M)..... 37
SURFACE ACTIVITY..... NONE, IDENTIFIED BY HEAT FLOW ANOMALY
ROCK TYPES: SANDY DELTAIC SEDIMENTS
GEOPHYSICS: HEAT FLOW, RESISTIVITY, GRAVITY, MICROEARTHQUAKE, SEISMIC NOISE

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	150 (0)	170 (0)	160 (0)	160	4

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	1.8	2.0	1.8		
THICKNESS (KM)	1.0	1.2	1.2		
SUBSURFACE AREA (KM**2)	2.6	5	3	1.1	0.0
				3.5	0.5

BASED ON: ESTIMATES OF RENNER ET AL (1976), TEMPERATURE GRADIENT DATA

VOLUME (KM**3).....	4.0	STD. DEV. = 0.6
THERMAL ENERGY(10**18 J).	1.57	STD. DEV. = 0.25

COMMENTS: DEPTH TO RESERVOIR AND THICKNESS ESTIMATES ARE ASSUMED USING ANALOGY TO EAST MESA TEST SITE.

REFERENCES: DUTCHER AND OTHERS, 1972; U.S. BUREAU OF RECLAMATION, 1972, 1974; RENNER AND OTHERS, 1976

COMPILED BY: BROOK, C.

BORDER, CALIFORNIA

FIELD NAME..... HEBER
KGRA OR OTHER NAME..... HEBER KGRA
CIRCULAR REFERENCE..... 071

GEOGRAPHIC LOCALITY

STATE..... CALIFORNIA
LATITUDE..... 32-43.0 N
LONGITUDE..... 115-31.7 W
MAPS..... HEBER 1124,000

TOWNSHIP RANGE SECTION
16S 14E 29

BASE & MERIDIAN
SAN BERNARDINO

GENERAL INFORMATION

ELEVATION (M)..... -1.5
SURFACE ACTIVITY..... NONE. IDENTIFIED BY HEAT FLOW ANOMALY, FOUND BY DRILLING.
NO. OF WELLS..... 11
WELL DEPTHS (M)..... 916 TO 3360
ROCK TYPES: SANDY DELTAIC SEDIMENTS
GEOPHYSICS: HEAT FLOW, RESISTIVITY, GRAVITY

CHEMISTRY

SAMPLE SOURCE.... GEONOMICS, INC., 1976

TEMP(C)	S102	CA	MG	NA	K	HC03	C03	S04	CL
	268	781	3.8	4563	197			150	8076
F	B	PH		DEL 0(18) S04	DEL 0(18) H2O	DEL 0 H2O			
		6.5							

GEO THERMOMETERS (C)

CATION

NA-K-CA (1/3).....	162
NA-K-CA (4/3).....	180
NA-K.....	103

SILICA

ADIABATIC.....	185
CONDUCTIVE.....	201
CHALCEDONY.....	183
CRISTOBALITE.....	152
OPAL.....	76

RESERVOIR PROPERTIES

SUBSURFACE TEMP (C)

MINIMUM
160

MAXIMUM
185

MOST LIKELY
180

MEAN
175

STD. DEV.
5

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
H) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.6	1.8	1.5		
THICKNESS (KM)	1.2	2.4	1.5		
SUBSURFACE AREA (KM**2)	30	55	40	1.7	0.3
				41.7	5.1

BASED ON: TANSEV AND WASSERMAN (1976) AND TEMPERATURE GRADIENT CONTOURS

VOLUME (KM**3).....	70.8	STD. DEV. = 13.8
THERMAL ENERGY (10**18 J). 30.60		STD. DEV. = 6.06

COMMENTS: CHEMICAL ANALYSIS FOR WELL J.D. JACKSON #1. AVERAGE BOTTOM HOLE TEMPERATURE OF PRODUCING WELLS IS 179-181 C. MAXIMUM TEMPERATURE REPORTED FOR THE FIELD IS 191 C (TANSEV AND WASSERMAN, 1977).

REFERENCES: U.S. BUREAU OF RECLAMATION, 1972; GEONOMICS, INC., 1976; TANSEV AND WASSERMAN, 1977; MEIDAV AND FURGERSON, 1972; BIEHLER, 1971

COMPILED BY: BROOK, C.

HEUER, CALIFORNIA

Colorado

FIELD NAME..... ROUTT HOT SPRINGS
CIRCULAR REFERENCE..... 072

GEOGRAPHIC LOCALITY

STATE..... COLORADO
COUNTY..... ROUTT
LATITUDE..... 40-33.6 N
LONGITUDE..... 106-51.0 W
MAPS..... ROCKY REAK 1:24,000

TOWNSHIP RANGE SECTION BASE & MERIDIAN
07N 84W 18 SW OF SE 6TH PRINCIPAL MERIDIAN

GENERAL INFORMATION

WARNING FIGURE..... 2
WARNING NUMBER..... 2
ELEVATION (M)..... 2266
SURFACE ACTIVITY..... HOT SPRINGS
NO. OF SPRINGS..... 5
SPRING TEMPERATURES (C)..... 51 TO 64
DISCHARGE (L/MIN)..... 200-300
ROCK TYPES: PRECAMBRIAN GNEISS AND GRANITE

CHEMISTRY

SAMPLE SOURCE.... BARRETT AND PEARL, 1976
FLOW (L/MIN)..... 133
COLLECTION DATE.. 1976/04/00

TEMP (C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
64	89	7.7	0.1	160	8.8	139		45	130
F	B	PH		DEL 0 (18) S04	DEL 0 (18) H2O	DEL 0 H2O			
17	0.28	7.8							

GEOOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 157
 NA-K-CA (4/3)..... 126
 NA-K..... 123

SILICA

ADIABATIC..... 127
 CONDUCTIVE..... 131
 CHALCEDONY..... 103
 CRISTOBALITE..... 80
 OPAL..... 11

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)

MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
103 (D)	157 (I)	131 (A)	130	11

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5		
SUBSURFACE AREA (KM**2)	1	3	2	1.7	0.3
BASED ON: STANDARD ESTIMATE				2.0	0.4

VOLUME (KM**3)..... 3.3
 THERMAL ENERGY(10**18 J). 1.04
 STD. DEV. = 0.9
 STD. DEV. = 0.31

REFERENCES: BARNETT AND PEARL, 1976, 1978

COMPILED BY: MARINER, R. AND BROOK, C.

ROUTT HOT SPRINGS , COLORADO

FIELD NAME..... PENNY (AVALANCHE) HOT SPRINGS
CIRCULAR REFERENCE..... 073

GEOGRAPHIC LOCALITY

STATE..... COLORADO
COUNTY..... PITKIN
LATITUDE..... 39-13.6 N
LONGITUDE..... 107-13.5 W
MAPS..... REDSTONE 1124,000

TOWNSHIP RANGE SECTION BASE & MERIDIAN
10S 88W 04 NE OF NW 6TH PRINCIPAL MERIDIAN

GENERAL INFORMATION

WAVING FIGURE..... 2
WAVING NUMBER..... 8
ELEVATION (M)..... 2110
SURFACE ACTIVITY..... HOT SPRINGS
NO. OF SPRINGS..... SEVERAL FOR 0.8 KM ALONG RIVER
SPRING TEMPERATURES (C)..... 40 TO 56
DISCHARGE (L/MIN)..... 750
ROCK TYPES: TERTIARY GRANODIORITE INTRUDING PALEOZOIC SEDIMENTARY ROCKS

CHEMISTRY

SAMPLE SOURCE.... BARRETT AND PEARL, 1976 (GRANGES SPRING)
FLOW (L/MIN)..... 45
COLLECTION DATE.. 1975/09/00

TEMP(C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
56	81	440	55	400	38	565		1400	260
F	D	PH		DEL 0(18) S04	UEL 0(18) H2O			DEL D H2O	
2.7	0.65	9.27							

GEOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 166
 NA-K-CA (4/3)..... 90
 NA-K..... 178

SILICA

ADIABATIC..... 123
 CONDUCTIVE..... 126
 CHALCEDONY..... 98
 CRISTOBALITE..... 75
 OPAL..... 7

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)

MINIMUM
 90 (I)

MAXIMUM
 126 (A)

MOST LIKELY
 98 (D)

MEAN
 105

STD. DEV.
 8

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE

B) QUARTZ CONDUCTIVE, PH-CORRECTED

C) QUARTZ ADIABATIC

D) CHALCEDONY

E) CHALCEDONY, PH-CORRECTED

F) CRISTOBALITE

G) AMORPHOUS SILICA

H) NA-K

I) NA-K-CA

J) NA-K-CA, MG-CORRECTED

K) SULFATE GEOTHERMOMETER

L) SURFACE TEMPERATURE

M) WELL TEMPERATURE

N) MIXING MODEL

O) RENNER AND OTHERS, 1976

DEPTH TO TOP (KM) MINIMUM 0.5
 THICKNESS (KM) 1.0
 SUBSURFACE AREA (KM**2) 1
 BASED ON: STANDARD ESTIMATE

MAXIMUM
 2.0
 2.5
 3

MOST LIKELY
 1.5
 1.5
 2

MEAN
 1.7
 2.0

STD. DEV.
 0.3
 0.4

VOLUME (KM**3)..... 3.3
 THERMAL ENERGY(10**18 J). 0.81

STD. DEV. = 0.9
 STD. DEV. = 0.24

COMMENTS: CHEMICAL ANALYSIS FOR GRANGES SPRING REPORTED PH (9.2) ASSUMED TO BE IN ERROR AS OTHER SPRINGS HAVE A PH OF 6.3.

REFERENCES: BARRETT AND PEARL, 1976, 1978

COMPILED BY: MARINER, R. AND BROOK, C.

PENNY (AVALANCHE) HOT SPRINGS , COLORADO

FIELD NAME..... MT. PRINCETON HOT SPRINGS AREA
 KGRA OR OTHER NAME..... CHALK CREEK AREA
 CIRCULAR REFERENCE..... 074

GEOGRAPHIC LOCALITY

STATE..... COLORADO
 COUNTY..... CHAFFEE
 LATITUDE..... 38-43.9 N
 LONGITUDE..... 106-10.2 W
 MAPS..... PONCHA SPRINGS 1162,500

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
15S	78W	19	6TH PRINCIPAL MERIDIAN

GENERAL INFORMATION

WAVING FIGURE..... 2
 WAVING NUMBER..... 20
 AREA OF SURFACE EXPRESSION (KM**2). 5.0
 ELEVATION (M)..... 2486
 SURFACE ACTIVITY..... NUMEROUS THERMAL SPRINGS AND SHALLOW WELLS
 ASSOCIATED DEPOSITS..... ZEOLITIC ALTERATION
 NO. OF SPRINGS..... ABOUT 34
 SPRING TEMPERATURES (C)..... 39 TO 85
 DISCHARGE (L/MIN)..... 675
 NO. OF WELLS..... 5
 WELL DEPTHS (M)..... 12 TO 55
 ROCK TYPES: TERTIARY QUARTZ MONZONITE

CHEMISTRY

SAMPLE SOURCE.... HARRETT AND PEARL, 1976 (HORTENSE HOT SPRING, PRINCETON HOT SPRING)
 FLOW (L/MIN)..... 64
 COLLECTION DATE.. 1976/04/00

TEMP(C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
83	88	4.7	0	94	3.2	86		98	10
F	H	PH		DEL O(18) S04		DEL O(18) H2O		DEL D H2O	
15	0.04	8.2		-3.75		-16.40		-117.1	

GEOOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 131
 NA-K-CA (4/3)..... 93
 NA-K..... 85

SILICA

ADIABATIC..... 127
 CONDUCTIVE..... 130
 CHALCEDONY..... 103
 CRISTOBALITE..... 80
 OPAL..... 11

SULFATE

CONDUCTIVE..... 140
 ONE-STEP STEAM LOSS.... 133
 CONTINUOUS STEAM LOSS.. 134

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)

MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
93 (I)	140 (K)	103 (D)	112	10

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.1	2.0	1.0		
THICKNESS (KM)	1.0	2.3	1.5	1.6	0.3
SUBSURFACE AREA (KM**2)	2	6	4	4.0	0.8

BASED ON: SPRING AND WELL DISTRIBUTION

VOLUME (KM**3).....	6.4	STD. DEV. = 1.7
THERMAL ENERGY(10**18 J).	1.68	STD. DEV. = 0.48

COMMENTS: CHEMICAL ANALYSIS FOR HORTENSE HOT SPRING. ISOTOPIC DATA FROM MT. PRINCETON HOT SPRING. THERMAL WELLS USED FOR SPACE HEATING, GREENHOUSES, AND BATHING. ZEOLITIZATION IS PROBABLY NOT ACTIVE.

REFERENCES: BARRETT AND PEARL, 1976, 1978; OLSON AND DELLECHAIE, 1976; SHARP, 1970; WARING, 1965

COMPILED BY: MARINER, R. AND BROOK, C.

MT. PRINCETON HOT SPRINGS AREA, COLORADO

FIELD NAME..... PONCHA HOT SPRINGS
KGRA OR OTHER NAME..... PONCHA KGRA
CIRCULAR REFERENCE..... 075

GEOGRAPHIC LOCALITY

STATE..... COLORADO
COUNTY..... CHAFFEE
LATITUDE..... 38-29.8 N
LONGITUDE..... 106-04.6 W
MAPS..... RONANZA 1162.500

TOWNSHIP RANGE SECTION BASE & MERIDIAN
49N 08E 15 NEW MEXICO

GENERAL INFORMATION

WARNING FIGURE..... 2
WARNING NUMBER..... 21
ELEVATION (M)..... 2428
SURFACE ACTIVITY..... HOT SPRINGS
ASSOCIATED DEPOSITS..... TRAVERTINE
NO. OF SPRINGS..... 5
SPRING TEMPERATURES (C)..... 50 TO 71
DISCHARGE (L/MIN)..... 895
ROCK TYPES: PRECAMBRIAN GRANITE AND GNEISS

CHEMISTRY

SAMPLE SOURCE.... BARRETT AND PEARL, 1976 (SPRING B)
FLOW (L/MIN)..... 114
COLLECTION DATE.. 1975/06/00

TEMP (C)	SI02	CA	MG	NA	K	HC03	CO3	S04	CL
66	83	18	0.5	190	7.8	214		190	48
F	B	PH		DEL 0 (18) S04	DEL 0 (18) H2O	DEL D H2O			
12	0.07								

GEOOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 139
 NA-K-CA (4/3)..... 101
 NA-K..... 99

SILICA

ADIABATIC..... 124
 CONDUCTIVE..... 127
 CHALCEDONY..... 99
 CRISTOBALITE..... 76
 OPAL..... 8

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)

MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
98 (D)	127 (A)	101 (I)	109	7

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4

BASED ON: STANDARD ESTIMATE

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J).....	0.84	STD. DEV. = 0.24

COMMENTS: ANALYSIS FROM SPRING B; OTHER SPRINGS HAVE PH OF 7.5-8.0. TWO GROUPS OF SPRINGS. MOST OF THE WATER IS PIPED 8 KM TO SALIDA FOR USE IN SWIMMING POOL. ASSOCIATED WITH FLUORITE DEPOSITS.

REFERENCES: HARRETT AND PEARL, 1976, 1978

COMPILED BY: MARINER, R. AND BROOK, C.

PONCHA HOT SPRINGS, COLORADO

FIELD NAME..... WAUNITA HOT SPRINGS
CIRCULAR REFERENCE..... 076

GEOGRAPHIC LOCALITY

STATE..... COLORADO
COUNTY..... GUNNISON
LATITUDE..... 38-30.8 N
LONGITUDE..... 106-30.5 W
MAPS..... PITKIN 1124,000

TOWNSHIP RANGE SECTION
49N 04E 10-11

BASE & MERIDIAN
NEW MEXICO

GENERAL INFORMATION

WAKING FIGURE..... 2
WAKING NUMBER..... 14
ELEVATION (M)..... 2727
SURFACE ACTIVITY..... HOT SPRINGS
NO. OF SPRINGS..... SEVERAL IN 2 GROUPS
SPRING TEMPERATURES (C)..... 62 TO 80
DISCHARGE (L/MIN)..... MORE THAN 600
ROCK TYPES: MESOZOIC SANDSTONE AND SHALE ON NORTH SIDE OF TERTIARY INTRUSIVE DOME

CHEMISTRY

SAMPLE SOURCE.... HARRETT AND PEARL, 1976 (UPPER WAUNITA HOT SPRINGS)
FLOW (L/MIN)..... 114
COLLECTION DATE.. 1975/10/00

TEMP (C)	SiO2	CA	MG	NA	K	HCO3	CO3	SO4	CL
80	110	5.9	LT 0.2	160	10	119		190	15
F	B	PH		DEL 0(18) SO4	DEL 0(18) H2O	DEL 0 H2O			
18	0.06	8.4							

GEOTHERMOMETERS (C)

CATION

NA-K-CA (1/3).....	165
NA-K-CA (4/3).....	139
NA-K.....	135

SILICA

ADIABATIC.....	137
CONDUCTIVE.....	143
CHALCEDONY.....	116
CRISTOBALITE.....	92
OPAL.....	22

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)

MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
116 (D)	165 (I)	143 (A)	141	10

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ON: STANDARD ESTIMATE					

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J). 1.14		STD. DEV. = 0.33

COMMENTS: ANALYSIS FOR SPRING C, UPPER WAUNITA HOT SPRINGS. WATER USED FOR SPACE HEATING AND BATHING.

REFERENCES: BARRETT AND PEARL, 1976, 1978; HEDLUND AND OLSON, 1975

COMPILED BY: MARINER, R. AND BROOK, C.

WAUNITA HOT SPRINGS , COLORADO

FIELD NAME..... CEBOLLA (POWDERHORN) HOT SPRINGS
CIRCULAR REFERENCE..... 077

GEOGRAPHIC LOCALITY

STATE..... COLORADO
COUNTY..... GUNNISON
LATITUDE..... 38-16.4 N
LONGITUDE..... 107-05.9 W
MAPS..... POWDERHORN 1124,000

TOWNSHIP RANGE SECTION BASE & MERIDIAN
46N 02W 04 NW OF NE NEW MEXICO

GENERAL INFORMATION

WARNING FIGURE..... 2
WARNING NUMBER..... 15
ELEVATION (M)..... 2466
SURFACE ACTIVITY..... HOT SPRINGS
ASSOCIATED DEPOSITS..... FOSSIL TRAVERTINE AND SINTER
NO. OF SPRINGS..... 3
SPRING TEMPERATURES (C)..... 38 TO 41
DISCHARGE (L/MIN)..... MORE THAN 11
ROCK TYPES: PRECAMBRIAN METAMORPHIC ROCKS, CAMBRIAN AND ORDOVICIAN INTRUSIVE ROCKS AND OLIGOCENE
VOLCANICLASTIC ROCKS.

CHEMISTRY

SAMPLE SOURCE.... BARRETT AND PEARL, 1976 (SPRING A)
FLOW (L/MIN)..... 11
COLLECTION DATE.. 1976/04/00

TEMP(C)	SI02	CA	MG	NA	K	HCO3	CO3	SO4	CL
38	92	120	51	310	66	1180	0	120	120
F	B	PH		DEL 0(18) SO4		DEL 0(18) H2O		DEL 0 H2O	
5.8	1.1	6.4							

GEOTHERMOMETERS (C)

CATION

NA-K-CA (1/3).....	219
NA-K-CA (4/3).....	143
NA-K.....	293

SILICA

ADIABATIC.....	129
CONDUCTIVE.....	133
CHALCEDONY.....	105
CRISTOBALITE.....	82
OPAL.....	13

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	47 (J)	133 (A)	105 (D)	95	18

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4

BASED ON: STANDARD ESTIMATE AND SPRING DEPOSIT DISTRIBUTION

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J). 0.72		STD. DEV. = 0.26

COMMENTS: ANALYSIS FOR SPRING A. CO2-CHARGED WATER; GEOTHERMOMETRY MAY BE UNRELIABLE. MOST OF THERMAL ACTIVITY IN AREA PROBABLY OCCURRED DURING THE OLIGOCENE. PRESENT ACTIVITY ASSOCIATED WITH A FAULT.

REFERENCES: BARNETT AND PEARL, 1976, 1978; HEDLUND AND OLSON, 1975

COMPILED BY: MARINER, R. AND BROOK, C.

CEHOLLA (POWDERHORN) HOT SPRINGS, COLORADO

FIELD NAME..... PARADISE HOT SPRING
CIRCULAR REFERENCE..... 078

GEOGRAPHIC LOCALITY

STATE..... COLORADO
COUNTY..... DOLORES
LATITUDE..... 37-45.2 N
LONGITUDE..... 108-07.9 W
MAPS..... GROUNDHOG MOUNTAIN 1:24,000

TOWNSHIP RANGE SECTION BASE & MERIDIAN
40N 11W 06 NEW MEXICO

GENERAL INFORMATION

ELEVATION (M)..... 2745
SURFACE ACTIVITY..... HOT SPRINGS
SPRING TEMPERATURES (C)..... 40 TO 46
DISCHARGE (L/MIN)..... 114
ROCK TYPES: SANDSTONE, SHALES, AND SILTSTONE

CHEMISTRY

SAMPLE SOURCE..... BARRETT AND PEARL, 1976
FLOW (L/MIN)..... 114
COLLECTION DATE.. 1976/04/00

TEMP (C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
42	150	170	28	1900	370	697		110	3100
F	B	PH		DEL 0(18) S04	DEL 0(18) H2O	DEL 0 H2O			
3.7	4.3	6.8							

GEOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	250
NA-K-CA (4/3).....	268
NA-K.....	278
SILICA	
ADIABATIC.....	153
CONDUCTIVE.....	161
CHALCEDONY.....	137
CRISTOBALITE.....	111
OPAL.....	39

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	130	170 (J)	161 (A)	154	9

UNCORRECTED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ON: STANDARD ESTIMATE					

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J). 1.25		STD. DEV. = 0.36

COMMENTS: SALINE WATER, CHEMICAL GEOTHERMOMETERS UNRELIABLE. REPORTED TEMPERATURES ARE PROBABLY TOO HIGH.

REFERENCES: BARRETT AND PEARL, 1976, 1978

COMPILED BY: MARINER, R.

PARADISE HOT SPRING , COLORADO

FIELD NAME..... WAGON WHEEL GAP HOT SPRINGS
CIRCULAR REFERENCE..... 079

GEOGRAPHIC LOCALITY

STATE..... COLORADO
COUNTY..... MINERAL
LATITUDE..... 37-41.1 N
LONGITUDE..... 106-49.8 W
MAPS..... SPAN CITY 1:24,000

TOWNSHIP RANGE SECTION BASE & MERIDIAN
41N 01E 35 SE OF SE NEW MEXICO

GENERAL INFORMATION

WARNING FIGURE..... 2
WARNING NUMBER..... 31
ELEVATION (M)..... 2588
SURFACE ACTIVITY..... HOT SPRINGS
ASSOCIATED DEPOSITS..... FOSSIL TRAVERTINE AND SINTER
NO. OF SPRINGS..... 2
SPRING TEMPERATURES (C)..... 48 TO 57
DISCHARGE (L/MIN)..... 245
ROCK TYPES: TERTIARY TUFFS AND VOLCANICS

CHEMISTRY

SAMPLE SOURCE.... BARRETT AND PEARL, 1976 (4UR RANCH SPRING)
FLOW (L/MIN)..... 100
COLLECTION DATE.. 1976/04/00

TEMP (C)	SI02	CA	MG	NA	K	HCO3	CO3	SO4	CL
57	84	66	15	490	48	1020		200	200
F	B	PH		DEL O(18) SO4	DEL O(18) H2O	DEL D H2O			
7.6	2.6	6.7							

GEOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 188
 NA-K-CA (4/3)..... 154
 NA-K..... 181

SILICA

ADIABATIC..... 125
 CONDUCTIVE..... 128
 CHALCEDONY..... 100
 CRISTOBALITE..... 77
 OPAL..... 8

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)

MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
86 (J)	128 (A)	100 (D)	105	9

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ON: STANDARD ESTIMATE					

VOLUME (KM**3)..... 3.3 STD. DEV. = 0.9
 THERMAL ENERGY(10**18 J). 0.81 STD. DEV. = 0.24

COMMENTS: ANALYSIS FOR 40R RANCH SPRING. ASSOCIATED WITH FLUORITE DEPOSITS. GEOTHERMOMETERS MAY BE UNRELIABLE BECAUSE OF HIGH CO2 CONTENT.

REFERENCES: HARRETT AND PEARL, 1976, 1978

COMPILED BY: MARINER, R. AND BROOK, C.

WAGON WHEEL GAP HOT SPRINGS , COLORADO

FIELD NAME..... SAND DUNES SWIMMING POOL WELL
CIRCULAR REFERENCE..... 080

GEOGRAPHIC LOCALITY

STATE..... COLORADO
COUNTY..... ALAMOSA
LATITUDE..... 37-46.7 N
LONGITUDE..... 105-51.3 W
MAPS..... DEADMAN CAMP 1124,000

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
41N	10E	27 NE OF NE	NEW MEXICO

GENERAL INFORMATION

ELEVATION (M)..... 2375
SURFACE ACTIVITY..... NONE. FOUND BY DRILLING.
WELL DEPTHS (M)..... 1342
ROCK TYPES: ALLUVIUM OF SAN LUIS VALLEY
GEOPHYSICS: REGIONAL GRAVITY, REGIONAL HEAT FLOW

CHEMISTRY

SAMPLE SOURCE.... BARRETT AND PEARL, 1976
COLLECTION DATE.. 1975/08/00

TEMP (C)	SI02	CA	MG	NA	K	HCO3	CO3	SO4	CL
44	120	3.2	0.4	81	8.6	176		23	4.7
F	B	PH		DEL 0(18) SO4	DEL 0(18) H2O	DEL D H2O			
4.7	0.51	8.3							

GEOOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	187
NA-K-CA (4/3).....	140
NA-K.....	191
SILICA	
ADIABATIC.....	141
CONDUCTIVE.....	148
CHALCEDONY.....	122
CRISTOBALITE.....	97
OPAL.....	26

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	122 (D)	152 (J)	148 (A)	141	7

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	1.0	2.0	1.5		
THICKNESS (KM)	1.0	2.0	1.5		
SUBSURFACE AREA (KM**2)	1	3	2	1.5	0.2
BASED ON: STANDARD ESTIMATE				2.0	0.4

VOLUME (KM**3).....	3.0	STD. DEV. = 0.7
THERMAL ENERGY (10**18 J). 1.02		STD. DEV. = 0.26

COMMENTS: CHALCEDONY TEMPERATURE COMPARES FAVORABLY TO BOTTOM HOLE TEMPERATURE FOR MAPCO STATE WELL 16 KM TO THE SOUTHEAST. THERMAL WATERS BELIEVED TO BE FAULT CONTROLLED IN AREA OF ABOVE-NORMAL HEAT FLOW. AREA MAY BE LARGER.

REFERENCES: BARRETT AND PEARL, 1976, 1978; REITER, 1975

COMPILED BY: MARINER, R. AND BROOK, C.

SAND DUNES SWIMMING POOL WELL , COLORADO

FIELD NAME..... MAPCO STATE WELL 1-32
CIRCULAR REFERENCE..... 081

GEOGRAPHIC LOCALITY

STATE..... COLORADO
COUNTY..... ALAMOSA
LATITUDE..... 37-40.2 N
LONGITUDE..... 105-40.0 W
MAPS..... MEDANO RANCH 1124,000

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
40N	12E	32	NEW MEXICO

GENERAL INFORMATION

ELEVATION (M)..... 2375
SURFACE ACTIVITY..... NONE, FOUND BY DRILLING
NO. OF WELLS..... 1
WELL DEPTHS (M)..... 2890
MAXIMUM WELL TEMP (C)..... 128 AT DEPTH (M) 2890
ROCK TYPES: ALLUVIUM OF SAN LUIS VALLEY
GEOPHYSICS: REGIONAL GRAVITY, REGIONAL HEAT FLOW

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	90	135	128 (M)	118	10

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	2.0	3.0	2.5		
THICKNESS (KM)	0.5	1.0	1.0	0.8	0.1
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4

BASED ON: STANDARD ESTIMATE

VOLUME (KM**3).....	1.7	STD. DEV. = 0.4
THERMAL ENERGY(10**18 J).	0.46	STD. DEV. = 0.12

COMMENTS: MINIMUM AND MAXIMUM TEMPERATURES CALCULATED FOR 2 AND 3 KM DEPTHS, RESPECTIVELY, ASSUMING A CONSTANT GEOTHERMAL GRADIENT OF 45 C/KM. AREA MAY BE LARGER.

REFERENCES: BARRETT AND PEARL, 1978

COMPILED BY: MARINER, R. AND BROOK, C.

MAPCO STATE WELL 1-32 , COLORADO

FIELD NAME..... SPLASHLAND HOT WATER WELL
CIRCULAR REFERENCE..... 082

GEOGRAPHIC LOCALITY

STATE..... COLORADO
COUNTY..... ALAMOSA
LATITUDE..... 37-29.3 N
LONGITUDE..... 105-51.4 W
MAPS..... ALAMOSA EAST 1124,000

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
38N	10E	34 SE OF SE	NEW MEXICO

GENERAL INFORMATION

ELEVATION (M)..... 2375
SURFACE ACTIVITY..... NONE, FOUND BY DRILLING.
NO. OF WELLS..... 1
WELL DEPTHS (M)..... 610
ROCK TYPES: ALLUVIUM OF THESAN LUIS VALLEY
GEOPHYSICS: REGIONAL GRAVITY, REGIONAL HEAT FLOW

CHEMISTRY

SAMPLE SOURCE.... BARRETT AND PEARL, 1976
COLLECTION DATE.. 1975/08/00

TEMP(C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
40	110	4.1	0.4	72	9.9	151		29	6.4
F	B	PH		DEL 0(18) S04	DEL 0(18) H2O	DEL 0 H2O			
4.2	0.34	8.3							

GEOOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 197
 NA-K-CA (4/3)..... 137
 NA-K..... 224

SILICA

ADIABATIC..... 137
 CONDUCTIVE..... 143
 CHALCEDONY..... 116
 CRISTOBALITE..... 92
 OPAL..... 22

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)

MINIMUM
 116 (D)

MAXIMUM
 165 (J)

MOST LIKELY
 143 (A)

MEAN
 141

STD. DEV.
 10

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE

R) QUARTZ CONDUCTIVE, PH-CORRECTED

C) QUARTZ ADIABATIC

D) CHALCEDONY

E) CHALCEDONY, PH-CORRECTED

F) CRISTOBALITE

G) AMORPHOUS SILICA

H) NA-K

I) NA-K-CA

J) NA-K-CA, MG-CORRECTED

K) SULFATE GEOTHERMOMETER

L) SURFACE TEMPERATURE

M) WELL TEMPERATURE

N) MIXING MODEL

O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	1.0	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ON: STANDARD ESTIMATE					

VOLUME (KM**3)..... 3.3

THERMAL ENERGY(10**18 J). 1.14

STD. DEV. = 0.9

STD. DEV. = 0.33

COMMENTS: SYSTEM IS PROBABLY SIMILAR TO THE ONE AT SAND DUNES SWIMMING POOL.

REFERENCES: BARRETT AND PEARL, 1976, 1978

COMPILED BY: MARINER, R. AND BROOK, C.

SPLASHLAND HOT WATER WELL , COLORADO

Hawaii

FIELD NAME..... STEAMING FLATS (SULPHUR BANK) AREA
CIRCULAR REFERENCE..... 083

GEOGRAPHIC LOCALITY

STATE..... HAWAII
COUNTY..... HAWAII
LATITUDE..... 19-26.5 N
LONGITUDE..... 155-16.0 W
MAPS..... KILAUEA CRATER 1124,000

GENERAL INFORMATION

WAVING FIGURE..... 10
WAVING NUMBER..... 4
AREA OF SURFACE EXPRESSION (KM²)..... 5
ELEVATION (M)..... 1208
SURFACE ACTIVITY..... FUMARoles
SPRING TEMPERATURES (C)..... 97
ROCK TYPES: BASALT

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	100 (O)	240 (O)	150 (O)	163	29

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ON: STANDARD ESTIMATE					

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J),	1.33	STD. DEV. = 0.46

COMMENTS: SYSTEM MAY BE HOTTER AND MORE EXTENSIVE

REFERENCES: WARING, 1965; WHITE AND WARING, 1963; PETERSON, 1967; RENNER AND OTHERS, 1976

COMPILED BY: BROOK, C.

STEAMING FLATS (SULPHUR BANK) AREA, HAWAII

FIELD NAME..... KAMAILI HOMESTEADS (1955 ERUPTION) AREA
KGRA OR OTHER NAME..... EAST RIFT
CIRCULAR REFERENCE..... 084

GEOGRAPHIC LOCALITY

STATE..... HAWAII
COUNTY..... HAWAII
LATITUDE..... 19-26.5 N
LONGITUDE..... 154-57.0 W
MAPS..... PAHOA SOUTH 1:24,000

GENERAL INFORMATION

ELEVATION (M)..... 300
SURFACE ACTIVITY..... AREA OF RECENT LAVA ERUPTIONS
NO. OF WELLS..... 3
WELL DEPTHS (M)..... 56 TO 211
MAXIMUM WELL TEMP (C)..... 113 AT DEPTH (M) 211
ROCK TYPES: BASALT
GEOPHYSICS: RESISTIVITY, GRAVITY, MAGNETIC, MICROEARTHQUAKE, GROUND-NOISE

RESERVOIR PROPERTIES
SUBSURFACE TEMP (C)

MINIMUM
240

MAXIMUM
290

MOST LIKELY
290

MEAN
273

STD. DEV.
12

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE

F) CRISTOBALITE

K) SULFATE GEOTHERMOMETER

B) QUARTZ CONDUCTIVE, PH-CORRECTED

G) AMORPHOUS SILICA

L) SURFACE TEMPERATURE

C) QUARTZ ADIABATIC

H) NA-K

M) WELL TEMPERATURE

D) CHALCEDONY

I) NA-K-CA

N) MIXING MODEL

E) CHALCEDONY, PH-CORRECTED

J) NA-K-CA, MG-CORRECTED

O) RENNER AND OTHERS, 1976

DEPTH TO TOP (KM)

MINIMUM
0.7

MAXIMUM
1.5

MOST LIKELY
1.0

MEAN

STD. DEV.

THICKNESS (KM)

0.5

2.0

1.4

1.3

0.3

SUBSURFACE AREA (KM**2)

2

15

5

7.3

2.8

BASED ON: GRAVITY ANOMALY AND RESISTIVITY LOW

VOLUME (KM**3)..... 9.5

STD. DEV. = 4.3

THERMAL ENERGY(10**18 J). 6.65

STD. DEV. = 3.05

COMMENTS: LOCATED ABOUT 6 KM SOUTHWEST OF KAPOHO RESERVOIR AREA. NO SURFACE EXPRESSION. NO WATER CHEMISTRY. AREA IDENTIFIED BY GEOPHYSICAL ANOMALIES AND MAY BE SIMILAR TO KAPOHO RESERVOIR. DEPTH OF GRAVITY ANOMALY OCCURS AT 1 KM. ZONE OF LOW RESISTIVITY OCCURS BETWEEN 0.7 KM AND 2.1 KM, PROPOSED TO BE A SELF-SEALED SYSTEM.

REFERENCES: FURUMOTO, 1976; RENNER AND OTHERS, 1976

COMPILED BY: BROOK, C.

KAMAILI HOMESTEADS (1955 ERUPTION) AREA , HAWAII

FIELD NAME..... KAPOHO RESERVOIR (PUULENA AREA)
KGRA OR OTHER NAME..... WELL HGP-A
CIRCULAR REFERENCE..... 085

GEOGRAPHIC LOCALITY

STATE..... HAWAII
COUNTY..... HAWAII
LATITUDE..... 19-28.5 N
LONGITUDE..... 154-53.8 W
MAPS..... PAHOA SOUTH 1:24,000

GENERAL INFORMATION

ELEVATION (M)..... 185
SURFACE ACTIVITY..... AREA OF RECENT LAVA ERUPTIONS
NO. OF WELLS..... 2
WELL DEPTHS (M)..... 200 TO 1967
MAXIMUM WELL TEMP (C)..... 358 AT DEPTH (M) 1967
ROCK TYPES: BASALT
GEOPHYSICS: RESISTIVITY, GRAVITY, MAGNETIC, MICROEARTHQUAKE, GROUND-NOISE

CHEMISTRY

SAMPLE SOURCE.... KIHARA AND OTHERS, 1977

TEMP (C)	SI02	CA	MG	NA	K	HC03	CO3	S04	CL
146-153	420	40	1	600	123				925
F	0	PH		DEL 0(18) S04	DEL 0(18) H2O	DEL 0 H2O			
		LT 5							

GEO THERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 244
 NA-K-CA (4/3)..... 231
 NA-K..... 286

SILICA

ADIABATIC..... 214
 CONDUCTIVE..... 237
 CHALCEDONY..... 226
 CRISTOBALITE..... 191
 OPAL..... 112

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)

MINIMUM
 244 (I)

MAXIMUM
 290 (M)

MOST LIKELY
 290 (M)

MEAN
 275

STD. DEV.
 11

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE

B) QUARTZ CONDUCTIVE, PH-CORRECTED

C) QUARTZ ADIABATIC

D) CHALCEDONY

E) CHALCEDONY, PH-CORRECTED

F) CRISTOBALITE

G) AMORPHOUS SILICA

H) NA-K

I) NA-K-CA

J) NA-K-CA, MG-CORRECTED

K) SULFATE GEOTHERMOMETER

L) SURFACE TEMPERATURE

M) WELL TEMPERATURE

N) MIXING MODEL

O) RENNER AND OTHERS, 1976

DEPTH TO TOP (KM) MINIMUM
 2.2
 THICKNESS (KM) 0.5
 SUBSURFACE AREA (KM**2) 1
 BASED ON RESISTIVITY LOW

MAXIMUM
 2.5
 1.8
 3

MOST LIKELY
 2.2
 0.5
 2

MEAN
 0.9
 2.0

STD. DEV.
 0.3
 0.4

VOLUME (KM**3)..... 1.9
 THERMAL ENERGY(10**18 J). 1.31

STD. DEV. = 0.7
 STD. DEV. = 0.52

COMMENTS: TEMPERATURE CURVE INDICATES THAT THE MAXIMUM TEMPERATURE OF 358 DEG C AT 1967 M (TD) IS IN A ZONE OF CONDUCTIVE HEAT FLOW. THE CURVE IS ISOTHERMAL BETWEEN 1220 M AND 1769 M; THIS INTERVAL IS CONSIDERED AS THE RESERVOIR.

REFERENCES: FURUMOTO, 1976, 1978; KIHARA AND OTHERS, 1977; CHEN AND OTHERS, 1978

COMPILED BY: BROOK, C.

KAPOHO RESERVOIR (PUULENA AREA) , HAWAII

Idaho

FIELD NAME..... RED RIVER HOT SPRINGS
CIRCULAR REFERENCE..... 086

GEOGRAPHIC LOCALITY

STATE..... IDAHO
COUNTY..... IDAHO
LATITUDE..... 45-47.2 N
LONGITUDE..... 115-11.9 W
MAPS..... SABLE HILL 1:24,000

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
28N	10E	03 SE	BOISE

GENERAL INFORMATION

WARNING FIGURE..... 4
WARNING NUMBER..... 10
ELEVATION (M)..... 1585
SURFACE ACTIVITY..... HOT SPRINGS
ASSOCIATED DEPOSITS..... SINTER (?)
NO. OF SPRINGS..... 9
SPRING TEMPERATURES (C)..... 37 TO 55
ROCK TYPES: CRETACEOUS GRANITE

CHEMISTRY

SAMPLE SOURCE.... YOUNG AND MITCHELL, 1973
FLOW (L/MIN)..... 132
COLLECTION DATE.. 1972/08/21

TEMP(C)	SI02	CA	MG	NA	K	HC03	CO3	SO4	CL
55	76	2.7	0	81	1.6	36	36	44	4.4
F	B	PH		DEL 0(18) SO4	DEL 0(18) H2O	DEL 0 H2O			
23		8.6							

GEOTHERMOMETERS (C)

CATION

NA-K-CA (1/3).....	110
NA-K-CA (4/3).....	80
NA-K.....	50

SILICA

ADIABATIC.....	120
CONDUCTIVE.....	122
CHALCEDONY.....	94
CRISTOBALITE.....	72
OPAL.....	4

RESERVOIR PROPERTIES

SUBSURFACE TEMP (C)

MINIMUM

80 (I)

MAXIMUM

112 (B)

MOST LIKELY

83 (E)

MEAN

92

STD. DEV.

7

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE

B) QUARTZ CONDUCTIVE, PH-CORRECTED

C) QUARTZ ADIABATIC

D) CHALCEDONY

E) CHALCEDONY, PH-CORRECTED

F) CRISTOBALITE

G) AMORPHOUS SILICA

H) NA-K

I) NA-K-CA

J) NA-K-CA, MG-CORRECTED

K) SULFATE GEOTHERMOMETER

L) SURFACE TEMPERATURE

M) WELL TEMPERATURE

N) MIXING MODEL

O) RENNER AND OTHERS, 1976

DEPTH TO TOP (KM)

MINIMUM

0.5

MAXIMUM

2.0

MOST LIKELY

1.5

MEAN

1.7

STD. DEV.

0.3

THICKNESS (KM)

1.0

2.5

1.5

2.0

0.4

SUBSURFACE AREA (KM**2)

1

3

2

2.0

0.4

BASED ON: STANDARD ESTIMATE

VOLUME (KM**3)..... 3.3

STD. DEV. = 0.9

THERMAL ENERGY(10**10 J). 0.69

STD. DEV. = 0.20

COMMENTS: A VERY DILUTE, HIGH PH WATER.

REFERENCES: YOUNG AND MITCHELL, 1973

COMPILED BY: MARINER, R.

RED RIVER HOT SPRINGS , IDAHO

FIELD NAME..... RIGGINS HOT SPRINGS
CIRCULAR REFERENCE..... 087

GEOGRAPHIC LOCALITY

STATE..... IDAHO
COUNTY..... IDAHO
LATITUDE..... 45-25.0 N
LONGITUDE..... 116-10.2 W
MAPS..... RIGGINS HOT SPRINGS 1:24,000

TOWNSHIP RANGE SECTION BASE & MERIDIAN
24N 02E 14 SW OF NE OF SE BOISE

GENERAL INFORMATION

WARNING FIGURE..... 4
WARNING NUMBER..... 13
ELEVATION (M)..... 610
SURFACE ACTIVITY..... HOT SPRINGS
ASSOCIATED DEPOSITS..... TRAVERTINE
NO. OF SPRINGS..... 4
DISCHARGE (L/MIN)..... 190
ROCK TYPES: ALLUVIUM OVERLYING PALEOZOIC AND MESOZOIC GNEISSES

CHEMISTRY

SAMPLE SOURCE.... YOUNG AND MITCHELL, 1973
FLOW (L/MIN)..... 190
COLLECTION DATE.. 1972/08/01

TEMP(C)	SI02	CA	MG	NA	K	HC03	CO3	SO4	CL
42	72	6.2	0.1	160	3.4	11	25	300	8
F	B	PH		DEL 0(18) SO4	DEL 0(18) H2O	DEL 0 H2O			
2.1		8.6							

GEOOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	116
NA-K-CA (4/3).....	95
NA-K.....	54
SILICA	
ADIABATIC.....	118
CONDUCTIVE.....	120
CHALCEDONY.....	91
CRISTOBALITE.....	69
OPAL.....	1

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	91 (D)	120 (A)	95 (I)	102	6

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ON: STANDARD ESTIMATE					

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J). 0.78		STD. DEV. = 0.23

REFERENCES: YOUNG AND MITCHELL, 1973; HAMILTON, 1969

COMPILED BY: MARINER, R.

RIGGINS HOT SPRINGS , IDAHO

FIELD NAME..... KRIGBAUM HOT SPRINGS
CIRCULAR REFERENCE..... 088

GEOGRAPHIC LOCALITY

STATE..... IDAHO
COUNTY..... ADAMS
LATITUDE..... 44-58.1 N
LONGITUDE..... 116-11.4 W
MAPS..... BAKER 11250,000

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
19N	02E	22 SW OF NE	BOISE

GENERAL INFORMATION

WARNING FIGURE..... 4
WARNING NUMBER..... 17
ELEVATION (M)..... 1433
SURFACE ACTIVITY..... HOT SPRINGS
ASSOCIATED DEPOSITS..... TRAVERTINE
NO. OF SPRINGS..... 2
SPRING TEMPERATURES (C)..... 40 TO 43
DISCHARGE (L/MIN)..... 151
ROCK TYPES: CHETACEOUS GRANITE NEAR MIOCENE BASALT

CHEMISTRY

SAMPLE SOURCE.... YOUNG AND MITCHELL, 1973
FLOW (L/MIN)..... 80
COLLECTION DATE.. 1972/06/29

TEMP (C)	SI02	CA	MG	NA	K	HCO3	CO3	S04	CL
43	73	5.3	0.2	140	3.3	81	9	190	26
F	B	PH		DEL 0 (18) S04	DEL 0 (18) H2O	DEL D H2O			
2.8		8.8							

GEOOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	120
NA-K-CA (4/3).....	96
NA-K.....	61
SILICA	
ADIABATIC.....	118
CONDUCTIVE.....	120
CHALCEDONY.....	92
CRISTOBALITE.....	70
OPAL.....	2

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)

MINIMUM 92 (D)	MAXIMUM 120 (A)	MOST LIKELY 96 (I)	MEAN 103	STD. DEV. 6
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UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ON: STANDARD ESTIMATE					

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J). 0.79		STD. DEV. = 0.23

REFERENCES: YOUNG AND MITCHELL, 1973; WARING, 1965

COMPILED BY: MARINER, R.

KRIGDAUM HOT SPRINGS, IDAHO

FIELD NAME..... WHITE LICKS HOT SPRINGS
CIRCULAR REFERENCE..... 089

GEOGRAPHIC LOCALITY

STATE..... IDAHO
COUNTY..... ADAMS
LATITUDE..... 44-40.9 N
LONGITUDE..... 116-13.8 W
MAPS..... CASCADE 1162,500

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
16N	02E	33 SW OF NW	BOISE

GENERAL INFORMATION

WAKING FIGURE..... 4
WAKING NUMBER..... 19
ELEVATION (M)..... 1484
SURFACE ACTIVITY..... HOT SPRINGS
NO. OF SPRINGS..... NUMEROUS
SPRING TEMPERATURES (C)..... 63 TO 67
DISCHARGE (L/MIN)..... 115
ROCK TYPES: MIOCENE BASALT AND CRETACEOUS GRANITE

CHEMISTRY

SAMPLE SOURCE.... MARINER, R., UNPUB. DATA

TEMP (C)	SI02	CA	MG	NA	K	HC03	CO3	SO4	CL
67	105	39	LT 0.1	390	16	71		630	150
F	B	PH		DEL 0(18) SO4	DEL 0(18) H2O	DEL 0 H2O			
8.8		7.82		-4.24	-15.25				

GEOOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	144
NA-K-CA (4/3).....	118
NA-K.....	99
SILICA	
ADIABATIC.....	135
CONDUCTIVE.....	140
CHALCEDONY.....	114
CRISTOBALITE.....	89
OPAL.....	19
SULFATE	
CONDUCTIVE.....	162
ONE-STEP STEAM LOSS....	148
CONTINUOUS STEAM LOSS..	151

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	114 (D)	162 (K)	140 (A)	139	10

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5		
SUBSURFACE AREA (KM**2)	1	3	2	1.7	0.3
BASED ON: STANDARD ESTIMATE				2.0	0.4

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J). 1.11		STD. DEV. = 0.32

REFERENCES: YOUNG AND MITCHELL, 1973

COMPILED BY: BROOK, C., MARINER, R.

WHITE LICKS HOT SPRINGS , IDAHO

FIELD NAME..... VULCAN HOT SPRINGS
 KGRA OR OTHER NAME..... VULCAN HOT SPRINGS KGRA
 CIRCULAR REFERENCE..... 090

GEOGRAPHIC LOCALITY

STATE..... IDAHO
 COUNTY..... VALLEY
 LATITUDE..... 44-34.0 N
 LONGITUDE..... 115-41.5 W
 MAPS..... WARM LAKE 1162,500

TOWNSHIP 14N RANGE 06E SECTION 11 SE OF NW BASE & MERIDIAN BOISE

GENERAL INFORMATION

WAVING FIGURE..... 4
 WAVING NUMBER..... 32
 ELEVATION (M)..... 1707
 SURFACE ACTIVITY..... HOT SPRINGS
 ASSOCIATED DEPOSITS..... SINTER
 NO. OF SPRINGS..... 13
 SPRING TEMPERATURES (C)..... 84 (?) TO 87
 DISCHARGE (L/MIN)..... 1900
 ROCK TYPES: CRETACEOUS GRANITE WITH PEGMATITE VEINS

CHEMISTRY

SAMPLE SOURCE.... MARINER, R., UNPUB. DATA
 COLLECTION DATE.. 1978/05/07

TEMP(C)	S102	CA	MG	NA	K	HC03	C03	S04	CL
87	105	1.6		99	3.3	123		35	15
F	B	PH		DEL 0(18)	S04	DEL 0(18)	H2O	DEL 0	H2O
23	0.13	8.81		+3.44		-18.79			

GEOOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	138
NA-K-CA (4/3).....	122
NA-K.....	84
SILICA	
ADIABATIC.....	135
CONDUCTIVE.....	140
CHALCEDONY.....	114
CRISTOBALITE.....	89
UPAL.....	19
SULFATE	
CONDUCTIVE.....	56
ONE-STEP STEAM LOSS....	58
CONTINUOUS STEAM LOSS..	59

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	87 (L)	140 (A)	138 (I)	122	12

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
H) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5		
SUBSURFACE AREA (KM**2)	1	3	2	1.7	0.3
BASED ON: STANDARD ESTIMATE				2.0	0.4

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J). 0.96		STD. DEV. = 0.29

COMMENTS: PH-CORRECTED CHALCEDONY INDICATES 86 C; PH-CORRECTED QUARTZ 114 C. ESTIMATED AQUIFER TEMPERATURES ARE PROBABLY TOO HIGH. SO4-ISOTOPE GEOTHERMOMETER INDICATES LESS THAN THE SPRING TEMPERATURE. LOSS OF ONLY 1.6 MG/L CA WOULD HAVE INCREASED THE NA-K-CA GEOTHERMOMETER FROM 100 TO 138 C, IMPLYING POSSIBLE CALCITE PRECIPITATION IN THE SUBSURFACE.

REFERENCES: WARING, 1965; YOUNG AND MITCHELL, 1973

COMPILED BY: MARINER, R.

VULCAN HOT SPRINGS, IDAHO

FIELD NAME..... CABARTON HOT SPRINGS
CIRCULAR REFERENCE..... 091

GEOGRAPHIC LOCALITY

STATE..... IDAHO
COUNTY..... VALLEY
LATITUDE..... 44-25.0 N
LONGITUDE..... 116-01.7 W
MAPS..... SMITHS FERRY 1162,500

TOWNSHIP RANGE SECTION BASE & MERIDIAN
13N 04E 31 NE OF SW BOISE

GENERAL INFORMATION

ELEVATION (M)..... 1438
SURFACE ACTIVITY..... HOT SPRINGS
ASSOCIATED DEPOSITS..... TRAVERTINE
NO. OF SPRINGS..... NUMEROUS
SPRING TEMPERATURES (C)..... 56 TO 70.5
DISCHARGE (L/MIN)..... 265
ROCK TYPES: CRETACEOUS GRANITE

CHEMISTRY

SAMPLE SOURCE.... YOUNG AND MITCHELL, 1973
COLLECTION DATE.. 1972/08/03

TEMP(C)	SI02	CA	MG	NA	K	HCO3	CO3	SO4	CL
70.5	78	1.7	0	100	1.9	70	26	46	49
F	H	PH		DEL 0(18) SO4	DEL 0(18) H2O	DEL D H2O			
11		7.7							

GEOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	114
NA-K-CA (4/3).....	99
NA-K.....	48
SILICA	
ADIAHATIC.....	121
CONDUCTIVE.....	124
CHALCEDONY.....	96
CRISTOBALITE.....	73
OPAL.....	5

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	96 (D)	124 (A)	99 (I)	106	6

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ON: STANDARD ESTIMATE					

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**10 J). 0.82		STD. DEV. = 0.24

COMMENTS: A VERY DILUTE WATER. LOSS OF SEVERAL MG/L CALCIUM COULD BE INCREASING THE TEMPERATURE ESTIMATED FROM THE NA-K-CA GEOTHERMOMETER.

REFERENCES: YOUNG AND MITCHELL, 1973

COMPILED BY: MARINER, R.

CABARTON HOT SPRINGS, IDAHO

FIELD NAME..... BOILING SPRINGS
CIRCULAR REFERENCE..... 092

GEOGRAPHIC LOCALITY

STATE..... IDAHO
COUNTY..... VALLEY
LATITUDE..... 44-21.9 N
LONGITUDE..... 115-51.4 W
MAPS..... BOILING SPRINGS 1162,500

TOWNSHIP RANGE SECTION BASE & MERIDIAN
12N 05E 22 NW OF NW BOISE

GENERAL INFORMATION

WARNING FIGURE..... 4
WARNING NUMBER..... 38
ELEVATION (M)..... 1234
SURFACE ACTIVITY..... HOT SPRINGS
ASSOCIATED DEPOSITS..... SINTER, MINOR CARBONATE
NO. OF SPRINGS..... SEVERAL IN 3 MAIN GROUPS
SPRING TEMPERATURES (C)..... 80 TO 86
DISCHARGE (L/MIN)..... 624
ROCK TYPES: CRETACEOUS GRANITE WITH PEGMATITE VEINS

CHEMISTRY

SAMPLE SOURCE.... MARINER, R., UNPUB. DATA
COLLECTION DATE.. 1978/05/08

TEMP(C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
86	86	1.4		74	1.9	126		110	14
F	B	PH		DEL 0(18) S04		DEL 0(18) H2O		DEL D H2O	
13	0.09	8.70		+0.30		-17.76			

GEOOTHERMOMETERS (C)

CATION

NA-K-CA (1/3).....	124
NA-K-CA (4/3).....	100
NA-K.....	66

SILICA

ADIABATIC.....	126
CONDUCTIVE.....	129
CHALCEDONY.....	101
CRISTOBALITE.....	78
UPAL.....	10

SULFATE

CONDUCTIVE.....	86
ONE-STEP STEAM LOSS....	86
CONTINUOUS STEAM LOSS..	86

RESERVOIR PROPERTIES

SUBSURFACE TEMP (C)

MINIMUM

86 (L.K)

MAXIMUM

112 (B)

MOST LIKELY

100 (I)

MEAN

99

STD. DEV.

5

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE

B) QUARTZ CONDUCTIVE, PH-CORRECTED

C) QUARTZ ADIABATIC

D) CHALCEDONY

E) CHALCEDONY, PH-CORRECTED

F) CRISTOBALITE

G) AMORPHOUS SILICA

H) NA-K

I) NA-K-CA

J) NA-K-CA, MG-CORRECTED

K) SULFATE GEOTHERMOMETER

L) SURFACE TEMPERATURE

M) WELL TEMPERATURE

N) MIXING MODEL

O) RENNER AND OTHERS, 1976

DEPTH TO TOP (KM)

MINIMUM
0.5

MAXIMUM
2.0

MOST LIKELY
1.5

MEAN

STD. DEV.

THICKNESS (KM)

1.0

2.5

1.5

1.7

0.3

SUBSURFACE AREA (KM**2)

1

3

2

2.0

0.4

BASED ON: STANDARD ESTIMATE

VOLUME (KM**3)..... 3.3

STD. DEV. = 0.9

THERMAL ENERGY(10**18 J). 0.76

STD. DEV. = 0.22

COMMENTS: CHALCEDONY WITH PH-CORRECTION INDICATES 83 C. REPORTED DEPOSITION OF ZEOLITES, CALCITE, AND MERCURY MINERALS.

REFERENCES: WARING, 1965; DICKSON AND TUNELL, 1968; YOUNG AND MITCHELL, 1973

COMPILED BY: MARINER, R. BROOK, C.

BOILING SPRINGS , IDAHO

FIELD NAME..... CRANE CREEK - COVE CREEK AREA
KGRA OR OTHER NAME..... CRANE CREEK KGRA
CIRCULAR REFERENCE..... 093

GEOGRAPHIC LOCALITY

STATE..... IDAHO
COUNTY..... WASHINGTON
LATITUDE..... 44-18.3 N
LONGITUDE..... 116-44.7 W
MAPS..... CRANE CREEK RESERVOIR 1162,500

TOWNSHIP RANGE SECTION BASE & MERIDIAN
11N 03W 07 BOISE

GENERAL INFORMATION

ELEVATION (M)..... 732
SURFACE ACTIVITY..... HOT SPRINGS
ASSOCIATED DEPOSITS..... SINTER AND TRAVERTINE
NO. OF SPRINGS..... ABOUT 4 IN 2 GROUPS 11 KM APART
SPRING TEMPERATURES (C)..... 57 TO 92
DISCHARGE (L/MIN)..... 220
NO. OF WELLS..... 2
WELL DEPTHS (M)..... 550 TO 610
ROCK TYPES: TERTIARY BASALT AND FLUVIAL DEPOSITS
GEUPHYSICS: GRAVITY, MAGNETIC, AMT

CHEMISTRY

SAMPLE SOURCE.... YOUNG AND WHITEHEAD, 1975
FLOW (L/MIN)..... 17
COLLECTION DATE.. 1973/08/02

TEMP(C)	SI02	CA	MG	NA	K	HCO3	CO3	SO4	CL
92	180	29	0.5	280	18	201		250	200
F	B	PH		DEL 0(18) SO4	DEL 0(18) H2O	DEL D H2O			
		7.8		-7.99	-14.39	-150			

GEOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	163
NA-K-CA (4/3).....	126
NA-K.....	137
SILICA	
ADIABATIC.....	162
CONDUCTIVE.....	173
CHALCEDONY.....	151
CRISTOBALITE.....	123
OPAL.....	50
SULFATE	
CONDUCTIVE.....	249
ONE-STEP STEAM LOSS....	218
CONTINUOUS STEAM LOSS..	226

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	151 (D)	200	163 (I)	171	10

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	5	50	15	23.3	9.6
BASED ON: SPRING DISTRIBUTION, AREA OF ALTERATION, AMT SURVEY					

VOLUME (KM**3).....	38.9	STD. DEV. = 17.9
THERMAL ENERGY(10**18 J). 16.41		STD. DEV. = 7.65

COMMENTS: SPRINGS AT CRANE CREEK AND COVE CREEK HAVE SIMILAR CHEMISTRY AND ARE IN A ZONE OF ALTERATION AND MERCURY MINERALIZATION. SPRINGS ARE ABOUT 11 KM APART AND MAY BE SEPARATE SYSTEMS AS REFLECTED BY MINIMUM AREA ESTIMATE.

REFERENCES: YOUNG AND WHITEHEAD, 1975A; RIGHTMIRE AND OTHERS, 1976

COMPILED BY: MARINER, R., BROOK, C.

CRANE CREEK - COVE CREEK AREA , IDAHO

FIELD NAME..... WEISER AREA
CIRCULAR REFERENCE..... 094

GEOGRAPHIC LOCALITY

STATE..... IDAHO
COUNTY..... WASHINGTON
LATITUDE..... 44-17.9 N
LONGITUDE..... 117-02.9 W
MAPS..... OLDS FERRY SE 1162,500

TOWNSHIP RANGE SECTION BASE & MERIDIAN
11N 06W 10 BOISE

GENERAL INFORMATION

WAKING FIGURE..... 4
WAKING NUMBER..... 21
ELEVATION (M)..... 671
SURFACE ACTIVITY..... HOT SPRINGS
NO. OF SPRINGS..... SEVERAL
SPRING TEMPERATURES (C)..... 25 TO 77
DISCHARGE (L/MIN)..... 20
NO. OF WELLS..... 6 SHALLOW WELLS
WELL DEPTHS (M)..... 28 TO 183
MAXIMUM WELL TEMP (C)..... 77 AT DEPTH (M) 31
ROCK TYPES: PLEISTOCENE AND PLIOCENE FLUVIAL AND LAKE DEPOSITS
GEOPHYSICS: GRAVITY, MAGNETIC, AMT, GROUND TEMPERATURE

CHEMISTRY

SAMPLE SOURCE.... YOUNG AND WHITEHEAD, 1975
COLLECTION DATE.. 1972/08/02

TEMP (C)	SI02	CA	MG	NA	K	HCO3	CO3	SO4	CL
70.5	140	2.9		140	5.0	35	38	150	56
F	R	PH		DEL 0 (18) SO4		DEL 0 (18) H2O		DEL 0 H2O	
3.3		9.3				-13.4		-149	

GEOOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 142
 NA-K-CA (4/3)..... 127
 NA-K..... 89

SILICA

ADIABATIC..... 149
 CONDUCTIVE..... 157
 CHALCEDONY..... 133
 CRISTOBALITE..... 107
 OPAL..... 35

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)

MINIMUM
 90 (E)

MAXIMUM
 157 (A)

MOST LIKELY
 142 (I)

MEAN
 130

STD. DEV.
 14

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE

B) QUARTZ CONDUCTIVE, PH-CORRECTED

C) QUARTZ ADIABATIC

D) CHALCEDONY

E) CHALCEDONY, PH-CORRECTED

F) CRISTOBALITE

G) AMORPHOUS SILICA

H) NA-K

I) NA-K-CA

J) NA-K-CA, MG-CORRECTED

K) SULFATE GEOTHERMOMETER

L) SURFACE TEMPERATURE

M) WELL TEMPERATURE

N) MIXING MODEL

O) RENNER AND OTHERS, 1976

DEPTH TO TOP (KM)

MINIMUM
 0.5

MAXIMUM
 2.0

MOST LIKELY
 1.5

MEAN

STD. DEV.

THICKNESS (KM)

1.0

2.5

1.5

1.7

0.3

SUBSURFACE AREA (KM**2)

1

5

2

2.7

0.8

BASED ON: SPRING AND WELL DISTRIBUTION, GROUND TEMPERATURE ANOMALY

VOLUME (KM**3)..... 4.4

STD. DEV. = 1.7

THERMAL ENERGY(10**18 J). 1.38

STD. DEV. = 0.55

COMMENTS: SULFATE ISOTOPE GEOTHERMOMETER ON SEVERAL SAMPLES RANGE FROM 219 TO 235 C. ISOTOPIC DATA FROM RIGHTMIRE AND OTHERS (1976).

REFERENCES: YOUNG AND WHITEHEAD, 1975A; RIGHTMIRE AND OTHERS, 1976

COMPILED BY: MARINER, R., BROOK, C.

WEISER AREA , IDAHO

FIELD NAME..... ROYSTONE HOT SPRINGS
CIRCULAR REFERENCE..... 095

GEOGRAPHIC LOCALITY

STATE..... IDAHO
COUNTY..... GEM
LATITUDE..... 43-57.2 N
LONGITUDE..... 116-21.2 W
MAPS..... MONTOUR 1162,500

TOWNSHIP RANGE SECTION BASE & MERIDIAN
07N 01E 08 NE OF SE OF SE BOISE

GENERAL INFORMATION

WAKING FIGURE..... 4
WAKING NUMBER..... 66
ELEVATION (M)..... 768
SURFACE ACTIVITY..... HOT SPRINGS
NO. OF SPRINGS..... 5
SPRING TEMPERATURES (C)..... 45 TO 55
DISCHARGE (L/MIN)..... 76
ROCK TYPE: ALLUVIUM NEAR MIOCENE BASALT, OVERLYING CRETACEOUS GRANITE

CHEMISTRY

SAMPLE SOURCE.... YOUNG AND MITCHELL, 1973
FLOW (L/MIN)..... 76
COLLECTION DATE.. 1972/11/24

TEMP(C)	S102	CA	MG	NA	K	HC03	C03	S04	CL
55	120	8.7	0.6	160	7.7	187		110	62
F	B	PH		DEL 0(18) S04	DEL 0(18) H2O	DEL 0 H2O			
16		7.5							

GEOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	150
NA-K-CA (4/3).....	117
NA-K.....	112
SILICA	
ADIABATIC.....	141
CONDUCTIVE.....	148
CHALCEDONY.....	122
CRISTOBALITE.....	97
OPAL.....	26

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	122 (D)	148 (A)	135 (J)	135	5

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ON: STANDARD ESTIMATE					

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J). 1.08		STD. DEV. = 0.31

REFERENCES: YOUNG AND MITCHELL, 1973

COMPILED BY: MARINER, R.

ROYSTONE HOT SPRINGS, IDAHO

FIELD NAME..... BONNEVILLE HOT SPRINGS
CIRCULAR REFERENCE..... 096

GEOGRAPHIC LOCALITY

STATE..... IDAHO
COUNTY..... BOISE
LATITUDE..... 44-09.5 N
LONGITUDE..... 115-18.4 W
MAPS..... CHALLIS 11250,000

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
10N	10E	31 SW	BOISE

GENERAL INFORMATION

WAKING FIGURE..... 4
WAKING NUMBER..... 80
ELEVATION (M)..... 1585
SURFACE ACTIVITY..... HOT SPRINGS
ASSOCIATED DEPOSITS..... SINTER, TRAVERTINE
NO. OF SPRINGS..... 8
SPRING TEMPERATURES (C)..... 68 TO 85
DISCHARGE (L/MIN)..... 1370
ROCK TYPES: CRETACEOUS GRANITE

CHEMISTRY

SAMPLE SOURCE.... MARINER, R., UNPUB. DATA
COLLECTION DATE.. 1978/05/05

TEMP (C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
85	99	1.9		81	2.8	101		46	7.6
F	B	PH		DEL O (18) S04		DEL O (18) H2O		DEL D H2O	
17	0.06	9.32		-1.01		-18.46			

GEOTHERMOMETERS (C)

CATION

NA-K-CA (1/3).....	136
NA-K-CA (4/3).....	108
NA-K.....	86

SILICA

ADIABATIC.....	132
CONDUCTIVE.....	137
CHALCEDONY.....	110
CRISTOBALITE.....	86
OPAL.....	16

SULFATE

CONDUCTIVE.....	91
ONE-STEP STEAM LOSS....	90
CONTINUOUS STEAM LOSS..	90

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)

MINIMUM
87 (B)

MAXIMUM
136 (A,I)

MOST LIKELY
91 (K)

MEAN
105

STD. DEV.
11

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE

B) QUARTZ CONDUCTIVE, PH-CORRECTED

C) QUARTZ ADIABATIC

D) CHALCEDONY

E) CHALCEDONY, PH-CORRECTED

F) CRISTOBALITE

G) AMORPHOUS SILICA

H) NA-K

I) NA-K-CA

J) NA-K-CA, MG-CORRECTED

K) SULFATE GEOTHERMOMETER

L) SURFACE TEMPERATURE

M) WELL TEMPERATURE

N) MIXING MODEL

O) RENNER AND OTHERS, 1976

DEPTH TO TOP (KM)

MINIMUM
0.5

MAXIMUM
2.0

MOST LIKELY
1.5

MEAN

STD. DEV.

THICKNESS (KM)

1.0

2.5

1.5

1.7

0.3

SUBSURFACE AREA (KM**2)

1

3

2

2.0

0.4

BASED ON: STANDARD ESTIMATE

VOLUME (KM**3)..... 3.3

THERMAL ENERGY(10**18 J). 0.81

STD. DEV. = 0.9

STD. DEV. = 0.25

COMMENTS: CALCITE MAY BE PRECIPITATING IN THE SUBSURFACE! IF THE CALCIUM CONCENTRATION IS DOUBLED, THE NA-K-CA GEOTHERMOMETER WOULD GIVE 91 C.

REFERENCES: YOUNG AND MITCHELL, 1973; WARING, 1965

COMPILED BY: MARINER, R.

BONNEVILLE HOT SPRINGS, IDAHO

FIELD NAME..... PAYETTE RIVER AREA NEAR BANKS
CIRCULAR REFERENCE..... 097

GEOGRAPHIC LOCALITY

STATE..... IDAHO
COUNTY..... BOISE
LATITUDE..... 44-05.1 N
LONGITUDE..... 116-03.0 W
MAPS..... BANKS 1162,500

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
09N	03E	25 NE OF NW	BOISE

GENERAL INFORMATION

ELEVATION (M)..... 1158
SURFACE ACTIVITY..... HOT SPRINGS
NO. OF SPRINGS..... 1
SPRING TEMPERATURES (C)..... 78.5
DISCHARGE (L/MIN)..... 76
ROCK TYPES: CRETACEOUS GRANITE

CHEMISTRY

SAMPLE SOURCE.... MARINER, R., UNPUB. DATA
COLLECTION DATE.. 1978/05/08

TEMP(C)	SiO2	CA	MG	NA	K	HC03	C03	S04	CL
78.5	101	4.5	0.01	130	5.2	167		77	35
F	R	PH		DEL 0(18) S04	DEL 0(18) H2O	DEL 0 H2O			
12	0.25	8.03							

GEOOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 143
 NA-K-CA (4/3)..... 116
 NA-K..... 97

SILICA

ADIABATIC..... 133
 CONDUCTIVE..... 138
 CHALCEDONY..... 111
 CRISTOBALITE..... 87
 OPAL..... 17

RESERVOIR PROPERTIES

SUBSURFACE TEMP (C)

MINIMUM

111 (D)

MAXIMUM

143 (I)

MOST LIKELY

138 (A)

MEAN

131

STD. DEV.

7

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE

B) QUARTZ CONDUCTIVE, PH-CORRECTED

C) QUARTZ ADIABATIC

D) CHALCEDONY

E) CHALCEDONY, PH-CORRECTED

F) CRISTOBALITE

G) AMORPHOUS SILICA

H) NA-K

I) NA-K-CA

J) NA-K-CA, MG-CORRECTED

K) SULFATE GEOTHERMOMETER

L) SURFACE TEMPERATURE

M) WELL TEMPERATURE

N) MIXING MODEL

O) RENNER AND OTHERS, 1976

DEPTH TO TOP (KM)

MINIMUM

0.5

THICKNESS (KM)

1.0

SUBSURFACE AREA (KM**2)

1

BASED ON: STANDARD ESTIMATE

MAXIMUM

2.0

2.5

3

MOST LIKELY

1.5

1.5

2

MEAN

1.7

2.0

STD. DEV.

0.3

0.4

VOLUME (KM**3)..... 3.3

THERMAL ENERGY(10**18 J). 1.04

STD. DEV. = 0.9

STD. DEV. = 0.30

REFERENCES: YOUNG AND MITCHELL, 1973

COMPILED BY: MARINER, R., BROOK, C.

PAYETTE RIVER AREA NEAR BANKS , IDAHO

FIELD NAME..... NEINMEYER HOT SPRINGS
CIRCULAR REFERENCE..... 090

GEOGRAPHIC LOCALITY

STATE..... IDAHO
COUNTY..... ELMORE
LATITUDE..... 43-45.5 N
LONGITUDE..... 115-34.7 W
MAPS..... BARBER FLAT 1162,500

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
05N	07E	24	BOISE

GENERAL INFORMATION

WAKING FIGURE..... 4
WAKING NUMBER..... 116
ELEVATION (M)..... 1158
SURFACE ACTIVITY..... HOT SPRINGS
ASSOCIATED DEPOSITS..... SINTER
NO. OF SPRINGS..... 13
SPRING TEMPERATURES (C)..... 68 TO 76
DISCHARGE (L/MIN)..... 1320
ROCK TYPES: CRETACEOUS GRANITE

CHEMISTRY

SAMPLE SOURCE.... MARINER, R., UNPUB. DATA
COLLECTION DATE.. 1978/05/06

TEMP (C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
75	100	1.5		62	1.6	106		28	2
F	B	PH		DEL 0(18) S04		DEL 0(18) H2O		DEL 0 H2O	
10	0.03	9.35		-1.12		-18.35			

GEOOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	121
NA-K-CA (4/3).....	90
NA-K.....	66
SILICA	
ADIABATIC.....	133
CONDUCTIVE.....	137
CHALCEDONY.....	110
CRISTOBALITE.....	87
OPAL.....	17
SULFATE	
CONDUCTIVE.....	93
ONE-STEP STEAM LOSS....	91
CONTINUOUS STEAM LOSS..	91

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	90 (I)	100	93 (K)	94	2

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ON: STANDARD ESTIMATE					

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J). 0.71		STD. DEV. = 0.20

COMMENTS: PH-CORRECTED QUARTZ = 85 C. PROBABLY A DEEP CIRCULATING WATER WITH AN AQUIFER TEMPERATURE NEAR 90 C.

REFERENCES: YOUNG AND MITCHELL, 1973; WARING, 1965

COMPILED BY: MARINER, R.

NEINMEYER HOT SPRINGS , IDAHO

FIELD NAME..... LATTY HOT SPRINGS
CIRCULAR REFERENCE..... 099

GEOGRAPHIC LOCALITY

STATE..... IDAHO
COUNTY..... ELMORE
LATITUDE..... 43-07.0 N
LONGITUDE..... 115-18.3 W
MAPS..... BENNETT MTN. 1162,500

TOWNSHIP RANGE SECTION BASE & MERIDIAN
03S 10E 31 NW OF SE OF SE BOISE

GENERAL INFORMATION

ELEVATION (M)..... 1189
SURFACE ACTIVITY..... HOT SPRINGS
NO. OF SPRINGS..... 1
SPRING TEMPERATURES (C)..... 55
ROCK TYPES: PLEISTOCENE BASALTS; VITRIC TUFFS

CHEMISTRY

SAMPLE SOURCE.... YOUNG AND MITCHELL, 1973
COLLECTION DATE.. 1972/07/05

TEMP(C)	S102	CA	MG	NA	K	HC03	CO3	S04	CL
55	100	0.4		54	1.7	90	33	10	2.7
F	B	PH		DEL 0(18) S04	DEL 0(18) H2O	DEL D H2O			
7		8.4							

GEOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 137
 NA-K-CA (4/3)..... 124
 NA-K..... 80

SILICA

ADIABATIC..... 133
 CONDUCTIVE..... 137
 CHALCEDONY..... 110
 CRISTOBALITE..... 87
 OPAL..... 17

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)

MINIMUM
 110 (D)

MAXIMUM
 137 (A,I)

MOST LIKELY
 125

MEAN
 124

STD. DEV.
 6

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE

F) CRISTOBALITE

B) QUARTZ CONDUCTIVE, PH-CORRECTED

G) AMORPHOUS SILICA

C) QUARTZ ADIABATIC

H) NA-K

D) CHALCEDONY

I) NA-K-CA

E) CHALCEDONY, PH-CORRECTED

J) NA-K-CA, MG-CORRECTED

K) SULFATE GEOTHERMOMETER

L) SURFACE TEMPERATURE

M) WEILL TEMPERATURE

N) MIXING MODEL

O) RENNER AND OTHERS, 1976

DEPTH TO TOP (KM)

MINIMUM
 0.5

MAXIMUM
 2.0

MOST LIKELY
 1.5

MEAN

STD. DEV.

THICKNESS (KM)

1.0

2.5

1.5

1.7

0.3

SUBSURFACE AREA (KM**2)

1

3

2

2.0

0.4

BASED ON: STANDARD ESTIMATE

VOLUME (KM**3)..... 3.3

STD. DEV. = 0.9

THERMAL ENERGY(10**18 J). 0.98

STD. DEV. = 0.28

COMMENTS: PH-CORRECTION ON THE SILICA WOULD REDUCE THESE ESTIMATES 8 C. A VERY DILUTE WATER IN WHICH THE
 CHEMICAL GEOTHERMOMETERS MAY NOT BE VALID.

REFERENCES: YOUNG AND MITCHELL, 1973; MALDE AND OTHERS, 1963

COMPILED BY: MARINER, R.

LATTY HOT SPRINGS , IDAHO

FIELD NAME..... RADIO TOWERS AREA
CIRCULAR REFERENCE..... 100

GEOGRAPHIC LOCALITY

STATE..... IDAHO
COUNTY..... ELMORE
LATITUDE..... 43-02.2 N
LONGITUDE..... 115-27.4 W
MAPS..... BENNETT MTN. 1162,500

TOWNSHIP RANGE SECTION BASE & MERIDIAN
04S 08E 36 NE OF NW OF NW BOISE

GENERAL INFORMATION

ELEVATION (M)..... 968
SURFACE ACTIVITY..... NONE, FOUND BY DRILLING
DISCHARGE (L/MIN)..... 30
NO. OF WELLS..... 1
WELL DEPTHS (M)..... 580
ROCK TYPES: PLIOCENE AND PLEISTOCENE SEDIMENTS

CHEMISTRY

SAMPLE SOURCE.... YOUNG AND MITCHELL, 1973
FLOW (L/MIN)..... 30
COLLECTION DATE.. 1972/06/06

TEMP(C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
38	86	3.2	0.2	160	3.7	447		5.4	10
F	H	PH		DEL 0(18) S04	DEL 0(18) H2O	DEL 0 H2O			
3		7.8							

GEO THERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	124
NA-K-CA (4/3).....	114
NA-K.....	59
SILICA	
ADIABATIC.....	126
CONDUCTIVE.....	129
CHALCEDONY.....	101
CRISTOBALITE.....	78
OPAL.....	10

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	101 (D)	150	124 (I)	125	10

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
H) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ON: STANDARD ESTIMATE					

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J),	0.99	STD. DEV. = 0.29

COMMENTS: A VERY DILUTE WATER! GEOTHERMOMETERS MAY BE UNRELIABLE. GEOTHERMAL TEST WELL ABOUT 0.5 KM NORTH HAD A MAXIMUM TEMPERATURE OF 189 C AT 2.7 KM.

REFERENCES: YOUNG AND MITCHELL, 1973! RALSTON AND CHAPMAN, 1968

COMPILED BY: MARINER, R. AND BROOK, C.

RADIO TOWERS AREA , IDAHO

FIELD NAME..... GRAVEL PITS AREA
CIRCULAR REFERENCE..... 101

GEOGRAPHIC LOCALITY

STATE..... IDAHO
COUNTY..... ELMORE
LATITUDE..... 42-56.3 N
LONGITUDE..... 115-29.6 W
MAPS..... HAMMETT 1:24,000; GLENNS FERRY 1:62,500

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
05S	08E	34 SE	BOISE

GENERAL INFORMATION

ELEVATION (M)..... 762
SURFACE ACTIVITY..... NONE, FOUND BY DRILLING
ASSOCIATED DEPOSITS..... TRAVERTINE
SPRING TEMPERATURES (C)..... 34
DISCHARGE (L/MIN)..... 7.6
NO. OF WELLS..... 1
WELL DEPTHS (M)..... 403
ROCK TYPES: PLIOCENE AND PLEISTOCENE SEDIMENTS

CHEMISTRY

SAMPLE SOURCE.... YOUNG AND MITCHELL, 1973
FLOW (L/MIN)..... 8
COLLECTION DATE.. 1972/07/05

TEMP (C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
34	58	9.1	1	320	11	797		6.5	59
F 2.2	8	PH 7.7		DEL 0(18) S04	DEL 0(18) H2O	DEL D H2O			

GEO THERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 144
 NA-K-CA (4/3)..... 141
 NA-K..... 86

SILICA

ADIABATIC..... 109
 CONDUCTIVE..... 109
 CHALCEDONY..... 79
 CRISTOBALITE..... 58
 OPAL..... -8

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)

MINIMUM
 79 (D)

MAXIMUM
 120 (J)

MOST LIKELY
 109 (A)

MEAN
 103

STD. DEV.
 9

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE

B) QUARTZ CONDUCTIVE, PH-CORRECTED

C) QUARTZ ADIABATIC

D) CHALCEDONY

E) CHALCEDONY, PH-CORRECTED

F) CRISTOBALITE

G) AMORPHOUS SILICA

H) NA-K

I) NA-K-CA

J) NA-K-CA, MG-CORRECTED

K) SULFATE GEOTHERMOMETER

L) SURFACE TEMPERATURE

M) WELL TEMPERATURE

N) MIXING MODEL

O) RENNER AND OTHERS, 1976

DEPTH TO TOP (KM) MINIMUM
 THICKNESS (KM) 0.5
 SUBSURFACE AREA (KM**2) 1.0
 BASED ONI' STANDARD ESTIMATE 1

MAXIMUM
 2.0
 2.5
 3

MOST LIKELY
 1.5
 1.5
 2

MEAN
 1.7
 2.0

STD. DEV.
 0.3
 0.4

VOLUME (KM**3)..... 3.3
 THERMAL ENERGY(10**18 J). 0.79

STD. DEV. = 0.9
 STD. DEV. = 0.23

COMMENTS: CHEMICAL GEOTHERMOMETERS QUESTIONABLE BECAUSE OF THE LOW FLOW-RATE.

REFERENCES: YOUNG AND MITCHELL, 1973

COMPILED BY: MARINER, R.

GRAVEL PITS AREA, IDAHO

FIELD NAME..... BRUNEAU-GRAND VIEW AREA
KGRA OR OTHER NAME..... BRUNEAU KGRA, CASTLE CREEK KGRA
CIRCULAR REFERENCE..... 102

GEOGRAPHIC LOCALITY

STATE..... IDAHO
COUNTY..... OWYHEE
LATITUDE..... 42-56.0 N
LONGITUDE..... 115-56.0 W
MAPS..... HOT SPRINGS, JACKASS BUTTE, LITTLE VALLEY, SUGAR VALLEY, BRUNEAU, GRANDVIEW
1:24,000; BRUNEAU, GRAND VIEW, BIG FOOT BUTTE, INDIAN COVE 1:62,500

TOWNSHIP RANGE SECTION BASE & MERIDIAN
06S 04E BOISE

GENERAL INFORMATION

WARNING FIGURE..... 4
WARNING NUMBER..... 160-169
ELEVATION (M)..... 808
SURFACE ACTIVITY..... HOT SPRINGS AND WELLS
NO. OF SPRINGS..... SEVERAL
SPRING TEMPERATURES (C)..... 11 TO 41
DISCHARGE (L/MIN)..... 10,000 (COMBINED SPRING AND WELL DISCHARGE)
NO. OF WELLS..... MORE THAN 80
WELL DEPTHS (M)..... 46 TO 3000
MAXIMUM WELL TEMP (C)..... 83 AT DEPTH (M) WELL HEAD
ROCK TYPES: LACUSTRINE AND FLUVIAL TUFFACEOUS SEDIMENTS, SILICIC AND BASALTIC VOLCANIC ROCKS
GEOPHYSICS: GRAVITY, MAGNETIC, RESISTIVITY, AMT

CHEMISTRY

SAMPLE SOURCE.... YOUNG AND WHITEHEAD, 1975
COLLECTION DATE.. 1973/06/07

TEMP (C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
83	110	2.1	0	110	1.7	22	64	62	15
F	B	PH		DEL 0(18) S04	DEL 0(18) H2O	DEL 0 H2O			
15		9.3			-17.5	-146			

GEOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 106
 NA-K-CA (4/3)..... 91
 NA-K..... 36

SILICA

ADIABATIC..... 137
 CONDUCTIVE..... 143
 CHALCEDONY..... 116
 CRISTOBALITE..... 92
 OPAL..... 22

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)

MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
90 (1.E)	120	110	107	6

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.9	2.0	2.0		
THICKNESS (KM)	1.0	1.7	1.0	1.2	0.2
SUBSURFACE AREA (KM**2)	1000	2250	1200	1483.3	274.1

BASED ON: WELL DISTRIBUTION, ESTIMATE OF RENNER ET AL (1976), AND AMT SURVEY

VOLUME (KM**3).....	1829.4	STD. DEV. = 419.8
THERMAL ENERGY(10**18 J). 452.79		STD. DEV. = 108.60

COMMENTS: SEVERAL WATER WELLS 300 TO 1000 M DEEP USED FOR IRRIGATION. TWO DEEP TEST WELLS TO 3 KM. MAY BE A STACKED SYSTEM. SULFATE-ISOTOPE GEOTHERMOMETER FOR 6 SAMPLES GIVES 95 TO 131 C.

REFERENCES: YOUNG AND WHITEHEAD, 1975; RIGHTMIRE AND OTHERS, 1976; RENNER AND OTHERS, 1976

COMPILED BY: MARTIN, R. AND BROOK, C.

BRUNEAU-GRAND VIEW AREA , IDAHO

FIELD NAME..... MURPHY HOT SPRINGS
KGRA OR OTHER NAME..... KITTY'S HOT HOLE
CIRCULAR REFERENCE..... 103

GEOGRAPHIC LOCALITY

STATE..... IDAHO
COUNTY..... Owyhee
LATITUDE..... 42-01.8 N
LONGITUDE..... 115-22.0 W
MAPS..... TWIN FALLS 1:250,000

TOWNSHIP RANGE SECTION BASE & MERIDIAN
16S 09E 24 NW OF NW BOISE

GENERAL INFORMATION

WARNING FIGURE..... 4
WARNING NUMBER..... 1698
ELEVATION (M)..... 1554
SURFACE ACTIVITY..... HOT SPRINGS
NO. OF SPRINGS..... 2
ROCK TYPE(S): PLIOCENE SILICIC VOLCANIC ROCKS

CHEMISTRY

SAMPLE SOURCE.... YOUNG AND MITCHELL, 1973
FLOW (L/MIN)..... 265
COLLECTION DATE.. 1972/05/23

TEMP(C)	SiO2	CA	MG	NA	K	HCO3	CO3	SO4	CL
51	83	0.6	0	30	2	67	1	4.7	2.3
F	R	PH		DEL 0(18) SO4	DEL 0(18) H2O	DEL D H2O			
3.6		7.1							

GEOOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 160
 NA-K-CA (4/3)..... 112
 NA-K..... 141

SILICA

ADIABATIC..... 124
 CONDUCTIVE..... 127
 CHALCEDONY..... 99
 CRISTOBALITE..... 76
 UPAL..... 8

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)

MINIMUM
 51 (L)

MAXIMUM
 160 (I)

MOST LIKELY
 99 (D)

MEAN
 103

STD. DEV.
 22

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ON: STANDARD ESTIMATE					

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J). 0.79		STD. DEV. = 0.30

COMMENTS: A VERY DILUTE WATER, CHEMICAL GEOTHERMOMETERS MAY BE UNRELIABLE.

REFERENCES: YOUNG AND MITCHELL, 1973

COMPILED BY: MARINEH, R. AND BROOK, C.

MURPHY HOT SPRINGS, IDAHO

FIELD NAME..... OWL CREEK HOT SPRINGS
CIRCULAR REFERENCE..... 104

GEOGRAPHIC LOCALITY

STATE..... IDAHO
COUNTY..... LEMHI
LATITUDE..... 45-20.5 N
LONGITUDE..... 114-27.0 W
MAPS..... SHoup 1:62,500

GENERAL INFORMATION

ELEVATION (M)..... 1158
SURFACE ACTIVITY..... HOT SPRINGS
NO. OF SPRINGS..... 2
ROCK TYPES: CHETACEOUS GRANITE

CHEMISTRY

SAMPLE SOURCE.... MARINER, R., UNPUB. DATA
COLLECTION DATE.. 1978/05/04

TEMP(C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
50	89	4.4	0.04	120	5	203		53	6.4
F	B	PH		DEL 0(18) S04		DEL 0(18) H2O		DEL 0 H2O	
19	0.1	8.47							

GEOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 144
 NA-K-CA (4/3)..... 114
 NA-K..... 100

SILICA

ADIABATIC..... 127
 CONDUCTIVE..... 131
 CHALCEDONY..... 103
 CRISTOBALITE..... 80
 OPAL..... 11

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)

MINIMUM
 103 (D)

MAXIMUM
 144 (I)

MOST LIKELY
 131 (A)

MEAN
 126

STD. DEV.
 9

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE

R) QUARTZ CONDUCTIVE, PH-CORRECTED

C) QUARTZ ADIABATIC

D) CHALCEDONY

E) CHALCEDONY, PH-CORRECTED

F) CRISTOBALITE

G) AMORPHOUS SILICA

H) NA-K

I) NA-K-CA

J) NA-K-CA, MG-CORRECTED

K) SULFATE GEOTHERMOMETER

L) SURFACE TEMPERATURE

M) WELL TEMPERATURE

N) MIXING MODEL

O) RENNER AND OTHERS, 1976

DEPTH TO TOP (KM) MINIMUM
 THICKNESS (KM) 0.5
 SUBSURFACE AREA (KM**2) 1.0
 BASED ON: STANDARD ESTIMATE 3

MAXIMUM
 2.0
 2.5
 3

MOST LIKELY
 1.5
 1.5
 2

MEAN
 1.7
 2.0

STD. DEV.
 0.3
 0.4

VOLUME (KM**3)..... 3.3
 THERMAL ENERGY(10**18 J). 1.00

STD. DEV. = 0.9
 STD. DEV. = 0.29

COMMENTS: PH-CORR, QUARTZ COND. = 122 DEG. C.

REFERENCES: USGS, UNPUB. DATA

COMPILED BY: MARINER, R.

OWL CREEK HOT SPRINGS , IDAHO

FIELD NAME..... BIG CREEK HOT SPRINGS
CIRCULAR REFERENCE..... 105

GEOGRAPHIC LOCALITY

STATE..... IDAHO
COUNTY..... LEMHI
LATITUDE..... 45-18.8 N
LONGITUDE..... 114-19.2 W
MAPS..... SHOUP 1162,500

TOWNSHIP RANGE SECTION
23N 18E 22 SW

BASE & MERIDIAN
BOISE

GENERAL INFORMATION

WARNING FIGURE..... 4
WARNING NUMBER..... 52
ELEVATION (M)..... 1698
SURFACE ACTIVITY..... HOT SPRINGS
ASSOCIATED DEPOSITS..... SINTER AND TRAVERTINE
NO. OF SPRINGS..... 15
SPRING TEMPERATURES (C)..... 82 TO 93
DISCHARGE (L/MIN)..... 284
ROCK TYPES: CRETACEOUS GRANITE

CHEMISTRY

SAMPLE SOURCE.... MARINER, R., UNPUB, DATA
COLLECTION DATE.. 1978/05/04

TEMP (C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
93	140	5.0	0.2	230	16	478		47	29
F	B	PH		DEL O (18) S04		DEL O (18) H2O		DEL D H2O	
16	0.5	7.45		-4.19		-19.94			

GEO THERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	179
NA-K-CA (4/3).....	173
NA-K.....	145
SILICA	
ADIABATIC.....	149
CONDUCTIVE.....	157
CHALCEDONY.....	133
CRISTOBALITE.....	107
OPAL.....	35
SULFATE	
CONDUCTIVE.....	106
ONE-STEP STEAM LOSS....	105
CONTINUOUS STEAM LOSS..	105

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	149 (C)	179 (I)	157 (A)	162	6

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ON: STANDARD ESTIMATE					

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J),	1.32	STD. DEV. = 0.37

COMMENTS: SULFATE-ISOTOPE GEOTHERMOMETER INDICATES 105 DEG. C PERHAPS DUE TO OXIDATION OF SULFIDE TO SULFATE PRIOR TO SAMPLE COLLECTION.

REFERENCES: YOUNG AND MITCHELL, 1973; USGS, UNPUB. DATA

COMPILED BY: BROOK, C. AND MARINER, R.

BIG CREEK HOT SPRINGS , IDAHO

FIELD NAME..... SHARKEY HOT SPRINGS
CIRCULAR REFERENCE..... 106

GEOGRAPHIC LOCALITY

STATE..... IDAHO
COUNTY..... LEMHI
LATITUDE..... 45-00.8 N
LONGITUDE..... 113-36.3 W
MAPS..... GOLDSTONE MTN, 1162,500

TOWNSHIP RANGE SECTION BASE & MERIDIAN
20N 24E 34 BOISE

GENERAL INFORMATION

WAKING FIGURE..... 7
WAKING NUMBER..... 60
ELEVATION (M)..... 1692
SURFACE ACTIVITY..... HOT SPRINGS
ASSOCIATED DEPOSITS..... TRAVERTINE
SPRING TEMPERATURES (C)..... 63
DISCHARGE (L/MIN)..... 30
ROCK TYPES: OLIGOCENE SILICIC VOLCANIC ROCKS

CHEMISTRY

SAMPLE SOURCE.... MARINER, R., UNPUB. DATA
COLLECTION DATE.. 1978/05/05

TEMP(C)	SI02	CA	MG	NA	K	HCO3	CO3	SO4	CL
63	94	5.7	0.36	290	16	472		155	53
F	H	PH		DEL O(18) S04		DEL O(18) H2O		DEL D H2O	
11	1.6	8.16		-3.59		-19.79			

GEOOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	170
NA-K-CA (4/3).....	172
NA-K.....	124
SILICA	
ADIABATIC.....	130
CONDUCTIVE.....	134
CHALCEDONY.....	107
CRISTOBALITE.....	83
OPAL.....	14
SULFATE	
CONDUCTIVE.....	102
ONE-STEP STEAM LOSS....	98
CONTINUOUS STEAM LOSS..	98

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	102 (K)	134 (A)	107 (D)	114	7

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ON: STANDARD ESTIMATE					

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J). 0.89		STD. DEV. = 0.26

COMMENTS: MG-CORRECTED NA-K-CA GEOTHERMOMETER GIVES 160 C. SPRING APPEARS TO BE DEPOSITING TRAVERTINE!
NA-K-CA GEOTHERMOMETER PROBABLY UNRELIABLE.

REFERENCES: YOUNG AND MITCHELL, 1973

COMPILED BY: BROOK, C. AND MARINER, R.

SHARKEY HOT SPRINGS , IDAHO

FIELD NAME..... SUNBEAM HOT SPRINGS
CIRCULAR REFERENCE..... 107

GEOGRAPHIC LOCALITY

STATE..... IDAHO
COUNTY..... CUSTER
LATITUDE..... 44-16.1 N
LONGITUDE..... 114-44.9 W
MAPS..... SUNBEAM 1162,500

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
11N	15E	19 SW	BOISE

GENERAL INFORMATION

WARNING FIGURE..... 4
WARNING NUMBER..... 93
ELEVATION (M)..... 1823
SURFACE ACTIVITY..... HOT SPRINGS
ASSOCIATED DEPOSITS..... TRAVERTINE AND SINTER
NO. OF SPRINGS..... NUMEROUS
SPRING TEMPERATURES (C)..... 65 TO 76
DISCHARGE (L/MIN)..... 1678
ROCK TYPES: CRETACEOUS GRANITE

CHEMISTRY

SAMPLE SOURCE.... MARINER, R., UNPUB. DATA
COLLECTION DATE.. 1978/05/05

TEMP (C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
76	88	1.5		89	2.2	130		35	10
F	B	PH		DEL 0(18) S04	DEL 0(18) H2O	DEL 0 H2O			
15	0.19	8.75							

GEOOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 124
 NA-K-CA (4/3)..... 106
 NA-K..... 64

SILICA

ADIABATIC..... 127
 CONDUCTIVE..... 130
 CHALCEDONY..... 103
 CRISTOBALITE..... 80
 OPAL..... 11

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)

MINIMUM 81 (E)	MAXIMUM 130 (A)	MOST LIKELY 124 (I)	MEAN 112	STD. DEV. 11
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UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5		
SUBSURFACE AREA (KM**2)	1	3	2	1.7	0.3
BASED ON: STANDARD ESTIMATE				2.0	0.4

VOLUME (KM**3)..... 3.3
 THERMAL ENERGY(10**18 J). 0.87

STD. DEV. = 0.9
 STD. DEV. = 0.26

COMMENTS: PH CORR. QUARTZ = 110 DEG. C. IF 1.5 MG/L CA LOST THEN NA-K-CA REDUCED TO 89 DEG C, SUGGESTING THAT CALCITE MAY BE PRECIPITATING IN THE SUBSURFACE,

REFERENCES: YOUNG AND MITCHELL, 1973; CHOATE, 1962

COMPILED BY: MARINER, R.

SUNBEAM HOT SPRINGS , IDAHO

FIELD NAME..... SLATE CREEK HOT SPRINGS
CIRCULAR REFERENCE..... 108

GEOGRAPHIC LOCALITY

STATE..... IDAHO
COUNTY..... CUSTER
LATITUDE..... 44-10.1 N
LONGITUDE..... 114-37.4 W
MAPS..... LIVINGSTON CREEK 1162,500

TOWNSHIP RANGE SECTION BASE & MERIDIAN
10N 16E 30 NE BOISE

GENERAL INFORMATION

WARNING FIGURE..... 4
WARNING NUMBER..... 99
ELEVATION (M)..... 2146
SURFACE ACTIVITY..... HOT SPRINGS
ASSOCIATED DEPOSITS..... TRAVERTINE
NO. OF SPRINGS..... 8
SPRING TEMPERATURES (C)..... 32 TO 50
DISCHARGE (L/MIN)..... 700
ROCK TYPES: PALEOZOIC ARGILLITE

CHEMISTRY

SAMPLE SOURCE.... YOUNG AND MITCHELL, 1973
COLLECTION DATE.. 1972/07/11

TEMP(C)	SI02	CA	MG	NA	K	HC03	CO3	S04	CL
50	86	0.1	0.1	83	4.5	110		110	7
F	H	PH		DEL 0(18) S04	DEL 0(18) H2O	DEL D H2O			
8.7		8.00							

GEOOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 145
 NA-K-CA (4/3)..... 90
 NA-K..... 122

SILICA

ADIABATIC..... 126
 CONDUCTIVE..... 129
 CHALCEDONY..... 101
 CRISTOBALITE..... 78
 OPAL..... 10

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)

MINIMUM
 90 (I)

MAXIMUM
 129 (A)

MOST LIKELY
 101 (D)

MEAN
 107

STD. DEV.
 8

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE

B) QUARTZ CONDUCTIVE, PH-CORRECTED

C) QUARTZ ADIABATIC

D) CHALCEDONY

E) CHALCEDONY, PH-CORRECTED

F) CRISTOBALITE

G) AMORPHOUS SILICA

H) NA-K

I) NA-K-CA

J) NA-K-CA, MG-CORRECTED

K) SULFATE GEOTHERMOMETER

L) SURFACE TEMPERATURE

M) WELL TEMPERATURE

N) MIXING MODEL

O) RENNER AND OTHERS, 1976

DEPTH TO TOP (KM)

MINIMUM
 0.5

MAXIMUM
 2.0

MOST LIKELY
 1.5

MEAN

STD. DEV.

THICKNESS (KM)

1.0

2.5

1.5

1.7

0.3

SUBSURFACE AREA (KM**2)

1

3

2

2.0

0.4

BASED ON: STANDARD ESTIMATE

VOLUME (KM**3)..... 3.3

THERMAL ENERGY(10**18 J), 0.82

STD. DEV. = 0.9

STD. DEV. = 0.24

REFERENCES: YOUNG AND MITCHELL, 1973

COMPILED BY: MARINER, R.

SLATE CREEK HOT SPRINGS , IDAHO

FIELD NAME..... MAGIC RESERVOIR AREA
KGRA OR OTHER NAME..... LAVA CREEK HOT SPRING
CIRCULAR REFERENCE..... 109

GEOGRAPHIC LOCALITY

STATE..... IDAHO
COUNTY..... BLAINE
LATITUDE..... 43-19.7 N
LONGITUDE..... 114-23.9 W
MAPS..... BELLEVUE 1162,500

TOWNSHIP RANGE SECTION BASE & MERIDIAN
01S 17E 23 NE OF NE BOISE

GENERAL INFORMATION

WARNING FIGURE..... 4
WARNING NUMBER..... 146
ELEVATION (M)..... 1465
SURFACE ACTIVITY..... FLOWING WELL
ASSOCIATED DEPOSITS..... TRAVERTINE
NO. OF SPRINGS..... NONE
DISCHARGE (L/MIN)..... 20
NO. OF WELLS..... 1
WELL DEPTHS (M)..... 79
ROCK TYPES: TERTIARY RHYOLITIC TUFFS

CHEMISTRY

SAMPLE SOURCE.... MITCHELL, 1976
FLOW (L/MIN)..... 20

TEMP(C)	SI02	CA	MG	NA	K	HCO3	CO3	S04	CL
72	105	20	0.1	321	23	735	0	52	85
F	H	PH		DEL 0(18) S04		DEL 0(18) H2O		DEL D H2O	
		6.9		-7.85		-16.97			

GEOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	174
NA-K-CA (4/3).....	151
NA-K.....	148
SILICA	
ADIABATIC.....	135
CONDUCTIVE.....	140
CHALCEDONY.....	114
CRISTOBALITE.....	89
OPAL.....	19
SULFATE	
CONDUCTIVE.....	192
ONE-STEP STEAM LOSS....	172
CONTINUOUS STEAM LOSS..	177

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	114 (D)	192 (K)	140 (A)	149	16

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5		
SUBSURFACE AREA (KM**2)	1	3	2	1.7	0.3
BASED ON: STANDARD ESTIMATE				2.0	0.4

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J). 1.20		STD. DEV. = 0.37

COMMENTS: ISOTOPES FROM R. MARINER, UNPUB. DATA.

REFERENCES: MITCHELL, 1976; YOUNG AND MITCHELL, 1973

COMPILED BY: MARINER, R. AND BROOK, C.

MAGIC RESERVOIR AREA, IDAHO

FIELD NAME..... WORSWICK (WASEWICK) HOT SPRINGS
CIRCULAR REFERENCE..... 110

GEOGRAPHIC LOCALITY

STATE..... IDAHO
COUNTY..... CAMAS
LATITUDE..... 43-33.5 N
LONGITUDE..... 114-47.2 W
MAPS..... SYDNEY BUTTE 1124,000

TOWNSHIP RANGE SECTION BASE & MERIDIAN
03N 14E 28 NE OF SW BOISE

GENERAL INFORMATION

WAVING FIGURE..... 4
WAVING NUMBER..... 136
ELEVATION (M)..... 1814
SURFACE ACTIVITY..... HOT SPRINGS
ASSOCIATED DEPOSITS..... SINTER, TRAVERTINE
NO. OF SPRINGS..... SEVERAL
SPRING TEMPERATURES (C)..... 50 TO 81
DISCHARGE (L/MIN)..... 1764
ROCK TYPES: CRETACEOUS GRANITE

CHEMISTRY

SAMPLE SOURCE.... YOUNG AND MITCHELL, 1973
FLOW (L/MIN)..... 1764
COLLECTION DATE.. 1972/07/10

TEMP(C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
81	96	1.8	0	69	1.9	51	28	35	5
F	B	PH		DEL 0(18) S04	DEL 0(18) H2O	DEL 0 H2O			
15		7.3							

GEOOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	124
NA-K-CA (4/3).....	93
NA-K.....	71
SILICA	
ADIABATIC.....	131
CONDUCTIVE.....	135
CHALCEDONY.....	108
CRISTOBALITE.....	84
UPAL.....	15

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	81 (L)	107 (D)	93 (I)	94	5

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5		
SUBSURFACE AREA (KM**2)	1	3	2	1.7	0.3
BASED ON: STANDARD ESTIMATE				2.0	0.4

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J). 0.71		STD. DEV. = 0.20

REFERENCES: WARING, 1965; YOUNG AND MITCHELL, 1973

COMPILED BY: BROOK, C. AND MARINER, R.

WORSWICK (WASEWICK) HOT SPRINGS, IDAHO

FIELD NAME..... WARDROP HOT SPRINGS
KGRA OR OTHER NAME..... HOT SPRINGS RANCH
CIRCULAR REFERENCE..... 111

GEOGRAPHIC LOCALITY

STATE..... IDAHO
COUNTY..... CAMAS
LATITUDE..... 43-23.0 N
LONGITUDE..... 114-55.9 W
MAPS..... FAIRFIELD 1162,500

TOWNSHIP RANGE SECTION BASE & MERIDIAN
01N 13E 32 NW OF SW BOISE

GENERAL INFORMATION

WAVING FIGURE..... 4
WAVING NUMBER..... 137
ELEVATION (M)..... 1573
SURFACE ACTIVITY..... HOT SPRINGS
NO. OF SPRINGS..... SEVERAL
DISCHARGE (L/MIN)..... 730
ROCK TYPES: ALLUVIUM OVERLYING CRETACEOUS GRANITE

CHEMISTRY

SAMPLE SOURCE.... MITCHELL, 1976
FLOW (L/MIN)..... 95

TEMP(C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
67	78	1	0	56	2	58	30	12	5.7
F	B	PH		DEL 0(18) S04	DEL 0(18) H2O	DEL 0 H2O			
		9.2							

GEOOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 136
 NA-K-CA (4/3)..... 107
 NA-K..... 89

SILICA

ADIABATIC..... 121
 CONDUCTIVE..... 124
 CHALCEDONY..... 96
 CRISTOBALITE..... 73
 OPAL..... 5

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)

MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
67 (L)	136 (I)	89 (R)	97	14

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
H) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4

BASED ON: STANDARD ESTIMATE

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J).	0.74	STD. DEV. = 0.25

COMMENTS: A VERY DILUTE WATER IN WHICH SMALL CHANGES IN CA OR K COULD HAVE A PRONOUNCED EFFECT ON THE NA-K-CA GEOTHERMOMETER.

REFERENCES: MITCHELL, 1976A; YOUNG AND MITCHELL, 1973

COMPILED BY: MARINER, R. AND BROOK, C.

WARDROP HOT SPRINGS , IDAHO

FIELD NAME..... BARRON'S HOT SPRINGS
CIRCULAR REFERENCE..... 112

GEOGRAPHIC LOCALITY

STATE..... IDAHO
COUNTY..... CAMAS
LATITUDE..... 43-17.5 N
LONGITUDE..... 114-54.4 W
MAPS..... FAIRFIELD 1162,500

TOWNSHIP RANGE SECTION BASE & MERIDIAN
01S 13E 34 NE OF NW BOISE

GENERAL INFORMATION

ELEVATION (M)..... 1541
SURFACE ACTIVITY..... HOT SPRINGS
ASSOCIATED DEPOSITS..... TRAVERTINE
NO. OF SPRINGS..... SEVERAL
SPRING TEMPERATURES (C)..... 62 TO 73
DISCHARGE (L/MIN)..... 117
NO. OF WELLS..... 1
ROCK TYPES: ALLUVIUM OVERLYING QUATERNARY BASALT

CHEMISTRY

SAMPLE SOURCE.... MITCHELL, 1976
FLOW (L/MIN)..... 40

TEMP (C)	SI02	CA	MG	NA	K	HCO3	CO3	SO4	CL
70	77	3.6	0.1	99	2.5	226	0	13	15
F	R	PH 7.3		DEL 0(18) SO4	DEL 0(18) H2O	DEL D H2O			

GEOOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	121
NA-K-CA (4/3).....	91
NA-K.....	65
SILICA	
ADIABATIC.....	121
CONDUCTIVE.....	123
CHALCEDONY.....	95
CRISTOBALITE.....	72
OPAL.....	4

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	90 (I)	123 (A)	95 (D)	103	7

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ON: STANDARD ESTIMATE					

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J).	0.79	STD. DEV. = 0.23

REFERENCES: MITCHELL, 1976A; YOUNG AND MITCHELL, 1973

COMPILED BY: BROOK, C. AND MARINER, R.

BARRON'S HOT SPRINGS, IDAHO

FIELD NAME..... WHITE ARROW HOT SPRINGS
CIRCULAR REFERENCE..... 113

GEOGRAPHIC LOCALITY

STATE..... IDAHO
COUNTY..... GOODING
LATITUDE..... 43-02.9 N
LONGITUDE..... 114-57.2 W
MAPS..... DAVIS MTN. 1162,500

TOWNSHIP RANGE SECTION BASE & MERIDIAN
04S 13E 30 SE OF NE BOISE

GENERAL INFORMATION

WARNING FIGURE..... 4
WARNING NUMBER..... 170, 172
ELEVATION (M)..... 1013
SURFACE ACTIVITY..... HOT SPRINGS
ASSOCIATED DEPOSITS..... TRAVERTINE
NO. OF SPRINGS..... 4
SPRING TEMPERATURES (C)..... 65
DISCHARGE (L/MIN)..... 3122
NO. OF WELLS..... 1
WELL DEPTHS (M)..... 49
ROCK TYPES: ALLUVIUM NEAR PLIOCENE BASALT

CHEMISTRY

SAMPLE SOURCE.... YOUNG AND MITCHELL, 1973
FLOW (L/MIN)..... 3126
COLLECTION DATE.. 1972/05/26

TEMP(C)	SI02	CA	MG	NA	K	HCO3	CO3	SO4	CL
65	97	1.2	0	91	1.6	141	22	15	6.6
F	B	PH		DEL 0(18) SO4		DEL 0(18) H2O		DEL D H2O	
12		7.5							

GEOOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	112
NA-K-CA (4/3).....	100
NA-K.....	43
SILICA	
ADIABATIC.....	131
CONDUCTIVE.....	136
CHALCEDONY.....	109
CRISTOBALITE.....	85
OPAL.....	15

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	100 (I)	109 (D)	100 (I)	103	2

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	2.5	5	3	3.5	0.5

BASED ON: SPRING AND WELL DISTRIBUTION

VOLUME (KM**3).....	5.8	STD. DEV. = 1.4
THERMAL ENERGY(10**18 J),	1.39	STD. DEV. = 0.34

COMMENTS: AREA INCLUDES 49 M DEEP WELL AT CHALK MINE ABOUT 2 KM TO THE EAST. OTHER THERMAL SPRINGS AND WELLS ARE IN THE VICINITY.

REFERENCES: YOUNG AND MITCHELL, 1973; WARING, 1965; STEARNS AND OTHERS, 1938

COMPILED BY: BROOK, C.

WHITE ARROW HOT SPRINGS , IDAHO

FIELD NAME..... BANBURY AREA
CIRCULAR REFERENCE..... 114

GEOGRAPHIC LOCALITY

STATE..... IDAHO
COUNTY..... TWIN FALLS
LATITUDE..... 42-41.4 N
LONGITUDE..... 114-50.0 W
MAPS..... THOUSAND SPRINGS 1124,000

TOWNSHIP RANGE SECTION BASE & MERIDIAN
08S 14E 30-33 BOISE

GENERAL INFORMATION

WARNING FIGURE..... 4
WARNING NUMBER..... 173-175
ELEVATION (M)..... 890
SURFACE ACTIVITY..... HOT SPRINGS
ASSOCIATED DEPOSITS..... TRAVERTINE
NO. OF SPRINGS..... SEVERAL
SPRING TEMPERATURES (C)..... 52 TO 59
DISCHARGE (L/MIN)..... 1550
ROCK TYPES: PLEISTOCENE AND PLIOCENE SEDIMENTS OVERLYING PLIOCENE AND OLDER SILICIC AND BASALTIC VOLCANICS

CHEMISTRY

SAMPLE SOURCE.... YOUNG AND MITCHELL, 1973
COLLECTION DATE.. 1972/05/24

TEMP (C)	SI02	CA	MG	NA	K	HCO3	CO3	SO4	CL
59	97	1.1	0	100	1.5	88	38	26	27
F	H	PH		DEL 0 (18) SO4	DEL 0 (18) H2O			DEL 0 H2O	
15		8.5							

GEOOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 108
 NA-K-CA (4/3)..... 101
 NA-K..... 35

SILICA

ADIABATIC..... 131
 CONDUCTIVE..... 136
 CHALCEDONY..... 109
 CRISTOBALITE..... 85
 OPAL..... 15

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)

MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
108 (I.D)	136 (A)	108 (I)	117	7

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	7	25	16	16.0	3.7

BASED ON: SPRING DISTRIBUTION

VOLUME (KM**3)..... 26.7 STD. DEV. = 8.0
 THERMAL ENERGY(10**18 J). 7.37 STD. DEV. = 2.26

COMMENTS: A VERY DILUTE, HIGH PH WATER. AREA INCLUDES BANBURY AND MIRACLE HOT SPRINGS, AND DEEP CREEK AND SALMON FALLS CREEK AREAS. ANALYSIS FOR MIRACLE HOT SPRINGS.

REFERENCES: YOUNG AND MITCHELL, 1973; STEARNS AND OTHERS, 1938

COMPILED BY: MARINER, R. AND BROOK, C.

BANBURY AREA, IDAHO

FIELD NAME..... RAFT RIVER AREA
KGRA OR OTHER NAME..... RAFT RIVER KGRA
CIRCULAR REFERENCE..... 115

GEOGRAPHIC LOCALITY

STATE..... IDAHO
COUNTY..... CASSIA
LATITUDE..... 42-06.1 N
LONGITUDE..... 113-22.8 W
MAPS..... CHOKECHERRY 1:24,000

TOWNSHIP RANGE SECTION BASE & MERIDIAN
15S 26E 23-25 BOISE

GENERAL INFORMATION

WAKING FIGURE..... 4
WAKING NUMBER..... 184
ELEVATION (M)..... 1478
SURFACE ACTIVITY..... HOT WELLS, WARM SEEPS
ASSOCIATED DEPOSITS..... TRAVERTINE
NO. OF WELLS..... 4 DEEP TEST WELLS
WELL DEPTHS (M)..... 866 TO 1996
MAXIMUM WELL TEMP (C)..... 147 AT DEPTH (M) 785
ROCK TYPES: ALLUVIUM OVERLYING TERTIARY TUFFACEOUS SEDIMENTS AND SILICIC VOLCANIC ROCKS
GEOPHYSICS: GRAVITY, MAGNETIC, RESISTIVITY, AMT, SP, SEISMIC REFRACTION

CHEMISTRY

SAMPLE SOURCE.... STOKER, R., PERSONAL COMMUNICATION, 1978; KUNZE, 1977, P.30

TEMP (C)	S102	CA	MG	NA	K	HC03	CO3	S04	CL
	158	193	0.6	1185	97.2	54		53.3	2170
F	B	PH		DEL 0 (18) S04	DEL 0 (18) H2O	DEL 0 H2O			
				-4.34	-17.42				

GEO THERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	184
NA-K-CA (4/3).....	169
NA-K.....	162
SILICA	
ADIABATIC.....	155
CONDUCTIVE.....	164
CHALCEDONY.....	141
CRISTOBALITE.....	114
UPAL.....	42
SULFATE	
CONDUCTIVE.....	135
ONE-STEP STEAM LOSS....	131
CONTINUOUS STEAM LOSS..	131

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	135 (K)	164 (A)	147 (M)	149	6

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	1.1	1.3	1.3		
THICKNESS (KM)	1.0	1.7	1.0	1.2	0.2
SUBSURFACE AREA (KM**2)	5	30	15	16.7	5.1

BASED ON: WELL DISTRIBUTION; GEOLOGY AND GEOPHYSICS

VOLUME (KM**3).....	20.6	STD. DEV. = 7.0
THERMAL ENERGY(10**18 J). 7.42		STD. DEV. = 2.54

COMMENTS: CHEMICAL ANALYSIS IS THE MEAN OF SEVERAL SAMPLES FROM WELL RRGE-3; ISOTOPIC DATA FROM WELL RRGE-2. TWO SHALLOW WELLS (126 AND 165 M) HAVE SURFACE TEMPERATURES OF 93 AND 90 C, RESPECTIVELY. PRODUCING ZONES FOR DEEP TEST WELLS OCCUR BETWEEN 1144 AND 1830 M WITH AVERAGE EFFECTIVE PERMEABLE PRODUCING THICKNESS OF ABOUT 183 M. STABILIZED RESERVOIR TEMPERATURE 147-149 C.

REFERENCES: WILLIAMS AND OTHERS, 1976; KUNZE, 1977; KUNZE AND OTHERS, 1977; YOUNG AND MITCHELL, 1973

COMPILED BY: BROOK, C. AND MARINER, R.

RAFT RIVER AREA , IDAHO

FIELD NAME..... ASHTON WARM SPRINGS
CIRCULAR REFERENCE..... 116

GEOGRAPHIC LOCALITY

STATE..... IDAHO
COUNTY..... FREMONT
LATITUDE..... 44-05.7 N
LONGITUDE..... 111-27.5 W
MAPS..... ASHTON 1124,000

TOWNSHIP RANGE SECTION BASE & MERIDIAN
09N 42E 23 NW OF NE OF SE HOISE

GENERAL INFORMATION

ELEVATION (M)..... 1582
SURFACE ACTIVITY..... HOT SPRINGS
ROCK TYPES: PLEISTOCENE BASALT

CHEMISTRY

SAMPLE SOURCE.... YOUNG AND MITCHELL, 1973
FLOW (L/MIN)..... 8
COLLECTION DATE.. 1972/08/28

TEMP (C)	SI02	CA	MG	NA	K	HC03	CO3	SO4	CL
41	110	1.1	0.1	36	1.6	92		4.7	2.9
F	H	PH		DEL 0(18) SO4	DEL 0(18) H2O	DEL 0 H2O			
2.2		7.6							

GEOTHERMOMETERS (C)

CATION

NA-K-CA (1/3).....	139
NA-K-CA (4/3).....	91
NA-K.....	105

SILICA

ADIABATIC.....	137
CONDUCTIVE.....	143
CHALCEDONY.....	116
CRISTOBALITE.....	92
OPAL.....	22

RESERVOIR PROPERTIES

SUBSURFACE TEMP (C)

MINIMUM

41 (L)

MAXIMUM

143 (A)

MOST LIKELY

91 (I)

MEAN

92

STD. DEV.

21

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE

F) CRISTOBALITE

K) SULFATE GEOTHERMOMETER

B) QUARTZ CONDUCTIVE, PH-CORRECTED

G) AMORPHOUS SILICA

L) SURFACE TEMPERATURE

C) QUARTZ ADIABATIC

H) NA-K

M) WELL TEMPERATURE

D) CHALCEDONY

I) NA-K-CA

N) MIXING MODEL

E) CHALCEDONY, PH-CORRECTED

J) NA-K-CA, MG-CORRECTED

O) RENNER AND OTHERS, 1976

DEPTH TO TOP (KM)

MINIMUM

0.5

MAXIMUM

2.0

MOST LIKELY

1.5

MEAN

1.7

STD. DEV.

0.3

THICKNESS (KM)

1.0

2.5

1.5

2.0

0.4

SUBSURFACE AREA (KM**2)

1

3

2

2.0

0.4

BASED ON: STANDARD ESTIMATE

VOLUME (KM**3)..... 3.3

STD. DEV. = 0.9

THERMAL ENERGY(10**18 J). 0.69

STD. DEV. = 0.27

COMMENTS: LOW FLOW RATE; VERY DILUTE WATER; CHEMICAL GEOTHERMOMETERS MAY BE UNRELIABLE.

REFERENCES: YOUNG AND MITCHELL, 1973; STEARNS AND OTHERS, 1939

COMPILED BY: MARINER, R.

ASHTON WARM SPRINGS , IDAHO

FIELD NAME..... NEWDALE AREA
CIRCULAR REFERENCE..... 117

GEOGRAPHIC LOCALITY

STATE..... IDAHO
COUNTY..... FREMONT
LATITUDE..... 43-53.2 N
LONGITUDE..... 111-35.4 W
MAPS..... NEWDALE 1124,000

TOWNSHIP RANGE SECTION BASE & MERIDIAN
07N 41E 35 SE OF SE OF SW BOISE

GENERAL INFORMATION

ELEVATION (M)..... 1564
SURFACE ACTIVITY..... NONE, FOUND BY DRILLING
NO. OF WELLS..... SEVERAL
ROCK TYPES: TERTIARY SILICIC VOLCANIC ROCKS(?)

CHEMISTRY

SAMPLE SOURCE.... YOUNG AND MITCHELL, 1973
COLLECTION DATE.. 1972/08/09

TEMP(C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
36	75	28	6.3	78	8.6	240		33	24
F	B	PH		DEL 0(18) S04	DEL 0(18) H2O	DEL D H2O			
5.4		7.9							

GEOOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 169
 NA-K-CA (4/3)..... 84
 NA-K..... 195

SILICA

ADIABATIC..... 120
 CONDUCTIVE..... 122
 CHALCEDONY..... 93
 CRISTOBALITE..... 71
 OPAL..... 3

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)

MINIMUM
 84 (I)

MAXIMUM
 122 (A)

MOST LIKELY
 93 (D)

MEAN
 100

STD. DEV.
 8

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE

B) QUARTZ CONDUCTIVE, PH-CORRECTED

C) QUARTZ ADIABATIC

D) CHALCEDONY

E) CHALCEDONY, PH-CORRECTED

F) CRISTOBALITE

G) AMORPHOUS SILICA

H) NA-K

I) NA-K-CA

J) NA-K-CA, MG-CORRECTED

K) SULFATE GEOTHERMOMETER

L) SURFACE TEMPERATURE

M) WELL TEMPERATURE

N) MIXING MODEL

O) RENNER AND OTHERS, 1976

257

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	10	100	50	53.3	18.4

BASED ON: BLACKWELL, D.; UNPUB. DATA AND WELL DISTRIBUTION

VOLUME (KM**3)..... 88.9 STD. DEV. = 35.4

THERMAL ENERGY(10**18 J). 20.32 STD. DEV. = 8.35

REFERENCES: YOUNG AND MITCHELL, 1973

COMPILED BY: MARINER, R.

NEWDALE AREA, IDAHO

FIELD NAME..... MAPLE GROVE HOT SPRINGS
CIRCULAR REFERENCE..... 118

GEOGRAPHIC LOCALITY

STATE..... IDAHO
COUNTY..... FRANKLIN
LATITUDE..... 42-18.2 N
LONGITUDE..... 111-42.2 W
MAPS..... ONEIDA NARROW RESERVOIR 1124,000

TOWNSHIP RANGE SECTION BASE & MERIDIAN
135 41E 07 SW OF NE BOISE

GENERAL INFORMATION

ELEVATION (M)..... 1525
SURFACE ACTIVITY..... HOT SPRINGS
ASSOCIATED DEPOSITS..... TRAVERTINE
NO. OF SPRINGS..... SEVERAL
ROCK TYPES: PALEOZOIC QUARTZITE(?)

CHEMISTRY

SAMPLE SOURCE.... YOUNG AND MITCHELL, 1973
FLOW (L/MIN)..... 1325
COLLECTION DATE.. 1972/05/10

TEMP(C)	SI02	CA	MG	NA	K	HCO3	CO3	S04	CL
76	55	89	24	490	110	491	0	260	630
F	B	PH		DEL 0(18) S04	DEL 0(18) H2O	DEL D H2O			
1.1		7.3							

GEO THERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 236
 NA-K-CA (4/3)..... 187
 NA-K..... 303

SILICA

ADIABATIC..... 106
 CONDUCTIVE..... 106
 CHALCEDONY..... 77
 CRISTOBALITE..... 56
 OPAL..... -10

RESERVOIR PROPERTIES

SUBSURFACE TEMP (C)

MINIMUM
 77 (D,L)

MAXIMUM
 106 (A)

MOST LIKELY
 95 (J)

MEAN
 93

STD. DEV.
 6

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE

B) QUARTZ CONDUCTIVE, PH-CORRECTED

C) QUARTZ ADIABATIC

D) CHALCEDONY

E) CHALCEDONY, PH-CORRECTED

F) CRISTOBALITE

G) AMORPHOUS SILICA

H) NA-K

I) NA-K-CA

J) NA-K-CA, MG-CORRECTED

K) SULFATE GEOTHERMOMETER

L) SURFACE TEMPERATURE

M) WELL TEMPERATURE

N) MIXING MODEL

O) RENNER AND OTHERS, 1976

DEPTH TO TOP (KM)

MINIMUM

MAXIMUM

MOST LIKELY

MEAN

STD. DEV.

THICKNESS (KM)

0.5

2.0

1.5

SUBSURFACE AREA (KM**2)

1.0

2.5

1.5

BASED ON STANDARD ESTIMATE

1

3

2

1.7

0.3

2.0

0.4

VOLUME (KM**3)..... 3.3

THERMAL ENERGY(10**18 J). 0.70

STD. DEV. = 0.9

STD. DEV. = 0.20

COMMENTS: HIGH FLOW RATE SUGGESTS THAT SUBSURFACE TEMPERATURE IS PROBABLY NEAR SURFACE TEMPERATURE.

REFERENCES: YOUNG AND MITCHELL, 1973

COMPILED BY: BROOK, C.

MAPLE GROVE HOT SPRINGS , IDAHO

FIELD NAME..... RIVERDALE AREA (BFN MEEK WELL)
CIRCULAR REFERENCE..... 119

GEOGRAPHIC LOCALITY

STATE..... IDAHO
COUNTY..... FRANKLIN
LATITUDE..... 42-09.9 N
LONGITUDE..... 111-50.4 W
MAPS..... RIVERDALE 1124,000

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
14S	39E	36 SE OF NE	HOISE

GENERAL INFORMATION

ELEVATION (M)..... 1448
SURFACE ACTIVITY..... NONE. FOUND BY DRILLING
NO. OF WELLS..... 1
WELL DEPTHS (M)..... 12
ROCK TYPES: ALLUVIUM OVERLYING TERTIARY TUFFACEOUS SEDIMENTS(?)

CHEMISTRY

SAMPLE SOURCE.... YOUNG AND MITCHELL, 1973
COLLECTION DATE.. 1972/05/11

TEMP(C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
44.5	80	25	7.1	360	24	524		15	320
F	B	PH		DEL 0(18) S04	DEL 0(18) H2O	DEL 0 H2O			
10		7.3							

GEOOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 170
 NA-K-CA (4/3)..... 147
 NA-K..... 141

SILICA

ADIABATIC..... 122
 CONDUCTIVE..... 125
 CHALCEDONY..... 97
 CRISTOBALITE..... 74
 OPAL..... 6

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)

MINIMUM
 75 (J)

MAXIMUM
 125 (A)

MOST LIKELY
 97 (D)

MEAN
 99

STD. DEV.
 10

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ON: STANDARD ESTIMATE					

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY (10**18 J).....	0.76	STD. DEV. = 0.23

REFERENCES: MITCHELL, 1976; YOUNG AND MITCHELL, 1973

COMPILED BY: MARTIN, R. AND BROOK, C.

RIVERDALE AREA (HEN MECK WELL), IDAHO

FIELD NAME..... WAYLAND (BATTLE CREEK) HOT SPRINGS
CIRCULAR REFERENCE..... 120

GEOGRAPHIC LOCALITY

STATE..... IDAHO
COUNTY..... FRANKLIN
LATITUDE..... 42-08.0 N
LONGITUDE..... 111-55.6 W
MAPS..... BANIDA 1124,000

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
155	39E	08 SE OF NW	BOISE

GENERAL INFORMATION

ELEVATION (M)..... 1396
SURFACE ACTIVITY..... HOT SPRINGS
ASSOCIATED DEPOSITS..... TRAVERTINE
NO. OF SPRINGS..... 4
SPRING TEMPERATURES (C)..... 43 TO 84
DISCHARGE (L/MIN)..... 2215
ROCK TYPES: ALLUVIUM OVERLYING PALEOZOIC LIMESTONE (?)

CHEMISTRY

SAMPLE SOURCE..... MITCHELL, 1976
FLOW (L/MIN)..... 50

TEMP (C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
82	109	174	19	3161	552	696		35	5241
F	H	PH		DEL 0 (18) S04	DEL 0 (18) H2O	DEL 0 H2O			
6		6.7							

GEO THERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 254
 NA-K-CA (4/3)..... 315
 NA-K..... 260

SILICA

ADIABATIC..... 137
 CONDUCTIVE..... 142
 CHALCEDONY..... 116
 CRISTOBALITE..... 91
 OPAL..... 21

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	82 (L)	142 (A)	116 (D)	113	12

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHEMOMETER
H) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY (10**18 J),	0.88	STD. DEV. = 0.27

COMMENTS: A SALINE WATER: GEOTHERMOMETRY, ESPECIALLY NA-K-CA, MAY NOT BE RELIABLE.

REFERENCES: MITCHELL, 1976; YOUNG AND MITCHELL, 1973

COMPILED BY: BROOK, C. AND MARINER, R.

WAYLAND (HATTLE CREEK) HOT SPRINGS, IDAHO

FIELD NAME..... SQUAW HOT SPRINGS AREA
CIRCULAR REFERENCE..... 121

GEOGRAPHIC LOCALITY

STATE..... IDAHO
COUNTY..... FRANKLIN
LATITUDE..... 42-07.1 N
LONGITUDE..... 111-55.7 W
MAPS..... WESTON 1124,000

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
15S	39E	17 SW OF NW	BOISE

GENERAL INFORMATION

ELEVATION (M)..... 1366
SURFACE ACTIVITY..... HOT SPRINGS
ASSOCIATED DEPOSITS..... TRAVERTINE
NO. OF SPRINGS..... 4
SPRING TEMPERATURES (C)..... 69 TO 73
DISCHARGE (L/MIN)..... 590
NO. OF WELLS..... 1
WELL DEPTHS (M)..... 6.7
ROCK TYPES: ALLUVIUM OVERLYING TUFFACEOUS SEDIMENTARY ROCKS(?)

CHEMISTRY

SAMPLE SOURCE..... MITCHELL, 1976 (WELL-WATER SAMPLE)
FLOW (L/MIN)..... 115

TEMP (C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
84	124	279	24	4368	782	791		35	7398
F	B	PH		DEL 0 (18) S04	DEL 0 (18) H2O	DEL D H2O			
4.3		6.5							

GEOOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	258
NA-K-CA (4/3).....	328
NA-K.....	264
SILICA	
ADIABATIC.....	143
CONDUCTIVE.....	150
CHALCEDONY.....	124
CRISTOBALITE.....	99
OPAL.....	28

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	84 (L)	150 (A)	124 (D)	119	14

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ON: STANDARD ESTIMATE					

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J). 0.94		STD. DEV. = 0.29

COMMENTS: MG-CORRECTED NA-K-CA GREATER THAN 200 C! SALINE WATER IN WHICH THE CHEMICAL GEOTHERMOMETERS MAY NOT BE ACCURATE! AVAILABLE DATA DOES NOT DEMONSTRATE MIXING.

REFERENCES: MITCHELL, 1976B

COMPILED BY: MARINER, R.

SQUAW HOT SPRINGS AREA, IDAHO

Montana

FIELD NAME..... MARYSVILLE TEST WELL
KGRA OR OTHER NAME..... MARYSVILLE KGRA
CIRCULAR REFERENCE..... 122

GEOGRAPHIC LOCALITY

STATE..... MONTANA
COUNTY..... LEWIS AND CLARK
LATITUDE..... 46-45.2 N
LONGITUDE..... 112-22.6 W
MAPS..... GRANITE BUTTE 1124.000

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
12N	06W	32 SW OF NE	MONTANA

GENERAL INFORMATION

SURFACE ACTIVITY..... NONE. FOUND BY DRILLING
NO. OF WELLS..... 1
WELL DEPTHS (M)..... 2071
MAXIMUM WELL TEMP (C)..... 103 AT DEPTH (M) 915
ROCK TYPES: SHALE
GEOPHYSICS: HEAT FLOW, GRAVITY, MAGNETIC, ELECTRICAL RESISTIVITY

CHEMISTRY

SAMPLE SOURCE.... LEONARD AND OTHERS, 1978
COLLECTION DATE.. 1975/08/29

TEMP (C)	SI02	CA	MG	NA	K	HCO3	CO3	SO4	CL
96.5	69	7.7	0.5	210	10	260	0	180	51
F	H	PH		DEL 0(18) SO4	DEL 0(18) H2O	DEL 0 H2O			
20	0.1	7.9							

GEOOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	154
NA-K-CA (4/3).....	135
NA-K.....	111
SILICA	
ADIABATIC.....	116
CONDUCTIVE.....	117
CHALCEDONY.....	89
CRISTOBALITE.....	67
OPAL.....	-1

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	103 (M)	145 (J)	117 (A)	122	9

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	1.0	1.0	1.0		
THICKNESS (KM)	1.0	2.0	1.5	1.5	0.2
SUBSURFACE AREA (KM**2)	6	18	6	10.0	2.8

BASED ON: HEAT FLOW SURVEY AND USGS FILE DATA

VOLUME (KM**3).....	15.0	STD. DEV. = 4.7
THERMAL ENERGY(10**18 J). 4.32		STD. DEV. = 1.42

COMMENTS: AREA IDENTIFIED BY HIGH HEAT FLOW AND CORRESPONDING GRAVITY AND MAGNETIC LOWS. MAGMA CHAMBER POSTULATED TO BE AT 5-6 KM DEPTH.

REFERENCES: BLACKWELL, 1969, 1970; BLACKWELL AND BAAG, 1973; BLACKWELL AND OTHERS, 1974; LEONARD AND OTHERS, 1978

COMPILED BY: BROOK, C.

MARYSVILLE TEST WELL, MONTANA

FIELD NAME..... BROADWATER (HELENA) HOT SPRINGS
CIRCULAR REFERENCE..... 123

GEOGRAPHIC LOCALITY

STATE..... MONTANA
COUNTY..... LEWIS AND CLARK
LATITUDE..... 46-35.7 N
LONGITUDE..... 112-06.7 W
MAPS..... HELENA 1162,500

TOWNSHIP RANGE SECTION BASE & MERIDIAN
10N 04W 28 NE MONTANA

GENERAL INFORMATION

WARNING FIGURE..... 2
WARNING NUMBER..... 7
ELEVATION (M)..... 1190
SURFACE ACTIVITY..... HOT SPRINGS
NO. OF SPRINGS..... 2
SPRING TEMPERATURES (C)..... 59 TO 66.4
DISCHARGE (L/MIN)..... 110
NO. OF WELLS..... 4
WELL DEPTHS (M)..... 61 TO 73.2
MAXIMUM WELL TEMP (C)..... 68 AT DEPTH (M) 36.6
ROCK TYPES: QUARTZ MONZONITE INTRUDED INTO DOLOMITE

CHEMISTRY

SAMPLE SOURCE.... MARINER AND OTHERS, 1976
FLOW (L/MIN)..... LT 50
COLLECTION DATE.. 1974/08/24

TEMP (C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
62	9H	11	0.9	165	5.8	218		170	33
F	H	PH		DEL 0 (18) S04	DEL 0 (18) H2O	DEL 0 H2O			
9.4	0.80	8.53				-147.6			

GEOOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	134
NA-K-CA (4/3).....	100
NA-K.....	87
SILICA	
ADIABATIC.....	132
CONDUCTIVE.....	136
CHALCEDONY.....	109
CRISTOBALITE.....	85
UPAL.....	16

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	97 (E)	136 (A)	120 (J)	118	8

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.0		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ON: STANDARD ESTIMATE					

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J),	0.92	STD. DEV. = 0.27

REFERENCES: KNOFF, 1963; WARING, 1965; MARINER AND OTHERS, 1976; LEONARD AND OTHERS, 1978

COMPILED BY: BROOK, C.

BROADWATER (HELENA) HOT SPRINGS , MONTANA

FIELD NAME..... ALHAMRA HOT SPRINGS
CIRCULAR REFERENCE..... 124

GEOGRAPHIC LOCALITY

STATE..... MONTANA
COUNTY..... JEFFERSON
LATITUDE..... 46-26.8 N
LONGITUDE..... 111-59.0 W
MAPS..... CLANCY 1162,500

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
08N	03W	16 NE	MONTANA

GENERAL INFORMATION

WAKING FIGURE..... 2
WAKING NUMBER..... 18
ELEVATION (M)..... 1305
SURFACE ACTIVITY..... HOT SPRINGS AND SEEPS
ASSOCIATED DEPOSITS..... ANCIENT TRAVERTINE DEPOSIT
NO. OF SPRINGS..... 4 MAIN SPRINGS
SPRING TEMPERATURES (C)..... 50 TO 59.4
DISCHARGE (L/MIN)..... 385
NO. OF WELLS..... 7
WELL DEPTHS (M)..... 20 TO 95
MAXIMUM WELL TEMP (C)..... 54.8 AT DEPTH (M) 25.0
ROCK TYPES: QUARTZ MONZONITE, ALASKITE

CHEMISTRY

SAMPLE SOURCE.... MARINER AND OTHERS, 1976
FLOW (L/MIN)..... 40
COLLECTION DATE.. 1974/08/23

TEMP (C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
56.5	66	18	3.5	220	9.5	484		89	10
F	B	PH		DEL 0 (18) S04		DEL 0 (18) H2O		DEL D H2O	
8.4	0.24	7.23		-3.49		-19.23		-146.5	

GEOOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	144
NA-K-CA (4/3).....	110
NA-K.....	103
SILICA	
ADIABATIC.....	114
CONDUCTIVE.....	115
CHALCEDONY.....	86
CRISTOBALITE.....	65
OPAL.....	-2
SULFATE	
CONDUCTIVE.....	99
ONE-STEP STEAM LOSS....	95
CONTINUOUS STEAM LOSS..	95

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	86 (D,J)	115 (A)	86 (D,J)	96	7

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.1	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ON: STANDARD ESTIMATE					

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J). 0.73		STD. DEV. = 0.21

COMMENTS: WARING (1965) REPORTS 22 SPRINGS WITH TEMPERATURES OF 32-57 DEG C.

REFERENCES: WARING, 1965; CHADWICK AND KACZMAREK, 1975; MARINER AND OTHERS, 1976; LEONARD AND OTHERS, 1978

COMPILED BY: BROOK, C.

ALHAMBRA HOT SPRINGS, MONTANA

FIELD NAME..... BOULDER HOT SPRINGS
KGRA OR OTHER NAME..... BOULDER HOT SPRINGS KGRA
CIRCULAR REFERENCE..... 125

GEOGRAPHIC LOCALITY

STATE..... MONTANA
COUNTY..... JEFFERSON
LATITUDE..... 46-12.0 N
LONGITUDE..... 112-05.6 W
MAPS..... BOULDER, 1162,500

TOWNSHIP RANGE SECTION BASE & MERIDIAN
05N 04W 10 NE OF SW MONTANA

GENERAL INFORMATION

WARNING FIGURE..... 2
WARNING NUMBER..... 19
ELEVATION (M)..... 1476
SURFACE ACTIVITY..... HOT SPRINGS
ASSOCIATED DEPOSITS..... SINTER
NO. OF SPRINGS..... SEVERAL IN 2 GROUPS
SPRING TEMPERATURES (C)..... 62 TO 76
DISCHARGE (L/MIN)..... LARGE
ROCK TYPES: GRANITE

CHEMISTRY

SAMPLE SOURCE.... MARINER AND OTHERS, 1976
FLOW (L/MIN)..... LARGE
COLLECTION DATE.. 1974/08/22

TEMP (C)	SI02	CA	MG	NA	K	HC03	CO3	S04	CL
76	108	2.2	LT 0.1	120	3.8	168		74	19
F	B	PH		DEL 0(18) S04		DEL 0(18) H2O		DEL D H2O	
11	0.56	8.50		-5.45		-18.91		-146.5	

GEO THERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	136
NA-K-CA (4/3).....	122
NA-K.....	80
SILICA	
ADIABATIC.....	136
CONDUCTIVE.....	142
CHALCEDONY.....	115
CRISTOBALITE.....	91
OPAL.....	21
SULFATE	
CONDUCTIVE.....	130
ONE-STEP STEAM LOSS....	124
CONTINUOUS STEAM LOSS..	125

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	130 (K)	142 (A)	136 (I)	136	2

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ON: STANDARD ESTIMATE					

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J). 1.09		STD. DEV. = 0.31

COMMENTS: WARING (1965) REPORTS SURFACE TEMPERATURES AS HIGH AS 86 DEG C.

REFERENCES: WEED, 1900, 1905, 1912; WHITE, 1955; WARING, 1965; CHADWICK AND KACZMAREK, 1975; MARINER AND OTHERS, 1976; LEONARD AND OTHERS, 1978

COMPILED BY: BROOK, C.

BOULDER HOT SPRINGS , MONTANA

FIELD NAME..... GREGSON (FAIRMONT) HOT SPRINGS
CIRCULAR REFERENCE..... 126

GEOGRAPHIC LOCALITY

STATE..... MONTANA
COUNTY..... DEER LODGE
LATITUDE..... 46-02.6 N
LONGITUDE..... 112-48.6 W
MAPS..... ANACONDA 1162,500

TOWNSHIP RANGE SECTION BASE & MERIDIAN
03N 10W 02 SE OF NW MONTANA

GENERAL INFORMATION

WAKING FIGURE..... 2
WAKING NUMBER..... 17
ELEVATION (M)..... 1568
SURFACE ACTIVITY..... HOT SPRINGS
NO. OF SPRINGS..... SEVERAL
SPRING TEMPERATURES (C)..... 68 TO 73
DISCHARGE (L/MIN)..... 1150
ROCK TYPES: TERTIARY RHYOLITE OVERLYING QUARTZ MONZONITE

CHEMISTRY

SAMPLE SOURCE.... MARINER AND OTHERS, 1976
COLLECTION DATE.. 1974/08/19

TEMP (C)	SI02	CA	MG	NA	K	HCO3	CO3	SO4	CL
70	85	3.9	LT 0.1	165	3.9	166		180	17
F	D	PH		DEL 0 (18) SO4		DEL 0 (18) H2O		DEL D H2O	
18	0.30	8.41				-18.60		-149.1	

GEOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 124
 NA-K-CA (4/3)..... 112
 NA-K..... 61

SILICA

ADIABATIC..... 125
 CONDUCTIVE..... 128
 CHALCEDONY..... 101
 CRISTOBALITE..... 78
 OPAL..... 9

RESERVOIR PROPERTIES

SUBSURFACE TEMP (C)

MINIMUM

101 (D)

MAXIMUM

128 (A)

MOST LIKELY

124 (I)

MEAN

118

STD. DEV.

6

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE

B) QUARTZ CONDUCTIVE, PH-CORRECTED

C) QUARTZ ADIABATIC

D) CHALCEDONY

E) CHALCEDONY, PH-CORRECTED

F) CRISTOBALITE

G) AMORPHOUS SILICA

H) NA-K

I) NA-K-CA

J) NA-K-CA, MG-CORRECTED

K) SULFATE GEOTHERMOMETER

L) SURFACE TEMPERATURE

M) WELL TEMPERATURE

N) MIXING MODEL

O) KENNER AND OTHERS, 1976

DEPTH TO TOP (KM)

MINIMUM

0.5

MAXIMUM

2.0

MOST LIKELY

1.5

MEAN

1.7

STD. DEV.

0.3

THICKNESS (KM)

1.0

2.5

1.5

2.0

0.4

SUBSURFACE AREA (KM**2)

1

3

2

BASED ON: STANDARD ESTIMATE

VOLUME (KM**3)..... 3.3

STD. DEV. = 0.9

THERMAL ENERGY(10**18 J). 0.92

STD. DEV. = 0.26

COMMENTS: WATER USED TO HEAT GREENHOUSE.

REFERENCES: KONIZESKI AND OTHERS, 1962; WARING, 1965; MARINER AND OTHERS, 1976A

COMPILED BY: BROOK, C.

GREGSON (FAIRMONT) HOT SPRINGS, MONTANA

FIELD NAME..... NORRIS (HAPGOOD, BEARTRAP) HOT SPRINGS
CIRCULAR REFERENCE..... 127

GEOGRAPHIC LOCALITY

STATE..... MONTANA
COUNTY..... MADISON
LATITUDE..... 45-34.5 N
LONGITUDE..... 111-41.0 W
MAPS..... NORRIS 1162,500

TOWNSHIP RANGE SECTION BASE & MERIDIAN
03S 01W 14 NE OF SE MONTANA

GENERAL INFORMATION

WAKING FIGURE..... 2
WAKING NUMBER..... 32
SURFACE ACTIVITY..... HOT SPRINGS
NO. OF SPRINGS..... SEVERAL
SPRING TEMPERATURES (C)..... 41 TO 52.5
DISCHARGE (L/MIN)..... 425
NO. OF WELLS..... 1
ROCK TYPES: GNEISS (SYENITE?)

CHEMISTRY

SAMPLE SOURCE.... MARINER AND OTHERS, 1976
COLLECTION DATE.. 1974/08/21

TEMP(C)	SI02	CA	MG	NA	K	HCO3	CO3	S04	CL
52.5	88	17	3.2	180	10	380		130	23
F	B	PH		DEL 0(18) S04	DEL 0(18) H2O	DEL D H2O			
7.4	0.10	7.58				-148.4			

GEOOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	153
NA-K-CA (4/3).....	111
NA-K.....	124
SILICA	
ADIABATIC.....	127
CONDUCTIVE.....	130
CHALCEDONY.....	103
CRISTOBALITE.....	80
OPAL.....	11

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	87 (J)	130 (A)	103 (D)	107	9

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ON: STANDARD ESTIMATE					

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J). 0.82		STD. DEV. = 0.25

REFERENCES: PEALE, 1896; WARING, 1965; MARINER AND OTHERS, 1976A; LEONARD AND OTHERS, 1978; CHADWICK AND KACZMAREK, 1975; CHADWICK, 1978

COMPILED BY: BROOK, C.

NORRIS (HAPGUOD, HEARTRAP) HOT SPRINGS, MONTANA

FIELD NAME..... SILVER STAR (BARKEL'S) HOT SPRINGS
CIRCULAR REFERENCE..... 128

GEOGRAPHIC LOCALITY

STATE..... MONTANA
COUNTY..... MADISON
LATITUDE..... 45-41.5 N
LONGITUDE..... 112-17.2 W
MAPS..... TWIN BRIDGES, 1162,500

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
02S	06W	01 SW	MONTANA

GENERAL INFORMATION

WAKING FIGURE..... 2
WAKING NUMBER..... 30
ELEVATION (M)..... 1400
SURFACE ACTIVITY..... HOT SPRINGS
NO. OF SPRINGS..... 4
SPRING TEMPERATURES (C)..... 67 TO 73
DISCHARGE (L/MIN)..... 150-200
ROCK TYPES: TERTIARY LAKE BEDS OVERLYING GRANITE

CHEMISTRY

SAMPLE SOURCE.... MARINER AND OTHERS, 1976
COLLECTION DATE.. 1974/08/18

TEMP (C)	SI02	CA	MG	NA	K	HCO3	CO3	S04	CL
71.5	110	9.3	0.3	170	6.4	170		190	31
F	H	PH		DEL O(18) S04		DEL O(18) H2O		DEL D H2O	
8.7	0.25	8.17		-5.46		-18.48		-145.4	

GEOTHERMOMETERS (C)

CATION

NA-K-CA (1/3).....	139
NA-K-CA (4/3).....	109
NA-K.....	93

SILICA

ADIABATIC.....	137
CONDUCTIVE.....	143
CHALCEDONY.....	116
CRISTOBALITE.....	92
OPAL.....	22

SULFATE

CONDUCTIVE.....	135
ONE-STEP STEAM LOSS....	128
CONTINUOUS STEAM LOSS..	129

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)

MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
116 (D)	143 (A)	135 (K,I)	131	6

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ON: STANDARD ESTIMATE					

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J). 1.05		STD. DEV. = 0.30

REFERENCES: SAHINEN, 1939; WARING, 1965; MARINER AND OTHERS, 1976; LEONARD AND OTHERS, 1978; CHADWICK, 1978

COMPILED BY: BROOK, C.

SILVER STAR (BARKEL'S) HOT SPRINGS, MONTANA

FIELD NAME..... ENNIS (THEXTON) HOT SPRINGS
CIRCULAR REFERENCE..... 129

GEOGRAPHIC LOCALITY

STATE..... MONTANA
COUNTY..... MADISON
LATITUDE..... 45-22.0 N
LONGITUDE..... 111-44.8 W
MAPS..... ENNIS 1162,500

TOWNSHIP RANGE SECTION BASE & MERIDIAN
055 01W 28 SW OF SE MONTANA

GENERAL INFORMATION

SURFACE ACTIVITY..... HOT SPRING
NO. OF SPRINGS..... 1
SPRING TEMPERATURES (C)..... 83
DISCHARGE (L/MIN)..... 115
NO. OF WELLS..... 2
WELL DEPTHS (M)..... 100
MAXIMUM WELL TEMP (C)..... 89 AT DEPTH (M) 30
ROCK TYPES: ALLUVIUM OVERLYING GNEISS

CHEMISTRY

SAMPLE SOURCE.... LEONARD AND OTHERS, 1978
FLOW (L/MIN)..... LT 75
COLLECTION DATE.. 1976/04/01

TEMP (C)	SI02	CA	MG	NA	K	HCO3	CO3	SO4	CL
83	96	5.8	0.6	340	17	442	0	220	120
F	H	PH		DEL O(18) SO4		DEL O(18) H2O		DEL D H2O	
11	0.61	7.7		-1.80		-19.09			

GEOOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 167
 NA-K-CA (4/3)..... 170
 NA-K..... 115

SILICA

ADIABATIC..... 131
 CONDUCTIVE..... 135
 CHALCEDONY..... 108
 CRISTOBALITE..... 84
 OPAL..... 15

SULFATE

CONDUCTIVE..... 92
 ONE-STEP STEAM LOSS.... 91
 CONTINUOUS STEAM LOSS.. 91

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	108 (D)	145 (J)	135 (A)	129	8

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ON: STANDARD ESTIMATE					

VOLUME (KM**3)..... 3.3 STD. DEV. = 0.9
 THERMAL ENERGY(10**18 J). 1.03 STD. DEV. = 0.30

REFERENCES: LEONARD AND OTHERS, 1978; CHADWICK, 1978

COMPILED BY: BROOK, C.

FENNIS (THERXTON) HOT SPRINGS , MONTANA

Nevada

FIELD NAME..... BALTAZOR HOT SPRINGS
 KGRA OR OTHER NAME..... BALTAZOR HOT SPRINGS KGRA
 CIRCULAR REFERENCE..... 130

GEOGRAPHIC LOCALITY

STATE..... NEVADA
 COUNTY..... HUMBOLDT
 LATITUDE..... 41-55.3 N
 LONGITUDE..... 118-42.6 W
 MAPS..... DENIO 1162,500

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
46N	28E	13 NW	MT. DIABLO

GENERAL INFORMATION

ELEVATION (M)..... 1284
 SURFACE ACTIVITY..... HOT SPRINGS
 ASSOCIATED DEPOSITS..... SINTER, TRAVERTINE
 NO. OF SPRINGS..... 2
 SPRING TEMPERATURES (C)..... 80
 DISCHARGE (L/MIN)..... 100
 NO. OF WELLS..... 1
 WELL DEPTHS (M)..... SHALLOW
 ROCK TYPES: QUATERNARY ALLUVIUM; TERTIARY VOLCANIC ROCKS; CRETACEOUS TO TERTIARY GRANODIORITE
 GEOPHYSICS: GRAVITY, MAGNETIC, AMT

CHEMISTRY

SAMPLE SOURCE..... MARINER AND OTHERS, 1974, 1975
 FLOW (L/MIN)..... 100

TEMP (C)	SI02	CA	MG	NA	K	HC03	CO3	S04	CL
80	160	8.4	LT 0.1	180	8.7	139		220	48
F	B	PH		DEL 0 (18) S04		DEL 0 (18) H2O		DEL D H2O	
7.1	2.9	8.00		-3.98		-15.26		-125.3	

GEOTHERMOMETERS (C)

CATION

NA-K-CA (1/3).....	152
NA-K-CA (4/3).....	124
NA-K.....	112

SILICA

ADIABATIC.....	156
CONDUCTIVE.....	165
CHALCEDONY.....	142
CRISTOBALITE.....	115
OPAL.....	42

SULFATE

CONDUCTIVE.....	158
ONE-STEP STEAM LOSS....	148
CONTINUOUS STEAM LOSS..	150

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	152 (I)	165 (A)	158 (K)	158	3

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
H) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	6	4	3.7	1.0
BASED ON: AMT SURVEY					

VOLUME (KM**3).....	6.1	STD. DEV. = 2.1
THERMAL ENERGY(10**16 J). 2.36		STD. DEV. = 0.81

COMMENTS: AREA OF HIGH HEAT FLOW NEARBY. ONE SHALLOW WELL FLOWS 90 C WATER AT 25 LPM.

REFERENCES: MARINER AND OTHERS, 1974A, 1975; WILLDEN, 1964; USGS FILE DATA; RENNER AND OTHERS, 1976

COMPILED BY: MARINER, R., BROOK, C.

BALTAZOR HOT SPRINGS, NEVADA

FIELD NAME..... DYKE HOT SPRINGS
CIRCULAR REFERENCE..... 131

GEOGRAPHIC LOCALITY

STATE..... NEVADA
COUNTY..... HUMBOLDT
LATITUDE..... 41-34.0 N
LONGITUDE..... 118-33.7 W
MAPS..... DUFFER PEAK 1162,500

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
43N	36E	25 SE OF SE	MT. DIAULO

GENERAL INFORMATION

ELEVATION (M)..... 1256
SURFACE ACTIVITY..... HOT SPRINGS
DISCHARGE (L/MIN)..... 100
ROCK TYPES: QUATERNARY ALLUVIUM; TRIASSIC AND JURASSIC METAMORPHIC ROCKS

CHEMISTRY

SAMPLE SOURCE.... MARINER AND OTHERS, 1974, 1975

TEMP (C)	SI02	CA	MG	NA	K	HCO3	CO3	SO4	CL
66	85	1.8	LT 0.1	150	4.3	243		82	21
F	R	PH		DEL 0(18) SO4	DEL 0(18) H2O	DEL 0 H2O			
8.0	1.0	8.9			-16.29	-128.0			

GEOOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 137
 NA-K-CA (4/3)..... 136
 NA-K..... 73

SILICA

ADIABATIC..... 125
 CONDUCTIVE..... 128
 CHALCEDONY..... 101
 CRISTOBALITE..... 78
 OPAL..... 9

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)

MINIMUM
 76 (E)

MAXIMUM
 137 (I)

MOST LIKELY
 106 (B)

MEAN
 106

STD. DEV.
 12

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE

B) QUARTZ CONDUCTIVE, PH-CORRECTED

C) QUARTZ ADIABATIC

D) CHALCEDONY

E) CHALCEDONY, PH-CORRECTED

F) CRISTOBALITE

G) AMORPHOUS SILICA

H) NA-K

I) NA-K-CA

J) NA-K-CA, MG-CORRECTED

K) SULFATE GEOTHERMOMETER

L) SURFACE TEMPERATURE

M) WELL TEMPERATURE

N) MIXING MODEL

O) RENNER AND OTHERS, 1976

DEPTH TO TOP (KM) MINIMUM 0.5
 THICKNESS (KM) 1.0
 SUBSURFACE AREA (KM**2) 1
 BASED ON: STANDARD ESTIMATE

MAXIMUM 2.0
 MOST LIKELY 1.5
 2.5
 3 2

MEAN 1.7
 2.0
 STD. DEV. 0.3
 0.4

VOLUME (KM**3)..... 3.3
 THERMAL ENERGY(10**18 J), 0.82

STD. DEV. = 0.9
 STD. DEV. = 0.26

REFERENCES: MARINER AND OTHERS, 1974A, 1975; WILLDEN, 1964; SMITH, 1973

COMPILED BY: MARINER, R.

DYKE HOT SPRINGS, NEVADA

FIELD NAME..... PINTO HOT SPRINGS (EAST AND WEST)
 KGRA OR OTHER NAME..... PINTO HOT SPRINGS KGRA
 CIRCULAR REFERENCE..... 132

GEOGRAPHIC LOCALITY

STATE..... NEVADA
 COUNTY..... HUMBOLDT
 LATITUDE..... 41-21.0 N
 LONGITUDE..... 118-47.0 W
 MAPS..... VYA 11250,000

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
40N	28E	19 SE OF NE	MT. DIABLO

GENERAL INFORMATION

WAKING FIGURE..... 8
 WAKING NUMBER..... 9
 ELEVATION (M)..... 1372
 SURFACE ACTIVITY..... HOT SPRINGS
 ASSOCIATED DEPOSITS..... SINTER AND TRAVERTINE
 NO. OF SPRINGS..... SEVERAL
 SPRING TEMPERATURES (C)..... 92
 NO. OF WELLS..... ONE (WEST)
 ROCK TYPES: CRETACEOUS OR TERTIARY GRANODIORITE
 GEOPHYSICS: GRAVITY, MAGNETIC, AMT, TELLURIC CURRENT

CHEMISTRY

SAMPLE SOURCE.... MARINER AND OTHERS, 1974, 1975

TEMP(C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
93	150	14	0.4	330	23	495	1	120	160
F	H	PH		DEL O(18) S04	DEL O(18) H2O	DEL D H2O			
12	7.5	7.14		-7.09	-14.20	-129.2			

GEOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	176
NA-K-CA (4/3).....	163
NA-K.....	145
SILICA	
ADIABATIC.....	153
CONDUCTIVE.....	161
CHALCEDONY.....	137
CRISTOBALITE.....	111
OPAL.....	39
SULFATE	
CONDUCTIVE.....	232
ONE-STEP STEAM LOSS....	207
CONTINUOUS STEAM LOSS..	213

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	153 (C)	190	176 (I)	173	8

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	3	10	5	6.0	1.5

BASED ON: SPRING DISTRIBUTION, AMT, GRAVITY

VOLUME (KM**3).....	10.0	STD. DEV. = 3.1
THERMAL ENERGY(10**18 J). 4.27		STD. DEV. = 1.35

REFERENCES: MARINER AND OTHERS, 1974A, 1975; WARING, 1965; WILLDEN, 1964; HOOVER AND BATZLE, 1977

COMPILED BY: MARINER, R.

PINTO HOT SPRINGS (EAST AND WEST) , NEVADA

FIELD NAME..... DOUBLE HOT SPRINGS AREA
KGRA OR OTHER NAME..... DOUHLE HOT SPRINGS KGRA
CIRCULAR REFERENCE..... 133

GEOGRAPHIC LOCALITY

STATE..... NEVADA
COUNTY..... HUMBOLDT
LATITUDE..... 41-02.9 N
LONGITUDE..... 119-01.7 W
MAPS..... VYA 11250,000

TOWNSHIP RANGE SECTION
36N 26E 04

BASE & MERIDIAN
MT. DIABLO

GENERAL INFORMATION

WARNING FIGURE..... 8
WARNING NUMBER..... 12
ELEVATION (M)..... 1290
SURFACE ACTIVITY..... HOT SPRINGS
NO. OF SPRINGS..... SEVERAL
DISCHARGE (L/MIN)..... 175
ROCK TYPES: QUATERNARY ALLUVIUM; TERTIARY BASALT AND ASH-FLOW RHYOLITE

CHEMISTRY

SAMPLE SOURCE.... MARINER AND OTHERS, 1974, 1975

TEMP(C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
80	105	4.8	0.1	180	4.5	261	2	120	59
F	B	PH		DEL 0(18) S04	DEL 0(18) H2O	DEL 0 H2O			
10	1.8	7.93			-15.93	-128.8			

GEO THERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	127
NA-K-CA (4/3).....	113
NA-K.....	64
SILICA	
ADIABATIC.....	135
CONDUCTIVE.....	140
CHALCEDONY.....	114
CRISTODALITE.....	89
OPAL.....	19

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	114 (D)	140 (A)	127 (I)	127	5

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	2	12	8	7.3	2.1

BASED ON: THERMAL SPRINGS AND HIGH GROUND TEMPERATURES ALONG LINEAR TREND

VOLUME (KM**3).....	12.2	STD. DEV. = 4.2
THERMAL ENERGY(10**18 J). 3.70		STD. DEV. = 1.27

REFERENCES: MARINER AND OTHERS, 1974A, 1975; HOSE AND TAYLOR, 1974; WILLDEN, 1964; WARING, 1965; OLMSTED AND OTHERS, 1975.

COMPILED BY: MARINER, R.

DOUBLE HOT SPRINGS AREA , NEVADA

FIELD NAME..... BLACK ROCK POINT AREA
KGRA OR OTHER NAME..... DOUBLE HOT SPRINGS KGRA
CIRCULAR REFERENCE..... 134

GEOGRAPHIC LOCALITY

STATE..... NEVADA
COUNTY..... PERSHING
LATITUDE..... 40-57.0 N
LONGITUDE..... 119-00.2 W
MAPS..... LOVELOCK 1:250,000

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
36N	26E	347	MT. DIABLO

GENERAL INFORMATION

WAVING FIGURE..... 8
WAVING NUMBER..... 16
ELEVATION (M)..... 1220
SURFACE ACTIVITY..... HOT SPRINGS
ROCK TYPES: QUATERNARY PLAYA DEPOSITS; TERTIARY VOLCANIC AND SEDIMENTARY ROCKS

CHEMISTRY

SAMPLE SOURCE.... MARINER AND OTHERS, 1974

TEMP(C)	SiO2	CA	MG	NA	K	HC03	CO3	SO4	CL
90	120	35	4	1500	20	932		290	787

F	H	PH	DEL 0(18) SO4	DEL 0(18) H2O	DEL D H2O
		8.10			

GEOOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	116
NA-K-CA (4/3).....	151
NA-K.....	29
SILICA	
ADIAHATIC.....	141
CONDUCTIVE.....	148
CHALCEDONY.....	122
CRISTOBALITE.....	97
OPAL.....	26

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUHSURFACE TEMP (C)	116(I)	148 (A)	122 (D)	129	7

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUHSURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ON: STANDARD ESTIMATE					

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J),	1.02	STD. DEV. = 0.29

REFERENCES: MARINER AND OTHERS, 1974A; TATLOCK, 1969; OLMSTED AND OTHERS, 1975; RENNER AND OTHERS, 1976

COMPILED BY: MARINER, R.

BLACK ROCK POINT AREA , NEVADA

FIELD NAME..... BUTTE SPRINGS (TREGO)
KGRA OR OTHER NAME..... TREGO KGRA
CIRCULAR REFERENCE..... 135

GEOGRAPHIC LOCALITY

STATE..... NEVADA
COUNTY..... PERSHING
LATITUDE..... 40-46.0 N
LONGITUDE..... 119-07.0 W
MAPS..... LOVELOCK 1:250,000

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
34N	26E	31 NE	MT. DIABLO

GENERAL INFORMATION

WARNING FIGURE..... 8
WARNING NUMBER..... 63
ELEVATION (M)..... 1219
SURFACE ACTIVITY..... HOT SPRINGS
NO. OF SPRINGS..... SEVERAL
ROCK TYPES: QUATERNARY DUNE SANDS; CRETACEOUS GRANITE

CHEMISTRY

SAMPLE SOURCE.... MARINER AND OTHERS, 1976
COLLECTION DATE.. 1975/08/21

TEMP (C)	SiO2	CA	MG	NA	K	HCO3	CO3	SO4	CL
84.5	79	11	0.2	430	8.6	162		180	500
F	H	PH		DEL O (18) SO4	DEL O (18) H2O	DEL D H2O			
4.1	5.0	7.93			-14.87	-127.6			

GEOOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 124
 NA-K-CA (4/3)..... 129
 NA-K..... 51

SILICA

ADIABATIC..... 122
 CONDUCTIVE..... 124
 CHALCEDONY..... 96
 CRISTOBALITE..... 74
 OPAL..... 6

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	96 (D)	124 (A,I)	124 (A,I)	115	7

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ON: STANDARD ESTIMATE					

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J). 0.90		STD. DEV. = 0.26

REFERENCES: MARINER AND OTHERS, 1976; WARING, 1965; TATLOCK, 1969; OLMSTED AND OTHERS, 1975; RENNER AND OTHERS, 1976

COMPILED BY: MARINER, R.

BUTTE SPRINGS (TREGO) , NEVADA

FIELD NAME..... FLY RANCH (WARDS) HOT SPRINGS
 KGRA OR OTHER NAME..... FLY RANCH KGRA
 CIRCULAR REFERENCE..... 136

GEOGRAPHIC LOCALITY

STATE..... NEVADA
 COUNTY..... WASHOE
 LATITUDE..... 40-52.0 N
 LONGITUDE..... 119-20.9 W
 MAPS..... LOVELOCK 11250,000

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
34N	23E	01	MT. DIABLO

GENERAL INFORMATION

WARNING FIGURE..... 8
 WARNING NUMBER..... 37
 ELEVATION (M)..... 1234
 SURFACE ACTIVITY..... ARTESIAN WELLS
 ASSOCIATED DEPOSITS..... TRAVERTINE
 DISCHARGE (L/MIN)..... 500
 NO. OF WELLS..... 2
 WELL DEPTHS (M)..... 244 TO 305
 MAXIMUM WELL TEMP (C)..... 108
 ROCK TYPES: QUATERNARY ALLUVIUM, UPPER TERTIARY BASALT, TUFFS, AND SEDIMENTARY ROCK
 GEOPHYSICS: MAGNETIC, MICROEARTHQUAKE, SEISMIC GROUNDNOISE, RESISTIVITY, SP

CHEMISTRY

SAMPLE SOURCE.... MARINER AND OTHERS, 1974, 1975

TEMP (C)	SI02	CA	MG	NA	K	HCO3	CO3	S04	CL
80	82	31	4.2	340	17	458	4	46	240
F	B	PH		DEL 0 (18) S04	DEL 0 (18) H2O	DEL 0 H2O			
7.0	1.9	7.91			-14.72	-120.7			

GEOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 153
 NA-K-CA (4/3)..... 125
 NA-K..... 115

SILICA

ADIABATIC..... 124
 CONDUCTIVE..... 126
 CHALCEDONY..... 99
 CRISTOBALITE..... 76
 OPAL..... 7

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)

MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
99 (D)	126 (A)	100 (J)	108	6

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
0.5	2.0	1.5		
1.0	2.5	1.5	1.7	0.3
1	4	3	2.7	0.6

BASED ON: G. KELLER, UNPUB. TEMPERATURE GRADIENT DATA

VOLUME (KM**3)..... 4.4 STD. DEV. = 1.3
 THERMAL ENERGY(10**18 J). 1.12 STD. DEV. = 0.35

REFERENCES: MARINER AND OTHERS, 1974A, 1975; USGS FILE DATA

COMPILED BY: MARINER, R.

FLY RANCH (WARDS) HOT SPRINGS, NEVADA

FIELD NAME..... GREAT BOILING SPRINGS (GERLACH)
KGRA OR OTHER NAME..... GERLACH KGRA
CIRCULAR REFERENCE..... 137

GEOGRAPHIC LOCALITY

STATE..... NEVADA
COUNTY..... WASHOE
LATITUDE..... 40-39.7 N
LONGITUDE..... 119-21.7 W
MAPS..... GERLACH 1162,500

TOWNSHIP RANGE SECTION BASE & MERIDIAN
32N 23E 15 NW MT. DIABLO

GENERAL INFORMATION

WARNING FIGURE..... 8
WARNING NUMBER..... 38
AREA OF SURFACE EXPRESSION (KM**2). 0.6
ELEVATION (M)..... 1207
SURFACE ACTIVITY..... HOT SPRINGS AND POOLS
ASSOCIATED DEPOSITS..... SINTER
NO. OF SPRINGS..... APPROX. 70
SPRING TEMPERATURES (C)..... 20 TO 90
DISCHARGE (L/MIN)..... 1000
NO. OF WELLS..... 1
WELL DEPTHS (M)..... 150
MAXIMUM WELL TEMP (C)..... 110 AT DEPTH (M) 150?
ROCK TYPES: QUATERNARY ALLUVIUM AND LAKE SEDIMENTS, CRETACEOUS TO TERTIARY GRANODIORITE
GEOPHYSICS: GRAVITY, MAGNETIC, AMT, RESISTIVITY, MICROEARTHQUAKE, TEMPERATURE GRADIENT

CHEMISTRY

SAMPLE SOURCE.... MARINER AND OTHERS, 1974, 1975

TEMP (C)	SI02	CA	MG	NA	K	HCO3	CO3	SO4	CL
86	165	68	1.2	1400	130	83	1	400	2200
F	H	PH		DEL O(18) SO4	DEL O(18) H2O	DEL O H2O			
4.5	9.9	7.20		+6.53	-10.83	-100.5			

GEOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	205
NA-K-CA (4/3).....	230
NA-K.....	175
SILICA	
ADIAHATIC.....	158
CONDUCTIVE.....	167
CHALCEDONY.....	144
CRISTOBALITE.....	117
UPAL.....	44
SULFATE	
CONDUCTIVE.....	93
ONE-STEP STEAM LOSS....	92
CONTINUOUS STEAM LOSS..	92

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	158 (C)	205 (I)	170	178	10

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIAHATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4
VOLUME (KM**3).....	3.3	STD. DEV. = 0.9			
THERMAL ENERGY(10**18 J).	1.46	STD. DEV. = 0.42			

COMMENTS: THE SULFATE-ISOTOPE GEOTHERMOMETER INDICATES A TEMPERATURE NEAR BOILING; DISSOLUTION OF SALINE DEPOSITS POSSIBLE.

REFERENCES: MARINER AND OTHERS, 1974A, 1975; OLMSTED AND OTHERS, 1975; WARING, 1965; RENNER AND OTHERS, 1976; USGS FILE DATA

COMPILED BY: MARINER, R.

GREAT HOILING SPRINGS (GERLACH) , NEVADA

FIELD NAME..... SAN EMEDIO DESERT AREA
KGRA OR OTHER NAME..... SAN EMEDIO DESERT KGRA
CIRCULAR REFERENCE..... 138

GEOGRAPHIC LOCALITY

STATE..... NEVADA
COUNTY..... WASHOE
LATITUDE..... 40-24. N
LONGITUDE..... 119-25. W
MAPS..... KUMIVA PEAK 1162,500

TOWNSHIP RANGE SECTION BASE & MERIDIAN
29N 23E MT. DIABLO

GENERAL INFORMATION

ELEVATION (M)..... 1231
SURFACE ACTIVITY..... HOT SEEP SPRINGS
ASSOCIATED DEPOSITS..... SINTER AND TRAVERTINE
NO. OF SPRINGS..... THREE GROUPS
ROCK TYPES: ALLUVIUM OVERLYING TERTIARY BASALT, ANDESITE, AND TUFFACEOUS SEDIMENTS
GEOPHYSICS: GRAVITY, MAGNETIC, AMT

CHEMISTRY

SAMPLE SOURCE.... MARINER AND OTHERS, 1976
FLOW (L/MIN)..... LT 1
COLLECTION DATE.. 1975/08/20

TEMP(C)	SI02	CA	MG	NA	K	HC03	CO3	SO4	CL
95	215	160	2.3	1500	120	129		240	2300
F	H	PH		DEL 0(18) SO4		DEL 0(18) H2O		DEL 0 H2O	
5.2	7.2	6.63				-11.61		-106.4	

GEOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 189
 NA-K-CA (4/3)..... 191
 NA-K..... 159

SILICA

ADIABATIC..... 172
 CONDUCTIVE..... 185
 CHALCEDONY..... 165
 CRISTOBALITE..... 135
 OPAL..... 61

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	125	189 (I)	185 (A)	166	15

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ON: STANDARD ESTIMATE					

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J).	1.36	STD. DEV. = 0.40

COMMENTS: NEGLIGIBLE FLOW RATES MAKE QUANTITATIVE INTERPRETATION OF THE GEOTHERMOMETERS IMPOSSIBLE. NEAR SURFACE REACTIONS PROBABLE. MINIMUM TEMPERATURE ESTIMATED ASSUMING CONDUCTIVE COOLING. TEMPERATURES MAY BE 200 C OR HIGHER.

REFERENCES: MARINER AND OTHERS, 1976C

COMPILED BY: MARINER, R.

SAN EMEDIO DESERT AREA, NEVADA

FIELD NAME..... THE NEEDLES (NEEDLE ROCKS, PYRAMID LAKE)
CIRCULAR REFERENCE..... 139

GEOGRAPHIC LOCALITY

STATE..... NEVADA
COUNTY..... WASHOE
LATITUDE..... 40-08.8 N
LONGITUDE..... 119-40.5 W
MAPS..... THE NEEDLE ROCKS 1124:000

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
26N	21E	06 SW OF SW	MT. DIABLO

GENERAL INFORMATION

WAKING FIGURE..... 8
WAKING NUMBER..... 49
ELEVATION (M)..... 1158
SURFACE ACTIVITY..... HOT SPRINGS
ASSOCIATED DEPOSITS..... TRAVERTINE
NO. OF SPRINGS..... SEVERAL
NO. OF WELLS..... 3
WELL DEPTHS (M)..... 1219 (?) TO 1795
MAXIMUM WELL TEMP (C)..... 116
ROCK TYPES: QUATERNARY ALLUVIUM AND TUFAL OLIVINE BASALT

CHEMISTRY

SAMPLE SOURCE.... MARINER AND OTHERS, 1974, 1975

TEMP (C)	SI02	CA	MG	NA	K	HCO3	CO3	SO4	CL
56	110	260	0.1	1100	160	24	1	340	1900
F	R	PH		DEL 0 (18) SO4	DEL 0 (18) H2O	DEL D H2O			
3.0	6.1	8.43			-6.33	-106.5			

GEOOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 214
 NA-K-CA (4/3)..... 183
 NA-K..... 232

SILICA

ADIABATIC..... 137
 CONDUCTIVE..... 143
 CHALCEDONY..... 116
 CRISTOBALITE..... 92
 OPAL..... 22

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	115 (D)	137 (C)	116 (M)	123	5

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4

BASED ON: STANDARD ESTIMATE

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J),	0.97	STD. DEV. = 0.27

COMMENTS: SAMPLE FROM LEAKING STEAM WELL (FLASHING AT THE SURFACE)

REFERENCES: MARINER AND OTHERS, 1974A, 1975; WARING, 1965; BONHAM, 1969; RENNER AND OTHERS, 1976

COMPILED BY: MARINER, R.

THE NEEDLES (NEEDLE ROCKS, PYRAMID LAKE), NEVADA

FIELD NAME..... MOANA AREA
KGRA OR OTHER NAME..... MOANA SPRINGS KGRA
CIRCULAR REFERENCE..... 140

GEOGRAPHIC LOCALITY

STATE..... NEVADA
COUNTY..... WASHOE
LATITUDE..... 39-29.7 N
LONGITUDE..... 119-48.9 W
MAPS..... RENO 1124,000; MT, ROSE 1162,500; MT, ROSE NE 1124,000

TOWNSHIP RANGE SECTION BASE & MERIDIAN
19N 19E 26 NE MT, DIABLO

GENERAL INFORMATION

WATERING FIGURE..... 8
WATERING NUMBER..... 55A
ELEVATION (M)..... 1384
SURFACE ACTIVITY..... INACTIVE SPRINGS
NO. OF SPRINGS..... NONE
NO. OF WELLS..... MORE THAN 20
WELL DEPTHS (M)..... 20 TO 307
MAXIMUM WELL TEMP (C)..... 96 AT DEPTH (M) 94
ROCK TYPES: MIOCENE TO LATE PLIOCENE DIATOMITE, SANDSTONE, AND CONGLOMERATE; TERTIARY VOLCANIC FLOWS;
GRANITE AND METAMORPHICS OF PRE-TERTIARY AGE

CHEMISTRY

SAMPLE SOURCE.... BATEMAN AND SCHEIBACH, 1975

TEMP (C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
90	135	29	0.8	203	7.4	146		348	42
F	H	PH		DEL 0 (18) S04	DEL 0 (18) H2O	DEL D H2O			
4.8	1.8	7.65							

GEOOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	132
NA-K-CA (4/3).....	89
NA-K.....	90
SILICA	
ADIABATIC.....	147
CONDUCTIVE.....	155
CHALCEDONY.....	130
CRISTOBALITE.....	104
OPAL.....	33

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	96 (M)	155 (A)	96 (M)	116	14

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.1	1.0	0.5		
THICKNESS (KM)	2.0	2.5	2.1	2.2	0.1
SUBSURFACE AREA (KM**2)	2	6	4	4.0	0.8

BASED ON: WELL DISTRIBUTION

VOLUME (KM**3).....	8.8	STD. DEV. = 1.8
THERMAL ENERGY(10**18 J). 2.39		STD. DEV. = 0.61

COMMENTS: NA-K-CA GEOTHERMOMETER AGREES WITH THE OBSERVED WELL TEMPERATURE; CONTACT WITH DIATOMITE POSSIBLE AND MAY CAUSE THE LARGE SILICA CONCENTRATION.

REFERENCES: BATEMAN AND SCHEIBACH, 1975; ATKINSON, 1978

COMPILED BY: MARINER, R.

MOANA AREA, NEVADA

FIELD NAME..... STEAMBOAT SPRINGS
KGRA OR OTHER NAME..... STEAMBOAT SPRINGS KGRA
CIRCULAR REFERENCE..... 141

GEOGRAPHIC LOCALITY

STATE..... NEVADA
COUNTY..... WASHOE
LATITUDE..... 39-23.0 N
LONGITUDE..... 119-45.0 W
MAPS..... MT. ROSE 1162,5001 VIRGINIA CITY 1162,5001 RENO 11250,0001 STEAMBOAT
1:24,000

TOWNSHIP RANGE SECTION BASE & MERIDIAN
18N 20E 33 MT. DIABLO

GENERAL INFORMATION

WAVING FIGURE..... 8
WAVING NUMBER..... 56, 55 E.F
AREA OF SURFACE EXPRESSION (KM**2). 5.7
ELEVATION (M)..... 1420
SURFACE ACTIVITY..... HOT SPRINGS, FUMAROLE, GEYSER(S)
ASSOCIATED DEPOSITS..... SINTER
NO. OF SPRINGS..... MANY (74)
SPRING TEMPERATURES (C)..... 45 TO 96
DISCHARGE (L/MIN)..... 250
NO. OF WELLS..... 6 DEEP EXPLORATION WELLS
WELL DEPTHS (M)..... 218 TO 558
MAXIMUM WELL TEMP (C)..... 186 AT DEPTH (M) 221
ROCK TYPES: PLIOCENE-PLEISTOCENE VOLCANICS, PRE-TERTIARY GRANITE, METAMORPHICS
GEOPHYSICS: GRAVITY, MAGNETIC, RESISTIVITY, SP, AMT, TELLURIC CURRENT

CHEMISTRY

SAMPLE SOURCE.... MARINER AND OTHERS, 1974, 1975
FLOW (L/MIN)..... 10

TEMP(C)	SI02	CA	MG	NA	K	HCO3	CO3	SO4	CL
94	270	16	0.7	680	66	364	2	73	837
F	D	PH		DEL O(18) SO4	DEL O(18) H2O	DEL O H2O			
2.1	47	7.19		-3.28	-10.44	-116.7			

GEOOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	207
NA-K-CA (4/3).....	233
NA-K.....	180
SILICA	
ADIABATIC.....	185
CONDUCTIVE.....	201
CHALCEDONY.....	184
CRISTOBALITE.....	153
UPAL.....	77
SULFATE	
CONDUCTIVE.....	231
ONE-STEP STEAM LOSS....	207
CONTINUOUS STEAM LOSS..	213

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	186 (M)	207 (K)	207 (I)	200	5

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.3	1.0	0.3		
THICKNESS (KM)	2.0	2.7	2.7	2.5	0.2
SUBSURFACE AREA (KM**2)	4	25	6	11.7	4.7

BASED ON: SPRING DISTRIBUTION, RESISTIVITY, AND ESTIMATE OF RENNER AND OTHERS, 1976

VOLUME (KM**3).....	28.8	STD. DEV. = 11.9
THERMAL ENERGY(10**18 J),	14.37	STD. DEV. = 5.94

COMMENTS: SULFATE ISOTOPE GEOTHERMOMETER BASED ON SAMPLE COLLECTED BY N. NEHRING. EXTENSIVE SINTER DEPOSITS. ABOUT 35 WELLS USED MOSTLY FOR SPA SUPPLY.

REFERENCES: MARINER AND OTHERS, 1974A, 1975; RENNER AND OTHERS, 1976; WHITE, 1968; WHITE AND OTHERS, 1964; THOMPSON AND WHITE, 1964

COMPILED BY: MARINER, R.

STEAMBOAT SPRINGS , NEVADA

FIELD NAME..... WAHUSKA HOT SPRINGS
KGRA OR OTHER NAME..... WAHUSKA KGRA
CIRCULAR REFERENCE..... 142

GEOGRAPHIC LOCALITY

STATE..... NEVADA
COUNTY..... LYON
LATITUDE..... 39-09.7 N
LONGITUDE..... 119-11.0 W
MAPS..... WAHUSKA 1162,500

TOWNSHIP RANGE SECTION BASE & MERIDIAN
15N 25E 16 SE MT. DIABLO

GENERAL INFORMATION

WAKING FIGURE..... 8
WAKING NUMBER..... 62
ELEVATION (M)..... 1310
SURFACE ACTIVITY..... HOT SPRINGS
ASSOCIATED DEPOSITS..... TRAVERTINE
NO. OF SPRINGS..... SEVERAL
SPRING TEMPERATURES (C)..... 59 TO 97
NO. OF WELLS..... AT LEAST 3
WELL DEPTHS (M)..... 149 TO 678
MAXIMUM WELL TEMP (C)..... 106
ROCK TYPES: ALLUVIUM; MIOCENE-PLEISTOCENE BASALT & ANDESITE; MESOZOIC METAMORPHICS
GEOPHYSICS: GRAVITY, MAGNETIC, AMT

CHEMISTRY

SAMPLE SOURCE..... MARINER AND OTHERS, 1974, 1975

TEMP (C)	SiO2	CA	MG	NA	K	HC03	CO3	S04	CL
94	110	39	0.1	300	14	74		620	55
F	8	PH		DEL 0 (18) S04	DEL 0 (18) H2O	DEL D H2O			
8.2	10	8.06		-3.22	-15.38	-129.7			

GEOOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	146
NA-K-CA (4/3).....	109
NA-K.....	109
SILICA	
ADIABATIC.....	137
CONDUCTIVE.....	143
CHALCEDONY.....	116
CRISTOBALITE.....	92
OPAL.....	22
SULFATE	
CONDUCTIVE.....	146
ONE-STEP STEAM LOSS....	140
CONTINUOUS STEAM LOSS..	141

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	106 (M)	146 (I)	140 (K)	131	9

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	30	2	11.0	6.7
BASED ON: AMT					

VOLUME (KM**3).....	18.3	STD. DEV. =	11.9
THERMAL ENERGY(10**18 J). 5.73		STD. DEV. =	3.75

REFERENCES: MARINER AND OTHERS, 1974A, 1975; MOORE, 1969; WARING, 1965

COMPILED BY: MARINER, R.

WAMUSKA HOT SPRINGS , NEVADA

FIELD NAME..... LEE HOT SPRINGS
CIRCULAR REFERENCE..... 143

GEOGRAPHIC LOCALITY

STATE..... NEVADA
COUNTY..... CHURCHILL
LATITUDE..... 39-12.6 N
LONGITUDE..... 118-43.4 W
MAPS..... ALLEN SPRINGS 1162,500

TOWNSHIP RANGE SECTION BASE & MERIDIAN
16N 29E 34 NW OF NE MT. DIABLO

GENERAL INFORMATION

WARNING FIGURE..... 8
WARNING NUMBER..... 74A
ELEVATION (M)..... 4020
SURFACE ACTIVITY..... HOT SPRINGS
ASSOCIATED DEPOSITS..... TRAVERTINE
NO. OF SPRINGS..... SEVERAL
SPRING TEMPERATURES (C)..... 78 TO 88
DISCHARGE (L/MIN)..... 130
ROCK TYPES: MIOCENE TO PLIOCENE VOLCANIC ROCKS

CHEMISTRY

SAMPLE SOURCE.... MARINER AND OTHERS, 1974, 1975
FLOW (L/MIN)..... 130

TEMP(C)	SI02	CA	MG	NA	K	HCO3	CO3	SO4	CL
88	180	44	0.6	450	26	114		470	380

F	B	PH	DEL O(18) SO4	DEL O(18) H2O	DEL D H2O
7.9	2.4	7.40	-8.03	-13.21	-125.8

GEOOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	162
NA-K-CA (4/3).....	137
NA-K.....	128
SILICA	
ADIABATIC.....	162
CONDUCTIVE.....	173
CHALCEDONY.....	151
CRISTOBALITE.....	123
OPAL.....	50
SULFATE	
CONDUCTIVE.....	282
ONE-STEP STEAM LOSS....	239
CONTINUOUS STEAM LOSS..	251

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	162 (C,I)	173 (A)	162 (C,I)	166	3

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ON: STANDARD ESTIMATE					

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY (10**10 J).	1.36	STD. DEV. = 0.38

COMMENTS: THE SULFATE ISOTOPE GEOTHERMOMETER INDICATES A VERY HIGH TEMPERATURE (239 TO 282 C). THE PRESENCE OF TRAVERTINE RATHER THAN SINTER FAVORS THE LOWER TEMPERATURE.

REFERENCES: MARINER AND OTHERS, 1974A, 1975; WILLDEN AND SPEED, 1974

COMPILED BY: MARINER, R.

LEE HOT SPRINGS , NEVADA

FIELD NAME..... SODA LAKE AREA
KGRA OR OTHER NAME..... STILLWATER-SODA LAKE KGRA
CIRCULAR REFERENCE..... 144

GEOGRAPHIC LOCALITY

STATE..... NEVADA
COUNTY..... CHURCHILL
LATITUDE..... 39-34.0 N
LONGITUDE..... 118-51.1 W
MAPS..... SODA LAKE 1162,500

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
20N	28E	28	MT. DIABLO

GENERAL INFORMATION

ELEVATION (M)..... 1200
SURFACE ACTIVITY..... FUMAROLE AND WARM GROUND
NO. OF WELLS..... 2
WELL DEPTHS (M)..... 152 TO 1313
MAXIMUM WELL TEMP (C)..... 152 AT DEPTH (M) 152
ROCK TYPES: PLEISTOCENE LAKE DEPOSITS AND BASALTIC TUFF
GEOPHYSICS: GRAVITY, MAGNETIC, AMT, TEMPERATURE SURVEY

CHEMISTRY

SAMPLE SOURCE.... MARINER AND OTHERS, 1975

TEMP (C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
144	160	82	2.1	1000	48	144		360	1500
F	B	PH		DEL O (18) S04	DEL O (18) H2O	DEL O H2O			
0.6	5.7	7.86		+0.28	-13.48	-109.3			

GEOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 161
 NA-K-CA (4/3)..... 159
 NA-K..... 112

SILICA

ADIABATIC..... 156
 CONDUCTIVE..... 165
 CHALCEDONY..... 142
 CRISTOBALITE..... 115
 OPAL..... 42

SULFATE

CONDUCTIVE..... 127
 ONE-STEP STEAM LOSS.... 129
 CONTINUOUS STEAM LOSS.. 129

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	144 (M)	165 (A)	161 (I)	157	5

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.3	2.0	1.0		
THICKNESS (KM)	1.0	2.7	1.5	1.7	0.4
SUBSURFACE AREA (KM**2)	1	28	5	11.3	5.9

BASED ON: SHALLOW TEMPERATURE SURVEY

VOLUME (KM**3)..... 19.6 STD. DEV. = 11.3
 THERMAL ENERGY(10**18 J). 7.51 STD. DEV. = 4.32

COMMENTS: CHALCEDONY GEOTHERMOMETER INDICATES 142 DEG C PERMEABILITY OF AQUIFER IS VERY LOW! ONLY TOTAL DEPTH AVAILABLE ON THE DEEPER WELL.

REFERENCES: MORRISON, 1964; MARINER AND OTHERS, 1975; OLMSTED AND OTHERS, 1975

COMPILED BY: MARINER, R.

SODA LAKE AREA, NEVADA

FIELD NAME..... STILLWATER AREA
KGRA OR OTHER NAME..... STILLWATER-SODA LAKE KGRA
CIRCULAR REFERENCE..... 145

GEOGRAPHIC LOCALITY

STATE..... NEVADA
COUNTY..... CHURCHILL
LATITUDE..... 39-31.3 N
LONGITUDE..... 118-33.1 W
MAPS..... STILLWATER 1162,500

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
19N	31E	07 SW	MT. DIABLO

GENERAL INFORMATION

ELEVATION (M)..... 1189
SURFACE ACTIVITY..... NONE. FOUND BY DRILLING
WELL DEPTHS (M)..... 1292
MAXIMUM WELL TEMP (C)..... 156 AT DEPTH (M) 430
ROCK TYPES: ALLUVIUM AND TERTIARY BASALT
GEOPHYSICS: GRAVITY, MAGNETIC, AMT, TEMPERATURE SURVEY

CHEMISTRY

SAMPLE SOURCE.... MARINER AND OTHERS, 1974, 1975

TEMP (C)	SI02	CA	MG	NA	K	HCO3	CO3	SO4	CL
96	170	100	1.7	1480	42	90		190	2200
F	H	PH		DEL O(18) SO4	DEL O(18) H2O	DEL D H2O			
5.0	15	7.57		-3.14	-12.36	-110.2			

GEO THERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	140
NA-K-CA (4/3).....	150
NA-K.....	73
SILICA	
ADIABATIC.....	159
CONDUCTIVE.....	169
CHALCEDONY.....	146
CRISTOBALITE.....	119
OPAL.....	46
SULFATE	
CONDUCTIVE.....	191
ONE-STEP STEAM LOSS....	177
CONTINUOUS STEAM LOSS..	179

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	140 (I)	177 (K)	159 (C)	159	8

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMUMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.4	2.0	1.0		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	14	66	26	35.3	11.1

BASED ON: SHALLOW TEMPERATURE SURVEY

VOLUME (KM**3).....	58.9	STD. DEV. = 21.8
THERMAL ENERGY(10**18 J). 22.84		STD. DEV. = 8.56

COMMENTS: WELL DATA FROM THE O'NEILL-OLIPHANT REYNOLDS #1 GEOTHERMAL TEST WELL.

REFERENCES: MARINER AND OTHERS, 1974A; 1975; WILLDEN AND SPEED, 1974; MORRISON, 1964; OLMSTED AND OTHERS, 1975; RENNER AND OTHERS, 1975

COMPILED BY: MARINER, R.

STILLWATER AREA , NEVADA

FIELD NAME..... FERNLEY AREA
KGRA OR OTHER NAME..... BRADY-HAZEN KGRA
CIRCULAR REFERENCE..... 146

GEOGRAPHIC LOCALITY

STATE..... NEVADA
COUNTY..... LYON
LATITUDE..... 39-35.9 N
LONGITUDE..... 119-06.4 W
MAPS..... TWO TIPS 1162,500

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
20N	26E	18 SE	MT. DIABLO

GENERAL INFORMATION

ELEVATION (M)..... 1241
NO. OF WELLS..... 3
WELL DEPTHS (M)..... 91 TO 229
MAXIMUM WELL TEMP (C)..... 132
ROCK TYPES: ALLUVIUM OVERLYING TERTIARY BASALT, ANDESITE, AND TUFFACEOUS SEDIMENTARY ROCKS

CHEMISTRY

SAMPLE SOURCE.... MARINER AND OTHERS, 1975

TEMP (C)	SIU2	CA	MG	NA	K	HCO3	CO3	SO4	CL
86	150	70	1.5	620	38	100		400	820
F	B	PH		DEL O(18) SO4		DEL O(18) H2O		DEL O H2O	
4.2	5.6	7.05		-5.61		-13.30		-121.5	

GEOOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	166
NA-K-CA (4/3).....	145
NA-K.....	133
SILICA	
ADIABATIC.....	153
CONDUCTIVE.....	161
CHALCEDONY.....	137
CRISTOBALITE.....	111
OPAL.....	39
SULFATE	
CONDUCTIVE.....	220
ONE-STEP STEAM LOSS....	196
CONTINUOUS STEAM LOSS..	202

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	161 (A)	220 (K)	166 (I)	182	13

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ON: STANDARD ESTIMATE					

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J). 1.51		STD. DEV. = 0.44

REFERENCES: MARINER AND OTHERS, 1975

COMPILED BY: MARINER, R.

FERNLEY AREA, NEVADA

FIELD NAME..... BRADY HOT SPRINGS
 KGRA OR OTHER NAME..... BRADY-HAZEN KGRA
 CIRCULAR REFERENCE..... 147

GEOGRAPHIC LOCALITY

STATE..... NEVADA
 COUNTY..... CHURCHILL
 LATITUDE..... 39-47.2 N
 LONGITUDE..... 119-00.0 W
 MAPS..... FIRE BALL RIDGE 1162,500

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
22N	26E	12 SW	MT, DIABLO

GENERAL INFORMATION

WARNING FIGURE..... 8
 WARNING NUMBER..... 72
 ELEVATION (M)..... 1256
 SURFACE ACTIVITY..... FUMAROLE
 ASSOCIATED DEPOSITS..... SINTER, TRAVERTINE
 NO. OF WELLS..... MORE THAN 13
 WELL DEPTHS (M)..... 73 TO 2219
 MAXIMUM WELL TEMP (C)..... 214
 ROCK TYPES: PLIOCENE-PLEISTOCENE BASALT; QUATERNARY ALLUVIUM
 GEOPHYSICS: HEAT FLOW, GRAVITY, MAGNETICS

CHEMISTRY

SAMPLE SOURCE.... USGS FILE DATA

TEMP (C)	SI02	CA	MG	NA	K	HCO3	CO3	SO4	CL
BOILING	150	52	0.4	100	40	102		270	1400
F	B	PH	DEL 0(18) SO4		DEL 0(18) H2O		DEL 0 H2O		
4.7	5.5	6.99 AT 16 DEG C							

GEOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	246
NA-K-CA (4/3).....	129
NA-K.....	434
SILICA	
ADIABATIC.....	153
CONDUCTIVE.....	161
CHALCEDONY.....	137
CRISTOBALITE.....	111
OPAL.....	39

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	140	170	155	155	6

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.3	1.5	1.0		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	2	30	7	13.0	6.1

BASED ON: TEMPERATURE GRADIENT SURVEY

VOLUME (KM**3).....	21.7	STD. DEV. = 11.1
THERMAL ENERGY(10**18 J),	8.19	STD. DEV. = 4.22

COMMENTS: HOT SPRINGS BECAME INACTIVE AFTER SEVERAL GEOTHERMAL WELLS WERE DRILLED IN THE EARLY 1960'S. GEOTHERMAL FLUID WITH A WORKING TEMPERATURE OF 154 C (H. FALK, PERSONAL COMMUN., 1978) CURRENTLY USED IN A COMMERCIAL VEGETABLE DRYING OPERATION.

REFERENCES: OLMSTED AND OTHERS, 1975; GARSIDE, 1974

COMPILED BY: MARTINEZ, R. AND BROOK, C.

BRADY HOT SPRINGS , NEVADA

FIELD NAME..... DESERT PEAK AREA
KGRA OR OTHER NAME..... BRADY-HAZEN KGRA
CIRCULAR REFERENCE..... 148

GEOGRAPHIC LOCALITY

STATE..... NEVADA
COUNTY..... CHURCHILL
LATITUDE..... 39-45.7 N
LONGITUDE..... 118-57.0 W
MAPS..... DESERT PEAK 1:62,500

TOWNSHIP RANGE SECTION BASE & MERIDIAN
22N 27E 21 NE OF NE MT. DIABLO

GENERAL INFORMATION

ELEVATION (M)..... 1403
SURFACE ACTIVITY..... NONE, FOUND BY DRILLING
NO. OF WELLS..... 3
WELL DEPTHS (M)..... TO 2337
ROCK TYPES: TERTIARY ANDESITE, BASALT, SILICEOUS ASH FLOW TUFFS, AND JURASSIC METAVOLCANICS

CHEMISTRY

SAMPLE SOURCE.... BENOIT, 1978

TEMP(C)	5102	CA	MG	NA	K	HCO3	CO3	SO4	CL
	440	90	1.0	2000	240	43		90	3600

F	B	PH	DEL O(18) SO4	DEL O(18) H2O	DEL D H2O
			-5.26	-12.52	

GEO THERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	225
NA-K-CA (4/3).....	269
NA-K.....	206
SILICA	
ADIABATIC.....	217
CONDUCTIVE.....	241
CHALCEDONY.....	231
CRISTOBALITE.....	195
OPAL.....	116
SULFATE	
CONDUCTIVE.....	229
ONE-STEP STEAM LOSS....	206
CONTINUOUS STEAM LOSS..	211

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	208 (M)	229 (K)	225 (I)	221	5

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.3	2.0	1.5		
THICKNESS (KM)	1.0	2.7	1.5	1.7	0.4
SUBSURFACE AREA (KM**2)	10	50	30	30.0	8.2
BASED ON: GEOLOGIC INFERENCE					

VOLUME (KM**3).....	52.0	STD. DEV. = 18.0
THERMAL ENERGY(10**18 J),	28.88	STD. DEV. = 10.01

COMMENTS: WELLS B 21-2(200 C) AND B 21-1(208 C) ARE BOTH CAPABLE OF TOTAL FLOW OF OVER 204,300 KG/HRI
CHEMICALLY VERY DIFFERENT FROM GRADY HOT SPRINGS! RESERVOIR DEVELOPER THINKS THE HEAT COMES FROM DEEP
CIRCULATION. THICKNESS ESTIMATES BASED ON WELL DATA.

REFERENCES: BENNETT, 1978

COMPILED BY: MARINER, R.

DESERT PEAK AREA, NEVADA

FIELD NAME..... DIXIE HOT SPRINGS
KGRA OR OTHER NAME..... DIXIE VALLEY KGRA
CIRCULAR REFERENCE..... 149

GEOGRAPHIC LOCALITY

STATE..... NEVADA
COUNTY..... CHURCHILL
LATITUDE..... 39-47.9 N
LONGITUDE..... 118-04.0 W
MAPS..... DIXIE HOT SPRINGS 1162,500

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
22N	35E	05 SE	MT. DIABLO

GENERAL INFORMATION

WAVING FIGURE..... 8
WAVING NUMBER..... 71A
ELEVATION (M)..... 1045
SURFACE ACTIVITY..... HOT SPRINGS AND SEEPS
DISCHARGE (L/MIN)..... SEVERAL 100
ROCK TYPES: QUATERNARY ALLUVIUM; TERTIARY VOLCANIC ROCKS; MESOZOIC INTRUSIVE
GEOPHYSICS: GRAVITY, MAGNETIC, AMT, SEISMIC REFRACTION

CHEMISTRY

SAMPLE SOURCE.... MARINER AND OTHERS, 1974, 1975

TEMP(C)	SI02	CA	MG	NA	K	HCO3	CO3	SO4	CL
72	115	3.6	0.02	190	6.5	111	11	111	126
F	B	PH		DEL O(18) SO4	DEL O(18) H2O	DEL D H2O			
16.3	0.09	8.60		-2.09	-15.89	-126.1			

GEOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 143
 NA-K-CA (4/3)..... 137
 NA-K..... 86

SILICA

ADIABATIC..... 139
 CONDUCTIVE..... 145
 CHALCEDONY..... 119
 CRISTOBALITE..... 95
 OPAL..... 24

SULFATE

CONDUCTIVE..... 127
 ONE-STEP STEAM LOSS.... 120
 CONTINUOUS STEAM LOSS.. 121

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	127 (K)	145 (A)	145 (A)	139	4

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ON: STANDARD ESTIMATE					

VOLUME (KM**3)..... 3.3 STD. DEV. = 0.9
 THERMAL ENERGY(10**18 J). 1.12 STD. DEV. = 0.31

REFERENCES: MARINER AND OTHERS, 1974A, 1975; PAGE, 1965; WARING, 1965; RENNER AND OTHERS, 1976; THOMPSON AND OTHERS, 1967; USGS FILE DATA

COMPILED BY: MARINER, R.

DIXIE HOT SPRINGS , NEVADA

FIELD NAME..... COLADO AREA
CIRCULAR REFERENCE..... 150

GEOGRAPHIC LOCALITY

STATE..... NEVADA
COUNTY..... PERSHING
LATITUDE..... 40-14.9 N
LONGITUDE..... 118-24.7 W
MAPS..... OREANA 1162,500; LOVELOCK 1162,500

TOWNSHIP RANGE SECTION BASE & MERIDIAN
28N 32E 33 SE MT. DIABLO

GENERAL INFORMATION

ELEVATION (M)..... 1231
SURFACE ACTIVITY..... NONE
NO. OF SPRINGS..... NONE
NO. OF WELLS..... 2
ROCK TYPES: PLAYA DEPOSITS OVERLYING TERTIARY RHYOLITE AND MESOZOIC SEDIMENTS
GEOPHYSICS: GRAVITY, MAGNETIC

CHEMISTRY

SAMPLE SOURCE.... MARINER, R., UNPUB. USGS FILE DATA
COLLECTION DATE.. 1976/07/27

TEMP(C)	SI02	CA	MG	NA	K	HC03	CO3	S04	CL
60	85	110	6.5	1450	120	199		120	2400
F	H	PH		DEL 0(18) S04	DEL 0(18) H2O	DEL 0 H2O			
4.6	8.7	7.56 AT 38 DEG C							

GEOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 194
 NA-K-CA (4/3)..... 205
 NA-K..... 163

SILICA

ADIABATIC..... 125
 CONDUCTIVE..... 128
 CHALCEDONY..... 101
 CRISTOBALITE..... 78
 OPAL..... 9

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)

MINIMUM 61 (M)	MAXIMUM 128 (A)	MOST LIKELY 101 (D)	MEAN 97	STD. DEV. 14
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UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIAHATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4

BASED ON: STANDARD ESTIMATE

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J).....	0.73	STD. DEV. = 0.24

COMMENTS: MAGNESIUM CORRECTED NA-K-CA GEOTHERMOMETER INDICATES 160 DEG C(MIXING POSSIBLE) WELLS ARE ADJACENT TO THE COLADU KGRA AND HAVE PUMPED DISCHARGE RATES OF SEVERAL THOUSAND L/M.

REFERENCES: STEWART AND CARLSON, 1974

COMPILED BY: MARINER, R.

COLADO AREA , NEVADA

FIELD NAME..... HUMBOLDT HOUSE
CIRCULAR REFERENCE..... 151

GEOGRAPHIC LOCALITY

STATE..... NEVADA
COUNTY..... PERSHING
LATITUDE..... 40-32.1 N
LONGITUDE..... 118-16.1 W
MAPS..... LOVELOCK 11250,000

TOWNSHIP RANGE SECTION BASE & MERIDIAN
31N 33E 21 SE OF NE MT. DIABLO

GENERAL INFORMATION

ELEVATION (M)..... 1375(?)
SURFACE ACTIVITY..... THERMAL WATER DISCHARGING FROM A SULPHUR EXPLORATION WELL
ASSOCIATED DEPOSITS..... SULFUR, TRAVERTINE, AND SINTER(?)
NO. OF WELLS..... 3
ROCK TYPES: PLAYA DEPOSITS OVERLYING TRIASSIC CARBONATES(?)
GEOPHYSICS: GRAVITY, MAGNETIC

CHEMISTRY

SAMPLE SOURCE.... PHILLIPS-CAMPBELL E-1, USGS FILE DATA
COLLECTION DATE.. 1978/06/22

TEMP(C)	SiO2	CA	MG	NA	K	HCO3	CO3	SO4	CL
BOILING	340	43	3.6	1350	230	202		18	2230
F	B	PH		DEL 0(18) SO4	DEL 0(18) H2O	DEL D H2O			
6.2	8.1			-4.57	-14.89				

GEOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	249
NA-K-CA (4/3).....	295
NA-K.....	256
SILICA	
ADIABATIC.....	200
CONDUCTIVE.....	219
CHALCEDONY.....	205
CRISTOBALITE.....	172
OPAL.....	94
SULFATE	
CONDUCTIVE.....	172
ONE-STEP STEAM LOSS....	162
CONTINUOUS STEAM LOSS..	164

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	172 (K)	249 (I)	230 (J)	217	16

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5		
SUBSURFACE AREA (KM**2)	1	3	2	1.7	0.3
BASED ON: STANDARD ESTIMATE				2.0	0.4

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J). 1.82		STD. DEV. = 0.53

COMMENTS: CHEMICAL ANALYSIS FROM TOTAL-FLOW SAMPLE. THE OTHER DEEP EXPLORATION WELL WAS DRILLED BY UNION OIL CO. IN NE NE SEC. 3, T.31N., R. 33E.

REFERENCES: USGS, UNPUB. DATA

COMPILED BY: BROOK, C. AND MARINER, R.

HUMBOLDT HOUSE, NEVADA

FIELD NAME..... KYLE HOT SPRINGS
KGRA OR OTHER NAME..... KYLE HOT SPRINGS KGRA
CIRCULAR REFERENCE..... 152

GEOGRAPHIC LOCALITY

STATE..... NEVADA
COUNTY..... PERSHING
LATITUDE..... 40-24.4 N
LONGITUDE..... 117-52.9 W
MAPS..... KYLE HOT SPRINGS 1162,500

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
29N	36E	01 SW	MT. DIABLO

GENERAL INFORMATION

WARNING FIGURE..... 8
WARNING NUMBER..... 66
ELEVATION (M)..... 1390
SURFACE ACTIVITY..... HOT SPRING AND SEEPS
ASSOCIATED DEPOSITS..... SINTER
NO. OF SPRINGS..... SEVERAL
SPRING TEMPERATURES (C)..... 38 TO 77
DISCHARGE (L/MIN)..... 20
ROCK TYPES: QUATERNARY ALLUVIUM AND PALEOZOIC METAMORPHIC ROCKS
GEOPHYSICS: GRAVITY, MAGNETIC, HEAT FLOW, RESISTIVITY, SP, TELLURIC

CHEMISTRY

SAMPLE SOURCE.... MARINER AND OTHERS, 1974, 1975

TEMP(C)	S102	CA	MG	NA	K	HC03	CO3	S04	CL
77	150	95	25.5	540	80	544		51	770
F	R	PH		DEL O(18) S04	DEL O(18) H2O	DEL O H2O			
5.7	3.8	6.50		-3.93	-15.50	-130.0			

GEO THERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	211
NA-K-CA (4/3).....	169
NA-K.....	235
SILICA	
ADIABATIC.....	153
CONDUCTIVE.....	161
CHALCEDONY.....	137
CRISTOBALITE.....	111
UPAL.....	39
SULFATE	
CONDUCTIVE.....	154
ONE-STEP STEAM LOSS....	144
CONTINUOUS STEAM LOSS..	146

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	154 (K)	161 (A)	161 (A)	159	2

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	2	16	5	7.7	3.0

BASED ON: ACTIVE AND INACTIVE SPRING DEPOSITS AND GRAVITY ANOMALY

VOLUME (KM**3).....	12.8	STD. DEV. = 5.6
THERMAL ENERGY(10**18 J). 4.96		STD. DEV. = 2.19

COMMENTS: MG-CORRECTED NA-K-CA GEOTHERMOMETER INDICATES 75 C LOW FLOW RATE MAY HAVE PERMITTED EXTENSIVE NEAR-SURFACE REACTION WITH THE COUNTRY ROCK.

REFERENCES: MARINER AND OTHERS, 1974A, 1975; TATLOCK, 1969; WARING, 1965; GOLDSTEIN AND OTHERS, 1976; SASS AND OTHERS, 1976

COMPILED BY: MARINER, R.

KYLE HOT SPRINGS, NEVADA

FIELD NAME..... SOU (GILBERT'S) HOT SPRINGS
KGRA OR OTHER NAME..... DIXIE VALLEY KGRA
CIRCULAR REFERENCE..... 153

GEOGRAPHIC LOCALITY

STATE..... NEVADA
COUNTY..... PERSHING
LATITUDE..... 40-05.4 N
LONGITUDE..... 117-43.5 W
MAPS..... CAIN MTN. 1162,500

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
26N	38E	29 SE	MT. DIABLO

GENERAL INFORMATION

WARNING FIGURE..... 8
WARNING NUMBER..... 68
ELEVATION (M)..... 1122
SURFACE ACTIVITY..... HOT SPRINGS
ASSOCIATED DEPOSITS..... TRAVERTINE
NO. OF SPRINGS..... SEVERAL
ROCK TYPES: QUATERNARY ALLUVIUM; TERTIARY FLOWS AND VOLCANIC RELATED SEDIMENTS

CHEMISTRY

SAMPLE SOURCE.... MARINER AND OTHERS, 1974

TEMP(C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
73	65	110	22	165	26	312		370	110
F	H	PH		DEL 0(18) S04	DEL 0(18) H2O	DEL 0 H2O			
		8.1							

GEOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 189
 NA-K-CA (4/3)..... 99
 NA-K..... 244

SILICA

ADIABATIC..... 113
 CONDUCTIVE..... 114
 CHALCEDONY..... 86
 CRISTOBALITE..... 64
 OPAL..... -3

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)

MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
79 (J)	114 (A)	86 (D)	93	8

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4

BASED ON: STANDARD ESTIMATES

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J),	0.70	STD. DEV. = 0.21

REFERENCES: MARINER AND OTHERS, 1974; WARING, 1965; TATLOCK, 1969; RENNER AND OTHERS, 1976

COMPILED BY: MARINER, R.

SOU (GILBERT'S) HOT SPRINGS , NEVADA

FIELD NAME..... LEACH HOT SPRINGS
KGRA OR OTHER NAME..... LEACH HOT SPRINGS KGRA
CIRCULAR REFERENCE..... 154

GEOGRAPHIC LOCALITY

STATE..... NEVADA
COUNTY..... PERSHING
LATITUDE..... 40-36.2 N
LONGITUDE..... 117-38.7 W
MAPS..... LEACH HOT SPRINGS 1162,500

TOWNSHIP RANGE SECTION BASE & MERIDIAN
32N 38E 36 SE MT. DIABLO

GENERAL INFORMATION

WARNING FIGURE..... 8
WARNING NUMBER..... 64
ELEVATION (M)..... 1421
SURFACE ACTIVITY..... HOT SPRINGS
ASSOCIATED DEPOSITS..... SINTER AND TUFA
NO. OF SPRINGS..... 30
SPRING TEMPERATURES (C)..... 34 TO 95
DISCHARGE (L/MIN)..... 690

ROCK TYPES: QUATERNARY ALLUVIUM, TERTIARY SEDIMENTARY ROCKS, BASALT OF UNKNOWN AGE, PALEOZOIC ROCK
GEOPHYSICS: HEAT FLOW

CHEMISTRY

SAMPLE SOURCE.... MARINER AND OTHERS, 1974, 1975
COLLECTION DATE.. 1972/00/00

TEMP(C)	SI02	CA	MG	NA	K	HCO3	CO3	SO4	CL
92	135	8.8	0.5	160	13	366	1	53	29
F	D	PH		DEL O(18) SO4	DEL O(18) H2O	DEL D H2O			
7.8	1.2	7.40		-5.22	-15.70	-128.6			

GEOTHERMOMETERS (C)

CATION

NA-K-CA (1/3).....	176
NA-K-CA (4/3).....	139
NA-K.....	161

SILICA

ADIABATIC.....	147
CONDUCTIVE.....	155
CHALCEDONY.....	130
CRISTOHALITE.....	104
OPAL.....	33

SULFATE

CONDUCTIVE.....	170
ONE-STEP STEAM LOSS....	159
CONTINUOUS STEAM LOSS..	161

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	155 (A)	170 (K)	160 (J)	162	3

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	3.5	9	5	5.8	1.2

BASED ON: HEAT FLOW AND SHALLOW TEMPERATURE SURVEYS

VOLUME (KM**3).....	9.7	STD. DEV. = 2.7
THERMAL ENERGY(10**10 J). 3.85		STD. DEV. = 1.06

COMMENTS: DIFFERENCES IN SURFACE TEMPERATURES ARE APPARENTLY RELATED TO THE FLOW RATES.

REFERENCES: MARINER AND OTHERS, 1974A, 1975; OLMSTED AND OTHERS, 1975; WARING, 1965; SASS AND OTHERS, 1977

COMPILED BY: MARINER, R.

LEACH HOT SPRINGS , NEVADA

FIELD NAME..... GOLCONDA HOT SPRINGS
CIRCULAR REFERENCE..... 155

GEOGRAPHIC LOCALITY

STATE..... NEVADA
COUNTY..... HUMBOLDT
LATITUDE..... 40-57.7 N
LONGITUDE..... 117-29.6 W
MAPS..... GOLCONDA 1124,000

TOWNSHIP RANGE SECTION BASE & MERIDIAN
J6N 40E 29 SE MT. DIABLO

GENERAL INFORMATION

WAKING FIGURE..... 8
WAKING NUMBER..... 19
ELEVATION (M)..... 1329
SURFACE ACTIVITY..... HOT SPRINGS
ASSOCIATED DEPOSITS..... TRAVERTINE
NO. OF SPRINGS..... 12
SPRING TEMPERATURES (C)..... 49 TO 74
DISCHARGE (L/MIN)..... 750
ROCK TYPES: QUATERNARY ALLUVIUM; CAMBRIAN QUARTZITE; TERTIARY VOLCANIC ROCKS

CHEMISTRY

SAMPLE SOURCE..... MARINER AND OTHERS, 1974, 1975

TEMP (C)	SI02	CA	MG	NA	K	HCO3	CO3	SO4	CL
74	66	33	6.8	130	22	429		56	18
F	B	PH		DEL O (18) SO4	DEL O (18) H2O	DEL O H2O			
1.8	1.1	6.53			-15.65	-125.5			

GEOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 201
 NA-K-CA (4/3)..... 121
 NA-K..... 255

SILICA

ADIABATIC..... 114
 CONDUCTIVE..... 115
 CHALCEDONY..... 86
 CRISTOBALITE..... 65
 OPAL..... -2

RESERVOIR PROPERTIES SUHSURFACE TEMP (C)

MINIMUM
 86 (D,I)

MAXIMUM
 115 (A)

MOST LIKELY
 86 (D,I)

MEAN
 96

STD. DEV.
 7

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE

B) QUARTZ CONDUCTIVE, PH-CORRECTED

C) QUARTZ ADIABATIC

D) CHALCEDONY

E) CHALCEDONY, PH-CORRECTED

F) CRISTOBALITE

G) AMORPHOUS SILICA

H) NA-K

I) NA-K-CA

J) NA-K-CA, MG-CORRECTED

K) SULFATE GEOTHERMOMETER

L) SURFACE TEMPERATURE

M) WELL TEMPERATURE

N) MIXING MODEL

O) RENNER AND OTHERS, 1976

DEPTH TO TOP (KM)

MINIMUM
 0.5

MAXIMUM
 2.0

MOST LIKELY
 1.5

MEAN

STD. DEV.

THICKNESS (KM)

1.0

2.5

1.5

1.7

0.3

SUHSURFACE AREA (KM**2)

1

3

2

2.0

0.4

BASED ON: STANDARD ESTIMATE

VOLUME (KM**3)..... 3.3

STD. DEV. = 0.9

THERMAL ENERGY(10**18 J). 0.73

STD. DEV. = 0.21

REFERENCES: MARINER AND OTHERS, 1974A, 1975; WARING, 1965; WILLDEN, 1964; ERICKSON AND MARSH, 1974; RENNER AND OTHERS, 1976

COMPILED BY: MARINER, R.

GOLCONDA HOT SPRINGS, NEVADA

FIELD NAME..... HOT POT (BLOSSOM HOT SPRINGS)
CIRCULAR REFERENCE..... 156

GEOGRAPHIC LOCALITY

STATE..... NEVADA
COUNTY..... HUMPHOLDT
LATITUDE..... 40-55.3 N
LONGITUDE..... 117-06.5 W
MAPS..... HOT POT 1124,000

TOWNSHIP RANGE SECTION
35N 43E 11 SW

BASE & MERIDIAN
MT. DIABLO

GENERAL INFORMATION

WAKING FIGURE..... 8
WAKING NUMBER..... 19
ELEVATION (M)..... 1353
SURFACE ACTIVITY..... HOT SPRING
NO. OF SPRINGS..... 1
DISCHARGE (L/MIN)..... 265
ROCK TYPES: QUATERNARY ALLUVIUM, TERTIARY BASALT(?), AND CAMBRIAN QUARTZITE

CHEMISTRY

SAMPLE SOURCE.... MARINER AND OTHERS, 1974, 1975

TEMP(C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
58	80	29	5	288	33	823		60	28
F	B	PH.		DEL 0(18) S04	DEL 0(18) H2O	DEL D H2O			
		8.0							

GEOOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 194
 NA-K-CA (4/3)..... 154
 NA-K..... 200

SILICA

ADIABATIC..... 122
 CONDUCTIVE..... 125
 CHALCEDONY..... 97
 CRISTOBALITE..... 74
 OPAL..... 6

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)

MINIMUM
 97 (D)

MAXIMUM
 125 (A)

MOST LIKELY
 114 (J)

MEAN
 112

STD. DEV.
 6

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIAHATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4

BASED ON: STANDARD ESTIMATE

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J). 0.87		STD. DEV. = 0.25

REFERENCES: MARINER AND OTHERS, 1974A, 1975; WILLDEN, 1964; HOSE AND TAYLOR, 1974

COMPILED BY: MARINER, R.

HOT POT (BLOSSOM HOT SPRINGS) , NEVADA

FIELD NAME..... HOT SPRINGS RANCH
CIRCULAR REFERENCE..... 157

GEOGRAPHIC LOCALITY

STATE..... NEVADA
COUNTY..... HUMPHOLDT
LATITUDE..... 40-45.7 N
LONGITUDE..... 117-29.5 W
MAPS..... EONA MTN. 1162.500

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
J3N	40E	05 SE	MT. DIAULO

GENERAL INFORMATION

ELEVATION (M)..... 1475
SURFACE ACTIVITY..... HOT SPRINGS
ASSOCIATED DEPOSITS..... MINOR TRAVERTINE
NO. OF WELLS..... 1
WELL DEPTHS (M)..... 937
ROCK TYPES: CAMBRIAN PHYLLITIC SHALE

CHEMISTRY

SAMPLE SOURCE.... MARINER AND OTHERS, 1974, 1975

TEMP(C)	SiO2	CA	MG	NA	K	HCO3	CO3	SO4	CL
85	125	16	0.9	200	18	385		140	41
F	B	PH		DEL 0(18) SO4		DEL 0(18) H2O		DEL D H2O	
		8.40				-15.74		-131.4	

GEOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 180
 NA-K-CA (4/3)..... 139
 NA-K..... 172

SILICA

ADIABATIC..... 143
 CONDUCTIVE..... 150
 CHALCEDONY..... 125
 CRISTOBALITE..... 100
 OPAL..... 29

RESERVOIR PROPERTIES

SURFACE TEMP (C)

MINIMUM

125 (D)

MAXIMUM

160 (J)

MOST LIKELY

150 (A)

MEAN

145

STD. DEV.

7

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE

F) CRISTOBALITE

K) SULFATE GEOTHERMOMETER

B) QUARTZ CONDUCTIVE, PH-CORRECTED

G) AMORPHOUS SILICA

L) SURFACE TEMPERATURE

C) QUARTZ ADIABATIC

H) NA-K

M) WELL TEMPERATURE

D) CHALCEDONY

I) NA-K-CA

N) MIXING MODEL

E) CHALCEDONY, PH-CORRECTED

J) NA-K-CA, MG-CORRECTED

O) RENNER AND OTHERS, 1976

MINIMUM

0.5

MAXIMUM

2.0

MOST LIKELY

1.5

MEAN

1.7

STD. DEV.

0.3

DEPTH TO TOP (KM)

THICKNESS (KM)

SUBSURFACE AREA (KM**2)

BASED ON: STANDARD ESTIMATE

VOLUME (KM**3)..... 3.3

STD. DEV. = 0.9

THERMAL ENERGY(10**18 J). 1.17

STD. DEV. = 0.33

COMMENTS: SPRING WATER SUPERSATURATED WITH RESPECT TO CALCITE.

REFERENCES: MARINER AND OTHERS, 1974A, 1975; WILLDEN, 1964

COMPILED BY: MARINER, R.

HOT SPRINGS RANCH , NEVADA

FIELD NAME..... BUFFALO VALLEY HOT SPRINGS
CIRCULAR REFERENCE..... 158

GEOGRAPHIC LOCALITY

STATE..... NEVADA
COUNTY..... LANDER
LATITUDE..... 40-22.1 N
LONGITUDE..... 117-19.5 W
MAPS..... BUFFALO SPRINGS 1162,500

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
29N	41E	23 SE	MT. DIABLO

GENERAL INFORMATION

WAKING FIGURE..... 6
WAKING NUMBER..... 78
ELEVATION (M)..... 1405
SURFACE ACTIVITY..... HOT SPRINGS AND SEEPS
ASSOCIATED DEPOSITS..... TRAVERTINE
NO. OF SPRINGS..... 100 TO 200
SPRING TEMPERATURES (C)..... AMBIENT TO 79
DISCHARGE (L/MIN)..... 36
ROCK TYPES: QUATERNARY ALLUVIUM; QUATERNARY BASALT; TERTIARY TUFF

CHEMISTRY

SAMPLE SOURCE..... MARINER AND OTHERS, 1974, 1975

TEMP (C)	SiO2	CA	MG	NA	K	HCO3	CO3	SO4	CL
49	80	45	4.9	250	34	813		110	29
F 4.8	B 2.3	PH 6.53		DEL O (18) SO4 -3.22		DEL O (18) H2O -15.85		DEL D H2O -131.6	

GEOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 197
 NA-K-CA (4/3)..... 140
 NA-K..... 223

SILICA

ADIABATIC..... 122
 CONDUCTIVE..... 125
 CHALCEDONY..... 97
 CRISTOBALITE..... 74
 OPAL..... 6

SULFATE

CONDUCTIVE..... 140
 ONE-STEP STEAM LOSS.... 128
 CONTINUOUS STEAM LOSS.. 130

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUNSURFACE TEMP (C)	97 (D)	140 (K)	135 (J)	124	10

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUNSURFACE AREA (KM**2)	1.2	6	3	3.4	1.0

BASED ON: TEMPERATURE GRADIENT SURVEY

VOLUME (KM**3)..... 5.7 STD. DEV. = 2.0
 THERMAL ENERGY(10**18 J). 1.67 STD. DEV. = 0.60

COMMENTS: LOW FLOW RATE! GEOTHERMOMETERS ARE SEMIQUANTITATIVE AT BEST. NA-K-CA GEOTHERMOMETER RELATIVELY INSENSITIVE TO LOSS OF CALCIUM.

REFERENCES: MARINER AND OTHERS, 1974A, 1975; OLMSTED AND OTHERS, 1975; WARING, 1965; STEWART AND MCKEE, 1970

COMPILED BY: MARINER, R.

BUFFALO VALLEY HOT SPRINGS, NEVADA

FIELD NAME..... SMITH CREEK VALLEY AREA
CIRCULAR REFERENCE..... 159

GEOGRAPHIC LOCALITY

STATE..... NEVADA
COUNTY..... LANDER
LATITUDE..... 39-18.7 N
LONGITUDE..... 117-32.5 W
MAPS..... MILLETT 11250,000

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
17N	39E	11	MT. DIABLO

GENERAL INFORMATION

WAKING FIGURE..... 8
WAKING NUMBER..... 847
ELEVATION (M)..... 1859
SURFACE ACTIVITY..... HOT SPRINGS
ASSOCIATED DEPOSITS..... TRAVERTINE
NO. OF SPRINGS..... SEVERAL
DISCHARGE (L/MIN)..... 75
ROCK TYPES: QUATERNARY ALLUVIUM, TERTIARY (OLIGOCENE-MIOCENE) ASH-FLOW RHYOLITE

CHEMISTRY

FLOW (L/MIN)..... 25

TEMP(C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
86	110	4.8	0.06	170	8.4	246	5	102	22
F	B	PH		DEL O(18) S04	DEL O(18) H2O	DEL O H2O			
8.9	0.66	7.72		-4.06	-16.48	-130.4			

GEOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	156
NA-K-CA (4/3).....	138
NA-K.....	114
SILICA	
ADIABATIC.....	137
CONDUCTIVE.....	143
CHALCEDONY.....	116
CRISTOBALITE.....	92
OPAL.....	22
SULFATE	
CONDUCTIVE.....	143
ONE-STEP STEAM LOSS....	136
CONTINUOUS STEAM LOSS..	137

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	116 (D)	156 (I)	143 (A,K)	138	8

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
H) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ON: STANDARD ESTIMATE					

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J). 1.11		STD. DEV. = 0.32

REFERENCES: MARINER AND OTHERS, 1974A, 1975; WARING, 1965; MCKEE, 1968; RENNER AND OTHERS, 1976

COMPILED BY: MARINER, R.

SMITH CREEK VALLEY AREA , NEVADA

FIELD NAME..... SPENCER HOT SPRINGS
CIRCULAR REFERENCE..... 160

GEOGRAPHIC LOCALITY

STATE..... NEVADA
COUNTY..... LANDER
LATITUDE..... 39-19.5 N
LONGITUDE..... 116-51.5 W
MAPS..... SPENCER HOT SPRINGS 1162,500

TOWNSHIP RANGE SECTION

BASE & MERIDIAN
MT. DIABLO

GENERAL INFORMATION

WAKING FIGURE..... 8
WAKING NUMBER..... 83
ELEVATION (M)..... 1731
SURFACE ACTIVITY..... HOT SPRINGS AND ARTESIAN WELLS
ASSOCIATED DEPOSITS..... TRAVERTINE
NO. OF SPRINGS..... SEVERAL
DISCHARGE (L/MIN)..... 50
ROCK TYPES: QUATERNARY ALLUVIUM; TERTIARY ASH-FLOW TUFF; JURASSIC GRANITE

CHEMISTRY

SAMPLE SOURCE.... MARINER AND OTHERS, 1974, 1975

TEMP(C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
72	77	43	9.4	200	36	672		51	22
F	H	PH		DEL O(18) S04	DEL O(18) H2O	DEL D H2O			
4.7	2.6	6.50			-16.01	-135.8			

GEOOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 210
 NA-K-CA (4/3)..... 140
 NA-K..... 265

SILICA

ADIABATIC..... 121
 CONDUCTIVE..... 123
 CHALCEDONY..... 95
 CRISTOBALITE..... 72
 OPAL..... 4

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)

MINIMUM
 88 (J)

MAXIMUM
 123 (A)

MOST LIKELY
 95 (D)

MEAN
 102

STD. DEV.
 8

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE

B) QUARTZ CONDUCTIVE, PH-CORRECTED

C) QUARTZ ADIABATIC

D) CHALCEDONY

E) CHALCEDONY, PH-CORRECTED

F) CRISTOBALITE

G) AMORPHOUS SILICA

H) NA-K

I) NA-K-CA

J) NA-K-CA, MG-CORRECTED

K) SULFATE GEOTHERMOMETER

L) SURFACE TEMPERATURE

M) WELL TEMPERATURE

N) MIXING MODEL

O) RENNER AND OTHERS, 1976

DEPTH TO TOP (KM)

MINIMUM
 0.5

MAXIMUM
 2.0

MOST LIKELY
 1.5

MEAN

STD. DEV.

THICKNESS (KM)

1.0

2.5

1.5

1.7

0.3

SUBSURFACE AREA (KM**2)

1

3

2

2.0

0.4

BASED ON: STANDARD ESTIMATE

VOLUME (KM**3)..... 3.3

STD. DEV. = 0.9

THERMAL ENERGY (10**18 J). 0.78

STD. DEV. = 0.23

REFERENCES: MARINER AND OTHERS, 1974A, 1975; MCKEE, 1968; STEWART AND MCKEE, 1970; WARING, 1965; RENNER AND OTHERS, 1976

COMPILED BY: MARINER, R.

SPENCER HOT SPRINGS , NEVADA

FIELD NAME..... DARROUGH HOT SPRINGS
KGRA OR OTHER NAME..... DARROUGH HOT SPRINGS KGRA
CIRCULAR REFERENCE..... 161

GEOGRAPHIC LOCALITY

STATE..... NEVADA
COUNTY..... NYE
LATITUDE..... 38-49.3 N
LONGITUDE..... 117-10.8 W
MAPS..... TONOPAH 1:250,000

TOWNSHIP RANGE SECTION BASE & MERIDIAN
11N 43E 8 MT. DIABLO

GENERAL INFORMATION

WAKING FIGURE..... 8
WAKING NUMBER..... 118
ELEVATION (M)..... 1707
SURFACE ACTIVITY..... HOT SPRINGS
ASSOCIATED DEPOSITS..... MINOR TRAVERTINE
NO. OF SPRINGS..... SEVERAL
DISCHARGE (L/MIN)..... SEVERAL 100
NO. OF WELLS..... 1
WELL DEPTHS (M)..... 278
MAXIMUM WELL TEMP (C)..... 129 AT DEPTH (M) 278(?)
ROCK TYPES: QUATERNARY ALLUVIUM, PALEOZOIC RHYOLITE
GEOPHYSICS: GRAVITY, MAGNETIC, AMT

CHEMISTRY

SAMPLE SOURCE.... MARINER AND OTHERS, 1974, 1975

TEMP (C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
95	98	1.3	0.1	110	2.6	146	3	53	12
F	8	PH		DEL 0 (18) S04	DEL 0 (18) H2O	DEL 0 H2O			
14	0.22	8.30			-15.50	-122.5			

GEOOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	126
NA-K-CA (4/3).....	119
NA-K.....	61
SILICA	
ADIABATIC.....	132
CONDUCTIVE.....	136
CHALCEDONY.....	109
CRISTOBALITE.....	85
OPAL.....	16

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	129 (M)	136 (A)	132 (C)	132	1

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.3	2.0	1.5		
THICKNESS (KM)	1.0	2.7	1.5	1.7	0.4
SUBSURFACE AREA (KM**2)	2	20	3	8.3	4.1
BASED ON: AMI					

VOLUME (KM**3).....	14.4	STD. DEV. = 7.9
THERMAL ENERGY(10**18 J). 4.58		STD. DEV. = 2.50

COMMENTS: BOILING WFL FLOWS AT 4300 L/MIN.

REFERENCES: MARINER AND OTHERS, 1974A, 1975; WARING, 1965; KLEINHAMPL AND ZIONY, 1967; GARSIDE, 1974; USGS FILE DATA

COMPILED BY: MARINER, R.

DARROUGH HOT SPRINGS, NEVADA

FIELD NAME..... BEOWAVE HOT SPRINGS (ABANDONED STEAM WELL)
 KGRA OR OTHER NAME..... BEOWAVE KGRA
 CIRCULAR REFERENCE..... 162

GEOGRAPHIC LOCALITY

STATE..... NEVADA
 COUNTY..... EUREKA
 LATITUDE..... 40-34.2 N
 LONGITUDE..... 116-34.8 W
 MAPS..... DUNPHY 1162,500

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
31N	48E	17 NW	MT. DIABLO

GENERAL INFORMATION

WARNING FIGURE..... 8
 WARNING NUMBER..... 38
 ELEVATION (M)..... 1524
 ASSOCIATED DEPOSITS..... SINTER, HOT SPRINGS, GEYSER, FUMAROLE
 NO. OF WELLS..... 12
 WELL DEPTHS (M)..... 72 TO 2917
 MAXIMUM WELL TEMP (C)..... 211 AT DEPTH (M) 2917
 ROCK TYPES: QUATERNARY ALLUVIUM, MIOCENE BASALT AND ANDESITE
 GEOPHYSICS: GRAVITY, MAGNETIC, RESISTIVITY, SP, SEISMIC GROUND NOISE

CHEMISTRY

SAMPLE SOURCE.... MARINER AND OTHERS, 1974, 1975

TEMP (C)	SiO2	CA	MG	NA	K	HCO3	CO3	SO4	CL
BOILING	500	1.3	0.2	250	38	505	81	64	70
F	H	PH		DEL O(18) SO4		DEL O(18) H2O		DEL D H2O	
18	2.5	9.38		-10.01		-14.76		-130.0	

GEO THERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	242
NA-K-CA (4/3).....	292
NA-K.....	239
SILICA	
ADIABATIC.....	226
CONDUCTIVE.....	252
CHALCEDONY.....	245
CRISTOBALITE.....	207
OPAL.....	128
SULFATE	
CONDUCTIVE.....	295
ONE-STEP STEAM LOSS....	251
CONTINUOUS STEAM LOSS..	264

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	211 (M)	251 (K)	226 (C)	229	8

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.9	1.4	1.1		
THICKNESS (KM)	1.0	2.1	1.5	1.5	0.2
SUBSURFACE AREA (KM**2)	4	8	4	5.3	0.9

BASED ON: SPRINGS AND WELL DISTRIBUTION AND FAULT TREND

VOLUME (KM**3).....	8.2	STD. DEV. = 1.9
THERMAL ENERGY(10**18 J). 4.73		STD. DEV. = 1.11

COMMENTS: MINIMUM TEMPERATURE WAS MEASURED IN A 2917 M WELL (M. LANE, PERSONAL COMMUN., 1978). ANALYSIS FROM STEAM WELL; ISOTOPIC DATA FROM SPRING. DEPTH TO RESERVOIR AND THICKNESS BASED ON DRILL DATA.

REFERENCES: MARINER AND OTHERS, 1974A, 1975; GILLULY AND GATES, 1975; STEWART AND MCKEE, 1970; HOSE AND TAYLOR, 1974; OESTERLING, 1962

COMPILED BY: MARINER, R. AND BROOK, C.

BEOWAKE HOT SPRINGS (ABANDONED STEAM WELL), NEVADA

FIELD NAME..... HOT SPRINGS POINT
 KGRA OR OTHER NAME..... HOT SPRINGS POINT KGRA
 CIRCULAR REFERENCE..... 163

GEOGRAPHIC LOCALITY

STATE..... NEVADA
 COUNTY..... EUREKA
 LATITUDE..... 40-24.2 N
 LONGITUDE..... 116-31.0 W
 MAPS..... CRESCENT VALLEY 1162,500

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
29N	48E	11 NE	MT. DIABLO

GENERAL INFORMATION

WARNING FIGURE..... 8
 WARNING NUMBER..... 88A
 ELEVATION (M)..... 1442
 SURFACE ACTIVITY..... HOT SPRINGS, POOLS, AND SEEPS
 ASSOCIATED DEPOSITS..... TRAVERTINE
 NO. OF SPRINGS..... 2
 DISCHARGE (L/MIN)..... 125
 NO. OF WELLS..... 1
 WELL DEPTHS (M)..... 125
 MAXIMUM WELL TEMP (C)..... 74
 ROCK TYPES: MIOCENE AND PLIOCENE BASALTS, ORDOVICIAN CHERTS AND QUARTZITE
 GEOPHYSICS: GRAVITY

CHEMISTRY

SAMPLE SOURCE.... MARINER AND OTHERS, 1974, 1975

TEMP(C)	SI02	CA	MG	NA	K	HC03	CO3	S04	CL
54	67	53	35	230	58	913		7.0	1.0
F	R	PH		DEL O(18) S04	DEL O(18) H2O	DEL O H2O			
6.6	2.1	6.63			-15.97	-136.1			

GEOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 233
 NA-K-CA (4/3)..... 158
 NA-K..... 325

SILICA

ADIAHATIC..... 115
 CONDUCTIVE..... 116
 CHALCEDONY..... 87
 CRISTOBALITE..... 65
 OPAL..... -2

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)

MINIMUM
 74 (M)

MAXIMUM
 116 (A)

MOST LIKELY
 87 (D)

MEAN
 92

STD. DEV.
 9

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE

B) QUARTZ CONDUCTIVE, PH-CORRECTED

C) QUARTZ ADIAHATIC

D) CHALCEDONY

E) CHALCEDONY, PH-CORRECTED

F) CRISTOBALITE

G) AMORPHOUS SILICA

H) NA-K

I) NA-K-CA

J) NA-K-CA, MG-CORRECTED

K) SULFATE GEOTHERMOMETER

L) SURFACE TEMPERATURE

M) WELL TEMPERATURE

N) MIXING MODEL

O) RENNER AND OTHERS, 1976

DEPTH TO TOP (KM)

MINIMUM
 0.5

MAXIMUM
 2.0

MOST LIKELY
 1.5

MEAN

STD. DEV.

THICKNESS (KM)

1.0

2.5

1.5

1.7

0.3

SUBSURFACE AREA (KM**2)

1

3

2

2.0

0.4

BASED ON: STANDARD ESTIMATE

VOLUME (KM**3)..... 3.3

STD. DEV. = 0.9

THERMAL ENERGY(10**18 J). 0.70

STD. DEV. = 0.21

COMMENTS: MG-CORRECTED NA-K-CA GEOTHERMOMETER INDICATES A TEMPERATURE LESS THAN THE SURFACE TEMPERATURE.
 HIGH MG CONCENTRATION MAY RESULT FROM EXTENSIVE WATER-ROCK REACTION AT OR NEAR THE SURFACE.

REFERENCES: MARINER AND OTHERS, 1974A, 1975; GILLULY AND GATES, 1965

COMPILED BY: MARINER, R.

HOT SPRINGS POINT , NEVADA

FIELD NAME..... HOT SULPHUR SPRINGS (TUSCARORA)
CIRCULAR REFERENCE..... 164

GEOGRAPHIC LOCALITY

STATE..... NEVADA
COUNTY..... ELKO
LATITUDE..... 41-28.2 N
LONGITUDE..... 116-09.0 W
MAPS..... TUSCARORA 1162,500

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
41N	52E	08 SE OF NE	MT. DIABLO

GENERAL INFORMATION

ELEVATION (M)..... 1768
SURFACE ACTIVITY..... HOT SPRINGS
ROCK TYPES: TERTIARY LACUSTRINE ROCKS

CHEMISTRY

SAMPLE SOURCE.... MARINER AND OTHERS, 1974
COLLECTION DATE.. 1972/00/00

TEMP(C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
90	165	12	0.3	160	16	345		61	22
F	R	PH		DEL 0(18) S04	DEL 0(18) H2O	DEL 0 H2O			
10	1.2	7.3			-16.78	-134.9			

GEO THERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	184
NA-K-CA (4/3).....	139
NA-K.....	184
SILICA	
ADIABATIC.....	158
CONDUCTIVE.....	167
CHALCEDONY.....	144
CRISTOBALITE.....	117
OPAL.....	44

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	144 (D)	184 (I)	167 (A)	165	8

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4

BASED ON: STANDARD ESTIMATE

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J). 1.35		STD. DEV. = 0.39

REFERENCES: MARINER AND OTHERS, 1975; ROSE AND TAYLOR, 1974; GRANGER AND OTHERS, 1957; RENNER AND OTHERS, 1976

COMPILED BY: MARINER, R.

HOT SULPHUR SPRINGS (TUSCARORA) , NEVADA

FIELD NAME..... CARLIN AREA
CIRCULAR REFERENCE..... 165

GEOGRAPHIC LOCALITY

STATE..... NEVADA
COUNTY..... ELKO
LATITUDE..... 40-42.0 N
LONGITUDE..... 116-08.0 W
MAPS..... CARLIN 1:62,500

TOWNSHIP RANGE SECTION
 JJN S2E 33

BASE & MERIDIAN
MT. DIABLO

GENERAL INFORMATION

ELEVATION (M)..... 1500
SURFACE ACTIVITY..... HOT SPRINGS
ROCK TYPES: QUATERNARY ALLUVIUM; TERTIARY VOLCANIC ROCKS

CHEMISTRY

SAMPLE SOURCE.... MARINER AND OTHERS, 1974

TEMP (C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
79	70	60	15	45	16	335		52	12
F	R	PH		DEL 0(18) S04	DEL 0(18) H2O	DEL D H2O			
		7.60			-16.64	-132.7			

GEO THERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 218
 NA-K-CA (4/3)..... 81
 NA-K..... 403

SILICA

ADIABATIC..... 117
 CONDUCTIVE..... 118
 CHALCEDONY..... 90
 CRISTOBALITE..... 68
 OPAL..... 0

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)

MINIMUM
 81 (I)

MAXIMUM
 118 (A)

MOST LIKELY
 90 (D)

MEAN
 96

STD. DEV.
 8

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE

B) QUARTZ CONDUCTIVE, PH-CORRECTED

C) QUARTZ ADIABATIC

D) CHALCEDONY

E) CHALCEDONY, PH-CORRECTED

F) CRISTOBALITE

G) AMORPHOUS SILICA

H) NA-K

I) NA-K-CA

J) NA-K-CA, MG-CORRECTED

K) SULFATE GEOTHERMOMETER

L) SURFACE TEMPERATURE

M) WELL TEMPERATURE

N) MIXING MODEL

O) RENNER AND OTHERS, 1976

DEPTH TO TOP (KM)

MINIMUM
 0.5

MAXIMUM
 2.0

MOST LIKELY
 1.5

MEAN

STD. DEV.

THICKNESS (KM)

1.0

2.5

1.5

1.7

0.3

SUBSURFACE AREA (KM**2)

1

3

2

2.0

0.4

BASED ON: STANDARD ESTIMATE

VOLUME (KM**3)..... 3.3

STD. DEV. = 0.9

THERMAL ENERGY(10**18 J). 0.73

STD. DEV. = 0.22

COMMENTS: PH NOT DETERMINED IN THE FIELD.

REFERENCES: MARINER AND OTHERS, 1974; GRANGER AND OTHERS, 1957; SMITH AND KETNER, 1972

COMPILED BY: MARINER, R.

CARLIN AREA , NEVADA

FIELD NAME..... HOT HOLE (ELKO HOT SPRINGS)
KGRA OR OTHER NAME..... ELKO HOT SPRINGS KGRA
CIRCULAR REFERENCE..... 166

GEOGRAPHIC LOCALITY

STATE..... NEVADA
COUNTY..... ELKO
LATITUDE..... 40-49.1 N
LONGITUDE..... 115-46.5 W
MAPS..... ELKO WEST 1124.000

TOWNSHIP RANGE SECTION BASE & MERIDIAN
34N 55E 21 NE MT. DIABLO

GENERAL INFORMATION

WARNING FIGURE..... 8
WARNING NUMBER..... 32
ELEVATION (M)..... 1542
SURFACE ACTIVITY..... HOT SPRING
ASSOCIATED DEPOSITS..... TRAVERTINE
ROCK TYPES: TERTIARY LIMESTONE, VOLCANIC AND LACUSTRINE ROCKS

CHEMISTRY

SAMPLE SOURCE.... MARINER AND OTHERS, 1974, 1975

TEMP (C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
56	65	60	15.5	120	39	488	1	72	16
F	H	PH		DEL 0 (18) S04		DEL 0 (18) H2O		DEL 0 H2O	
1.9	0.70	7.21				-15.31		-144.7	

GEO THERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 234
 NA-K-CA (4/3)..... 127
 NA-K..... 381

SILICA

ADIABATIC..... 113
 CONDUCTIVE..... 114
 CHALCEDONY..... 86
 CRISTOBALITE..... 64
 OPAL..... -3

RESERVOIR PROPERTIES

SUBSURFACE TEMP (C)

MINIMUM

80 (J)

MAXIMUM

114 (A)

MOST LIKELY

86 (D)

MEAN

93

STD. DEV.

7

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE

B) QUARTZ CONDUCTIVE, PH-CORRECTED

C) QUARTZ ADIABATIC

D) CHALCEDONY

E) CHALCEDONY, PH-CORRECTED

F) CRISTOBALITE

G) AMORPHOUS SILICA

H) NA-K

I) NA-K-CA

J) NA-K-CA, MG-CORRECTED

K) SULFATE GEOTHERMOMETER

L) SURFACE TEMPERATURE

M) WELL TEMPERATURE

N) MIXING MODEL

O) RENNER AND OTHERS, 1976

DEPTH TO TOP (KM) MINIMUM
 THICKNESS (KM) 1.0
 SUBSURFACE AREA (KM**2) 1
 BASED ON: STANDARD ESTIMATE

MAXIMUM

2.0

MOST LIKELY

1.5

MEAN

1.7

STD. DEV.

0.3

THICKNESS (KM) 1.0
 SUBSURFACE AREA (KM**2) 1
 BASED ON: STANDARD ESTIMATE

2.5

1.5

2.0

0.4

VOLUME (KM**3)..... 3.3
 THERMAL ENERGY(10**18 J). 0.70

STD. DEV. = 0.9

STD. DEV. = 0.21

REFERENCES: MARINER AND OTHERS, 1974A, 1975; WARING, 1965; GRANGER AND OTHERS, 1957; RENNER AND OTHERS, 1976

COMPILED BY: MARINER, R.

HOT HOLE (ELKU HOT SPRINGS) , NEVADA

FIELD NAME..... MINERAL (SAN JACINTO) HOT SPRINGS
CIRCULAR REFERENCE..... 167

GEOGRAPHIC LOCALITY

STATE..... NEVADA
COUNTY..... ELKO
LATITUDE..... 41-47.3 N
LONGITUDE..... 114-43.3 W
MAPS..... DELEPLAIN 1162,500

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
45N	64E	16	MT. DIABLO

GENERAL INFORMATION

WARNING FIGURE..... 8
WARNING NUMBER..... 22B
ELEVATION (M)..... 1615
SURFACE ACTIVITY..... HOT SPRINGS
NO. OF SPRINGS..... SEVERAL SPRINGS
SPRING TEMPERATURES (C)..... 25 TO 60
DISCHARGE (L/MIN)..... 4500
NO. OF WELLS..... SEVERAL SHALLOW WELLS
ROCK TYPES: TERTIARY LACUSTRINE SEDIMENTS, VOLCANIC FLOWS, AND GRANITE(?)

CHEMISTRY

SAMPLE SOURCE.... MARINER AND OTHERS, 1974
FLOW (L/MIN)..... 4500

TEMP (C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
60	83	1.6	LT 0.01	75	2.2	108		45	15
F	B	PH		DEL 0(18) S04	DEL 0(18) H2O	DEL 0 H2O			
8.9	0.47	9.1							

GEOOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 129
 NA-K-CA (4/3)..... 102
 NA-K..... 75

SILICA

ADIAHATIC..... 124
 CONDUCTIVE..... 127
 CHALCEDONY..... 99
 CRISTOBALITE..... 76
 OPAL..... 8

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	100 (D.I)	128 (A.I)	100 (A.I)	109	7

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIAHATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ON: STANDARD ESTIMATE					

VOLUME (KM**3)..... 3.3 STD. DEV. = 0.9
 THERMAL ENERGY(10**18 J). 0.85 STD. DEV. = 0.25

REFERENCES: MARINER AND OTHERS, 1974; GRANGER AND OTHERS, 1957; RENNER AND OTHERS, 1976

COMPILED BY: MARINER, R.

MINERAL (SAN JACINTO) HOT SPRINGS , NEVADA

FIELD NAME..... HOT SULPHUR SPRINGS (SULPHUR SPRINGS)
CIRCULAR REFERENCE..... 168

GEOGRAPHIC LOCALITY

STATE..... NEVADA
COUNTY..... ELKO
LATITUDE..... 41-09.4 N
LONGITUDE..... 114-59.1 W
MAPS..... OXLEY PEAK 1124,000

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
J8N	62E	20 SE OF SE	MT. DIABLO

GENERAL INFORMATION

WARRING FIGURE..... 8
WARRING NUMBER..... 30
ELEVATION (M)..... 1743
SURFACE ACTIVITY..... HOT SPRINGS
ASSOCIATED DEPOSITS..... TRAVERTINE
NO. OF SPRINGS..... SEVERAL
ROCK TYPES: TERTIARY VOLCANIC ROCKS OVERLYING PALEOZOIC LIMESTONE

CHEMISTRY

SAMPLE SOURCE.... MARINER AND OTHERS, 1974, 1975

TEMP (C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
55	86	48	13	370	46	1230		12	37
F	R	PH		DEL 0 (18) S04	DEL 0 (18) H2O	DEL D H2O			
7.4	0.73	6.60			-16.95	-136.6			

GEO THERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 199
 NA-K-CA (4/3)..... 158
 NA-K..... 211

SILICA

ADIABATIC..... 126
 CONDUCTIVE..... 129
 CHALCEDONY..... 101
 CRISTOBALITE..... 78
 OPAL..... 10

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)

MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
85 (J)	129 (A)	102 (D)	105	9

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	2	6	4	4.0	0.8

BASED ON: SPRING DISTRIBUTION

VOLUME (KM**3).....	6.7	STD. DEV. = 1.9
THERMAL ENERGY(10**18 J). 1.63		STD. DEV. = 0.48

COMMENTS: AN ANALYSIS WITH HIGHER SILICA CONCENTRATION IS NOT USED BECAUSE IT CONTAINS TWICE AS MUCH MAGNESIUM.

REFERENCES: MARINER AND OTHERS, 1974A, 1975; WARING, 1965; GRANGER AND OTHERS, 1957

COMPILED BY: MARINER, R.

HOT SULPHUR SPRINGS (SULPHUR SPRINGS) , NEVADA

FIELD NAME..... SULPHUR HOT SPRINGS (HOT SULPHUR SPRINGS)
 KGRA OR OTHER NAME..... RUBY VALLEY KGRA
 CIRCULAR REFERENCE..... 169

GEOGRAPHIC LOCALITY

STATE..... NEVADA
 COUNTY..... ELKO
 LATITUDE..... 40-35.2 N
 LONGITUDE..... 115-17.1 W
 MAPS..... LAMOILLE 1162,500

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
J1N	S9E	11 NW	MT. DIABLO

GENERAL INFORMATION

ELEVATION (M)..... 1844
 SURFACE ACTIVITY..... HOT SPRINGS
 ASSOCIATED DEPOSITS..... SINTER
 NO. OF SPRINGS..... 101
 SPRING TEMPERATURES (C)..... 45 TO 95
 DISCHARGE (L/MIN)..... 500
 ROCK TYPES: QUATERNARY ALLUVIUM MESOZOIC GRANITE, OLDER METAMORPHICS
 GEOPHYSICS: AMT, GRAVITY, MAGNETIC, TELLURIC, TEMPERATURE SURVEY

CHEMISTRY

SAMPLE SOURCE..... MARINER AND OTHERS, 1974, 1975

TEMP (C)	SI02	CA	MG	NA	K	HC03	CO3	SO4	CL
93	210	1.0	0.03	135	8.9	244	15	40	23
F	R	PH		DEL O(18) SO4		DEL O(18) H2O		DEL D H2O	
17.7	0.20	8.53		-5.05		-16.09		-130.1	

GEOOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	181
NA-K-CA (4/3).....	190
NA-K.....	140
SILICA	
ADIABATIC.....	171
CONDUCTIVE.....	183
CHALCEDONY.....	163
CRISTOBALITE.....	134
OPAL.....	59
SULFATE	
CONDUCTIVE.....	161
ONE-STEP STEAM LOSS....	153
CONTINUOUS STEAM LOSS..	154

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	171 (C)	183 (A)	181 (I)	178	3

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	8	5	4.7	1.4

BASED ON: SHALLOW TEMPERATURE SURVEY AND AMT

VOLUME (KM**3).....	7.8	STD. DEV. = 2.8
THERMAL ENERGY(10**18 J). 3.43		STD. DEV. = 1.25

COMMENTS: SULFATE-ISOTOPE TEMPERATURE(150 DEG C) MAY BE DUE IN PART TO THE OXIDATION OF SULFIDE TO SULFATE AT THE SURFACE.

REFERENCES: MARINER AND OTHERS, 1974A, 1975; OLMSTED AND OTHERS, 1975; GRANGER AND OTHERS, 1957; RENNER AND OTHERS, 1976

COMPILED BY: MARINER, R.

SULPHUR HOT SPRINGS (HOT SULPHUR SPRINGS) , NEVADA

FIELD NAME..... CHERRY CREEK AREA
CIRCULAR REFERENCE..... 170

GEOGRAPHIC LOCALITY

STATE..... NEVADA
COUNTY..... WHITE PINE
LATITUDE..... 39-51.0 N
LONGITUDE..... 114-54.3 W
MAPS..... ELY 11250,000

TOWNSHIP RANGE SECTION
23N 63E 06

BASE & MERIDIAN

GENERAL INFORMATION

WAKING FIGURE..... 8
WAKING NUMBER..... 957
ELEVATION (M)..... 1859
SURFACE ACTIVITY..... HOT SPRINGS
NO. OF SPRINGS..... SEVERAL
ROCK TYPES: TERTIARY GRANITE

CHEMISTRY

SAMPLE SOURCE.... MARINER AND OTHERS, 1975

TEMP(C)	SiO2	CA	MG	NA	K	HCO3	CO3	SO4	CL
61	105	12	0.3	150	4.8	380		1	16
F	H	PH		DEL 0(18) SO4	DEL 0(18) H2O	DEL 0 H2O			
1.2	0.35	7.77			-16.20	-127.8			

GEO THERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 128
 NA-K-CA (4/3)..... 90
 NA-K..... 81

SILICA

ADIABATIC..... 135
 CONDUCTIVE..... 140
 CHALCEDONY..... 114
 CRISTOBALITE..... 89
 OPAL..... 19

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	90 (I)	140 (A)	114 (D)	115	10

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ON STANDARD ESTIMATE					

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY (10**18 J).	0.90	STD. DEV. = 0.27

REFERENCES: MARINER AND OTHERS, 1975

COMPILED BY: MARINER, R.

CHERRY CREEK AREA , NEVADA

New Mexico

FIELD NAME..... VALLES CALDERA
KGRA OR OTHER NAME..... HACA LOCATION NO. 1 KGRA
CIRCULAR REFERENCE..... 171

GEOGRAPHIC LOCALITY

STATE..... NEW MEXICO
COUNTY..... SANDOVAL
LATITUDE..... 35-54.0 N
LONGITUDE..... 106-32.0 W
MAPS..... VALLE SAN ANTONIO 1:24,000; JEMEZ SPRINGS 1:62,500

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
20N	03E	35	NEW MEXICO

GENERAL INFORMATION

WAKING FIGURE..... 2
WAKING NUMBER..... 11, 12
ELEVATION (M)..... 2650
SURFACE ACTIVITY..... HOT SPRINGS, FUMARoles
NO. OF SPRINGS..... SEVERAL IN 3 GROUPS
SPRING TEMPERATURES (C)..... 25 TO 87
DISCHARGE (L/MIN)..... GT 2080
NO. OF WELLS..... 17
WELL DEPTHS (M)..... 800 TO 2745
MAXIMUM WELL TEMP (C)..... 332 AT DEPTH (M) 1500
ROCK TYPES: RHYOLITE FLOWS AND TUFFS AND ANDESITE OVERLYING(?) SANDSTONES AND LIMESTONES
GEOPHYSICS: REGIONAL AEROMAGNETIC AND GRAVITY

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	250	290	278 (M)	273	8

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.4	1.5	1.0		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	25	160	40	75.0	30.2

BASED ON: WELL DISTRIBUTION, GEOLOGY, AEROMAGNETIC SURVEY

VOLUME (KM**3).....	125.0	STD. DEV. =	56.3
THERMAL ENERGY(10**18 J).	86.96	STD. DEV. =	39.29

COMMENTS: ONE GROUP OF ACID-SULFATE SPRINGS , EXTENSIVE HYDROTHERMAL ALTERATION, AND ASSOCIATED GAS SEEPS IN SOUTHWEST QUADRANT OF PLEISTOCENE CALDERA. VAPOR-DOMINATED AREAS OF LIMITED EXTENT LOCALLY OVERLIE HOT-WATER RESERVOIR. A 50 MW GENERATING PLANT IS PLANNED.

REFERENCES: WARING, 1965; SUMMERS, 1965A, B; SMITH AND OTHERS, 1970; LAMBERT, 1976; CORDELL, 1976; R.L. SMITH, PERSONAL COMMUN., 1978; DONDANVILLE, 1978

COMPILED BY: BROOK, C.

VALLES CALDERA, NEW MEXICO

FIELD NAME..... JEMEZ SPRINGS (OJOS CALIENTES)
CIRCULAR REFERENCE..... 172

GEOGRAPHIC LOCALITY

STATE..... NEW MEXICO
COUNTY..... SANDOVAL
LATITUDE..... 35-46.3 N
LONGITUDE..... 106-41.4 W
MAPS..... JEMEZ SPRINGS 1:24,000

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
1NN	02E	23	NEW MEXICO

GENERAL INFORMATION

WARNING FIGURE..... 2
WARNING NUMBER..... 15
ELEVATION (M)..... 1891
SURFACE ACTIVITY..... HOT SPRINGS
NO. OF SPRINGS..... 10
SPRING TEMPERATURES (C)..... 34 TO 76
DISCHARGE (L/MIN)..... 756
ROCK TYPES: ALLUVIUM OVERLYING LIMESTONE

CHEMISTRY

SAMPLE SOURCE.... TRAINER, 1974; USGS FILE DATA
FLOW (L/MIN)..... 4.9
COLLECTION DATE.. 1972/12/02

TEMP (C)	SiO2	CA	MG	NA	K	HCO3	CO3	SO4	CL
75	79	130	4.8	640	82	732	1.5	53	920
F	H	PH		DEL O (18) SO4	DEL O (18) H2O	DEL D H2O			
4.8	7.4	6.3			-10.52	-82.1			

GEOOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	202
NA-K-CA (4/3).....	163
NA-K.....	215
SILICA	
ADIABATIC.....	122
CONDUCTIVE.....	124
CHALCEDONY.....	96
CRISTOBALITE.....	74
OPAL.....	6

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	96 (D)	124 (A)	96 (D)	105	7

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
H) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ON: STANDARD ESTIMATE					

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J). 0.81		STD. DEV. = 0.24

COMMENTS: MAY BE DEPOSITING CALCITE IN THE SUBSURFACE. WARING (1965) REPORTS 50 SPRINGS IN 2 GROUPS. WATER MAY BE DERIVED IN PART FROM RESERVOIR BENEATH VALLES CALDERA.

REFERENCES: WARING, 1965; SUMMERS, 1965A,B; TRAINER, 1974; SMITH AND OTHERS, 1970

COMPILED BY: BROOK, C.

JEMEZ SPRINGS (OJOS CALIENTES), NEW MEXICO

FIELD NAME..... SPENCE SPRING
KGRA OR OTHER NAME..... BACA LOCATION NO. 1 KGRA
CIRCULAR REFERENCE..... 173

GEOGRAPHIC LOCALITY

STATE..... NEW MEXICO
COUNTY..... SANDOVAL
LATITUDE..... 35-51.0 N
LONGITUDE..... 106-37.8 W
MAPS..... JEMEZ SPRINGS 1:62,500

TOWNSHIP RANGE SECTION BASE & MERIDIAN
19N 03E 28 NW NEW MEXICO

GENERAL INFORMATION

ELEVATION (M)..... 2237
SURFACE ACTIVITY..... HOT SPRING
NO. OF SPRINGS..... 1
SPRING TEMPERATURES (C)..... 41
DISCHARGE (L/MIN)..... 167
ROCK TYPES: RHYOLITE OVERLYING SANDSTONE AND LIMESTONE

CHEMISTRY

SAMPLE SOURCE.... TRAINER, 1974: USGS FILE DATA
FLOW (L/MIN)..... 167
COLLECTION DATE.. 1972/12/01

TEMP(C)	SI02	CA	MG	NA	K	HCO3	CO3	SO4	CL
41	100	6.0	1.7	55	1.8	144	1.0	18	12
F	D	PH		DEL O(18) SO4	DEL O(18) H2O	DEL D H2O			
0.7	0.07	8.0			-11.89	-86.8			

GEO THERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 120
 NA-K-CA (4/3)..... 63
 NA-K..... 82

SILICA

ADIABATIC..... 133
 CONDUCTIVE..... 137
 CHALCEDONY..... 110
 CRISTOBALITE..... 87
 OPAL..... 17

RESERVOIR PROPERTIES

SUBSURFACE TEMP (C)

MINIMUM

63 (I)

MAXIMUM

137 (A)

MOST LIKELY

110 (D)

MEAN

103

STD. DEV.

15

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE

B) QUARTZ CONDUCTIVE, PH-CORRECTED

C) QUARTZ ADIABATIC

D) CHALCEDONY

E) CHALCEDONY, PH-CORRECTED

F) CRISTOBALITE

G) AMORPHOUS SILICA

H) NA-K

I) NA-K-CA

J) NA-K-CA, MG-CORRECTED

K) SULFATE GEOTHERMOMETER

L) SURFACE TEMPERATURE

M) WELL TEMPERATURE

N) MIXING MODEL

O) RENNER AND OTHERS, 1976

MINIMUM

0.5

MAXIMUM

2.0

MOST LIKELY

1.5

MEAN

1.7

STD. DEV.

0.3

DEPTH TO TOP (KM)

THICKNESS (KM)

SUBSURFACE AREA (KM**2)

BASED ON: STANDARD ESTIMATE

VOLUME (KM**3)..... 3.3

THERMAL ENERGY(10**18 J). 0.79

STD. DEV. = 0.9

STD. DEV. = 0.26

REFERENCES: SMITH AND OTHERS, 1970; TRAINER, 1974

COMPILED BY: BROOK, C.

SPENCE SPRING , NEW MEXICO

FIELD NAME..... SAN FRANCISCO (LOWER FRISCO) HOT SPRINGS
KGRA OR OTHER NAME..... LOWER FRISCO HOT SPRINGS KGRA
CIRCULAR REFERENCE..... 174

GEOGRAPHIC LOCALITY

STATE..... NEW MEXICO
COUNTY..... CATRON
LATITUDE..... 33-14.7 N
LONGITUDE..... 108-52.8 W
MAPS..... WILSON MOUNTAIN 1124,000

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
12S	20W	23	NEW MEXICO

GENERAL INFORMATION

WAKING FIGURE..... 2
WAKING NUMBER..... 25
ELEVATION (M)..... 1390
SURFACE ACTIVITY..... HOT SPRINGS
NO. OF SPRINGS..... 8
SPRING TEMPERATURES (C)..... 37
DISCHARGE (L/MIN)..... LT 50
ROCK TYPES: TERTIARY BASALT
GEOPHYSICS: GRAVITY

CHEMISTRY

SAMPLE SOURCE.... MARINER AND OTHERS, 1977

TEMP (C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
37	84	46	6.2	270	15	121		39	430
F	R	PH		DEL 0 (18) S04	DEL 0 (18) H2O	DEL 0 H2O			
1.4	0.26	7.35			-10.44	-78.6			

GEO THERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 151
 NA-K-CA (4/3)..... 106
 NA-K..... 124

SILICA

ADIABATIC..... 125
 CONDUCTIVE..... 128
 CHALCEDONY..... 100
 CRISTOBALITE..... 77
 OPAL..... 8

RESERVOIR PROPERTIES

SUBSURFACE TEMP (C)

MINIMUM
 99 (D,J)

MAXIMUM
 128 (A)

MOST LIKELY
 99 (D,J)

MEAN
 109

STD. DEV.
 7

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE

B) QUARTZ CONDUCTIVE, PH-CORRECTED

C) QUARTZ ADIABATIC

D) CHALCEDONY

E) CHALCEDONY, PH-CORRECTED

F) CRISTOBALITE

G) AMORPHOUS SILICA

H) NA-K

I) NA-K-CA

J) NA-K-CA, MG-CORRECTED

K) Sulfate Geothermometer

L) Surface Temperature

M) Well Temperature

N) Mixing Model

O) Renner and Others, 1976

DEPTH TO TOP (KM)

MINIMUM
 0.5

MAXIMUM
 2.0

MOST LIKELY
 1.5

MEAN

STD. DEV.

THICKNESS (KM)

1.0

2.5

1.5

1.7

0.3

SUBSURFACE AREA (KM**2)

1

3

2

2.0

0.4

BASED ON: STANDARD ESTIMATE

VOLUME (KM**3)..... 3.3

STD. DEV. = 0.9

THERMAL ENERGY(10**10 J). 0.84

STD. DEV. = 0.24

COMMENTS: SMALL SPRINGS AND SEEPS ARE SCATTERED FOR 2 KM ALONG THE SAN FRANCISCO RIVER.

REFERENCES: WARING, 1965; SUMMERS, 1965A, BI MARINER AND OTHERS, 1977A; RAMBERG AND OTHERS, 1978

COMPILED BY: BROOK, C.

SAN FRANCISCO (LOWER FRISCO) HOT SPRINGS, NEW MEXICO

FIELD NAME..... RADIUM HOT SPRINGS
KGRA OR OTHER NAME..... RADIUM SPRINGS KGRA
CIRCULAR REFERENCE..... 175

GEOGRAPHIC LOCALITY

STATE..... NEW MEXICO
COUNTY..... DONA ANA
LATITUDE..... 32-30.0 N
LONGITUDE..... 106-55.5 W
MAPS..... SAN DIEGO MOUNTAIN 1162,500

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
21S	01W	10 NW OF NE	NEW MEXICO

GENERAL INFORMATION

WARNING FIGURE..... 2
WARNING NUMBER..... 38
ELEVATION (M)..... 1220
SURFACE ACTIVITY..... EXTINGUISHED HOT SPRINGS
ASSOCIATED DEPOSITS..... TRAVERTINE
NO. OF WELLS..... 1
ROCK TYPES: SANDSTONE AND LIMESTONE
GEOPHYSICS: RESISTIVITY, GRAVITY

CHEMISTRY

SAMPLE SOURCE.... MARINER AND OTHERS, 1977

TEMP(C)	SI02	CA	MG	NA	K	HC03	CO3	S04	CL
52	70	120	15	1100	160	414		260	1650
F	B	PH		DEL O(18) S04	DEL O(18) H2O	DEL D H2O			
4.8	0.68	7.13			-9.06	-74.6			

GEOOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 222
 NA-K-CA (4/3)..... 213
 NA-K..... 232

SILICA

ADIABATIC..... 121
 CONDUCTIVE..... 124
 CHALCEDONY..... 96
 CRISTOBALITE..... 73
 OPAL..... 5

RESERVOIR PROPERTIES

SUBSURFACE TEMP (C)

MINIMUM

74 (M)

MAXIMUM

124 (A)

MOST LIKELY

96 (D)

MEAN

98

STD. DEV.

10

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE

F) CRISTOBALITE

K) SULFATE GEOTHERMOMETER

B) QUARTZ CONDUCTIVE, PH-CORRECTED

G) AMORPHOUS SILICA

L) SURFACE TEMPERATURE

C) QUARTZ ADIABATIC

H) NA-K

M) WELL TEMPERATURE

D) CHALCEDONY

I) NA-K-CA

N) MIXING MODEL

E) CHALCEDONY, PH-CORRECTED

J) NA-K-CA, MG-CORRECTED

O) RENNER AND OTHERS, 1976

MINIMUM

0.5

MAXIMUM

2.0

MOST LIKELY

1.5

MEAN

1.7

STD. DEV.

0.3

DEPTH TO TOP (KM)

THICKNESS (KM)

SUBSURFACE AREA (KM**2)

1.0

1

2.5

3

1.5

2

2.0

2.0

0.4

0.4

BASED ON: STANDARD ESTIMATE AND IN PART RESISTIVITY

VOLUME (KM**3)..... 3.3

STD. DEV. = 0.9

THERMAL ENERGY(10**18 J). 0.75

STD. DEV. = 0.23

COMMENTS: WARING (1965) REPORTS 2 SPRINGS WITH TEMPERATURES OF 74 AND 85 C. MARINER AND OTHERS (1977) REPORT THAT ORIGINAL SPRINGS ARE DRY. TEMPERATURE AND CHEMICAL ANALYSIS FROM PUMPED WELL. SPRING WATER SUPER-SATURATED WITH CALCITE! NA-K-CA GEOTHERMOMETER UNRELIABLE.

REFERENCES: WARING, 1965; SUMMERS, 1965A; BJ JIRACEK AND SMITH, 1976; MARINER AND OTHERS, 1977A; DECKER AND OTHERS, 1975; SEAGER, 1975; SWANBERG, 1975

COMPILED BY: BROOK, C.

RADIUM HOT SPRINGS, NEW MEXICO

FIELD NAME..... LIGHTNING DOCK AREA
 KGRA OR OTHER NAME..... LIGHTNING DOCK KGRA
 CIRCULAR REFERENCE..... 176

GEOGRAPHIC LOCALITY

STATE..... NEW MEXICO
 COUNTY..... HIDALGO
 LATITUDE..... 32-08.9 N
 LONGITUDE..... 108-49.9 W
 MAPS..... SWALLOW FORK PEAK 1:24,000

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
25S	19W	07 NW OF SE	NEW MEXICO

GENERAL INFORMATION

ELEVATION (M)..... 1280
 SURFACE ACTIVITY..... NONE, FOUND BY DRILLING.
 NO. OF WELLS..... 4
 WELL DEPTHS (M)..... 27 TO 173
 MAXIMUM WELL TEMP (C)..... 107 AT DEPTH (M) 907
 ROCK TYPES: ALLUVIUM OVERLYING TERTIARY ANDESITIC TO RHYOLITIC ROCKS
 GEOPHYSICS: RESISTIVITY, GRAVITY

CHEMISTRY

SAMPLE SOURCE.... SWANHERG, 1978

TEMP (C)	SI02	CA	MG	NA	K	HCO3	CO3	SO4	CL
81	143	23.2	0.4	318.6	21.1	103.7		480	87.6
F	B	PH		DEL 0 (18) SO4		DEL 0 (18) H2O		DEL D H2O	
12	0.5	8.16							

GEOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 168
 NA-K-CA (4/3)..... 142
 NA-K..... 140

SILICA

ADIABATIC..... 150
 CONDUCTIVE..... 158
 CHALCEDONY..... 134
 CRISTOBALITE..... 108
 OPAL..... 36

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)

MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
107 (M)	168 (I)	158 (A)	144	13

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.09	2.0	1.0		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4

BASED ON: DIPOLE-DIPOLE RESISTIVITY AND SHALLOW TEMPERATURE SURVEYS

VOLUME (KM**3)..... 3.3 STD. DEV. = 0.9
 THERMAL ENERGY(10**18 J). 1.16 STD. DEV. = 0.35

COMMENTS: CHEMICAL ANALYSIS FROM MCCANT'S WELL: HOT WATER (100 C) OCCURS AT SHALLOW DEPTH (26 M) IN FRACTURED TUFF. OIL TEST WELL (COCKRELL NO-1, FEDERAL) 3 KM NORTH RECORDED 122 C AT 2254 M. NEAR-SURFACE WARM AREA OF 3 KM**2 DEFINED BY AREA OF RAPID SNOW MELT AND ANOMALOUS TEMPERATURES AT 1 M DEPTH.

REFERENCES: KINTZINGER, 1956; SUMMERS, 1965A, B; DEAL AND ELSTON, 1978; JIRACEK AND SMITH, 1976; SWANBERG, 1978; USGS FILE DATA; RAMBERG AND OTHERS, 1978

COMPILED BY: BROOK, C.

LIGHTNING DOCK AREA, NEW MEXICO

Oregon

FIELD NAME..... MT. HOOD AREA
KGRA OR OTHER NAME..... MT, HOOD KGRA
CIRCULAR REFERENCE..... 177

GEOGRAPHIC LOCALITY

STATE..... OREGON
COUNTY..... WASCO/CLACKAMAS
LATITUDE..... 45-22.5 N
LONGITUDE..... 121-42.5 W
MAPS..... CATHEDRAL RIDGE 1124,000; TIMBERLINE LODGE 1124,000

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
02S	09E	29	WILLAMETTE

GENERAL INFORMATION

WAKING FIGURE..... 6
WAKING NUMBER..... 1
AREA OF SURFACE EXPRESSION (KM*2)..... 0.1L
ELEVATION (M)..... 3050
SURFACE ACTIVITY..... FUMARoles AND ACID-SULFATE SPRINGS
NO. OF SPRINGS..... SEVERAL
SPRING TEMPERATURES (C)..... 49 TO 90
ROCK TYPES: QUATERNARY ANDESITIC LAVA AND TUFF

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	90 (0)	150 (0)	125 (0)	122	12

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ON: STANDARD ESTIMATE					

VOLUME (KM**3).....	3.3	STD. DEV. =	0.9
THERMAL ENERGY(10**18 J).	0.96	STD. DEV. =	0.29

COMMENTS: FUMAROLE GASES ARE MORE THAN 97% WATER VAPOR WITH THE REMAINDER CO2 AND H2S. MAY BE A SMALL VAPOR DOMINATED SYSTEM.

REFERENCES: AYRES AND CRESWELL, 1951; WARING, 1965; RENNER AND OTHER, 1976

COMPILED BY: MARINER, R.

MT. HOOD AREA , OREGON

FIELD NAME..... CAREY(AUSTIN) HOT SPRINGS
 KGRA OR OTHER NAME..... CAREY HOT SPRINGS KGRA
 CIRCULAR REFERENCE..... 178

GEOGRAPHIC LOCALITY

STATE..... OREGON
 COUNTY..... CLACKAMAS
 LATITUDE..... 45-01.2 N
 LONGITUDE..... 122-00.6 W
 MAPS..... FISH CREEK MTN. 1162,500

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
06S	07E	30 NW	WILLAMETTE

GENERAL INFORMATION

WAVING FIGURE..... 6
 WAVING NUMBER..... 4
 AREA OF SURFACE EXPRESSION (KM**2). 0.1
 ELEVATION (M)..... 503
 NO. OF SPRINGS..... SEVERAL
 SPRING TEMPERATURES (C)..... 80 TO 91
 DISCHARGE (L/MIN)..... 950
 ROCK TYPES: PLIOCENE TO RECENT BASALTIC FLOW AND PYROCLASTIC ROCKS

CHEMISTRY

SAMPLE SOURCE.... MARINER AND OTHERS, 1974, 1975

TEMP(C)	SI02	CA	MG	NA	K	HCO3	CO3	SO4	CL
86	81	35	0.1	300	7.1	56		140	430
F	H	PH		DEL O(18) SO4		DEL O(18) H2O		DEL D H2O	
1.4	2.6	7.63		-2.41		-12.22		-94.5	

GEOOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	118
NA-K-CA (4/3).....	87
NA-K.....	61
SILICA	
ADIABATIC.....	123
CONDUCTIVE.....	126
CHALCEDONY.....	98
CRISTOBALITE.....	75
OPAL.....	7
SULFATE	
CONDUCTIVE.....	181
ONE-STEP STEAM LOSS....	167
CONTINUOUS STEAM LOSS..	170

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	87 (I)	126 (A)	98 (D)	104	8

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ON: STANDARD ESTIMATE					

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J). 0.80		STD. DEV. = 0.24

COMMENTS: SULFATE - ISOTOPES INDICATE 181 DEG C, MAY BE UNRELIABLE DUE TO OXIDATION OF H2S OR INDICATE A VERY DEEP RESERVOIR

REFERENCES: MARINER AND OTHERS, 1974B, 1975; PECK AND OTHERS, 1964; WARING, 1965

COMPILED BY: MARINER, R.

CAREY(AUSTIN) HOT SPRINGS , OREGON

FIELD NAME..... BREITENBUSH HOT SPRINGS
KGRA OR OTHER NAME..... BREITENBUSH HOT SPRINGS KGRA
CIRCULAR REFERENCE..... 179

GEOGRAPHIC LOCALITY

STATE..... OREGON
COUNTY..... MARION
LATITUDE..... 44-46.9 N
LONGITUDE..... 121-58.5 W
MAPS..... BREITENBUSH HOT SPRINGS 11621500

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
09S	07E	20 NE	WILLAMETTE

GENERAL INFORMATION

WARNING FIGURE..... 6
WARNING NUMBER..... 6
AREA OF SURFACE EXPRESSION (KM**2)..... 0.1
ELEVATION (M)..... 683
SURFACE ACTIVITY..... HOT SPRINGS
NO. OF SPRINGS..... 40
SPRING TEMPERATURES (C)..... 60 TO 92
DISCHARGE (L/MIN)..... 3400
ROCK TYPES: MIOCENE BASALT, TUFF-BRECCIA, TUFFS, AND ALTERED ROCK
GEOPHYSICS: GRAVITY, MAGNETIC, AMT

CHEMISTRY

SAMPLE SOURCE.... MARINER AND OTHERS, 1974

TEMP(C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
92	83	100	1.3	720	31	142		140	1300
F	B	PH		DEL 0(18) S04	DEL 0(18) H2O	DEL D H2O			
3.4	4.1	7.31		-2.67	-11.66	-97.5			

GEOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 149
 NA-K-CA (4/3)..... 128
 NA-K..... 103

SILICA

ADIABATIC..... 124
 CONDUCTIVE..... 127
 CHALCEDONY..... 99
 CRISTOBALITE..... 76
 OPAL..... 8

SULFATE

CONDUCTIVE..... 195
 ONE-STEP STEAM LOSS... 179
 CONTINUOUS STEAM LOSS.. 182

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)

MINIMUM
 99 (D)

MAXIMUM
 149 (I)

MOST LIKELY
 127 (A)

MEAN
 125

STD. DEV.
 10

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE

H) QUARTZ CONDUCTIVE, PH-CORRECTED

C) QUARTZ ADIABATIC

D) CHALCEDONY

E) CHALCEDONY, PH-CORRECTED

F) CRISTOBALITE

G) AMORPHOUS SILICA

H) NA-K

I) NA-K-CA

J) NA-K-CA, MG-CORRECTED

K) SULFATE GEOTHERMOMETER

L) SURFACE TEMPERATURE

M) WELL TEMPERATURE

N) MIXING MODEL

O) RENNER AND OTHERS, 1976

DEPTH TO TOP (KM)

MINIMUM
 0.5

MAXIMUM
 2.0

MOST LIKELY
 1.5

MEAN

STD. DEV.

THICKNESS (KM)

1.0

2.5

1.5

1.7

0.3

SUBSURFACE AREA (KM**2)

1

3

2

2.0

0.4

BASED ON: STANDARD ESTIMATE AND AMT

VOLUME (KM**3)..... 3.3

STD. DEV. = 0.9

THERMAL ENERGY(10**18 J). 0.99

STD. DEV. = 0.29

COMMENTS: SULFATE-ISOTOPE GEOTHERMOMETER INDICATES 195 DEG C AND MAY INDICATE A DEEP RESERVOIR

REFERENCES: MARINER AND OTHERS, 1974B, 1975; PECK AND OTHERS, 1964; WARING, 1965; USGS FILE DATA

COMPILED BY: MARINER, R.

BREITENBUSH HOT SPRINGS , OREGON

FIELD NAME..... KAHNEETAH HOT SPRINGS
CIRCULAR REFERENCE..... 180

GEOGRAPHIC LOCALITY

STATE..... OREGON
COUNTY..... WASCO
LATITUDE..... 44-51.9 N
LONGITUDE..... 121-12.9 W
MAPS..... EAGLE BUTTE 1124,000; BEND 11250,000

TOWNSHIP RANGE SECTION BASE & MERIDIAN
08S 13E 20 WILLAMETTE

GENERAL INFORMATION

ELEVATION (M)..... 448
SURFACE ACTIVITY..... HOT SPRINGS
NO. OF SPRINGS..... SEVERAL
SPRING TEMPERATURES (C)..... 52
DISCHARGE (L/MIN)..... 200
ROCK TYPES: OLIGOCENE AND MIOCENE RHYOLITES AND TUFFS

CHEMISTRY

SAMPLE SOURCE.... MARINER AND OTHERS, 1974

TEMP (C)	SI02	CA	MG	NA	K	HCO3	CO3	SO4	CL
52	104	3.2	0.05	325	3.4	493	9	34	155
F	B	PH		DEL 0(18) SO4	DEL 0(18) H2O	DEL D H2O			
21	2.6	8.32			-14.75	-118.9			

GEO THERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	102
NA-K-CA (4/3).....	120
NA-K.....	17
SILICA	
ADIABATIC.....	135
CONDUCTIVE.....	139
CHALCEDONY.....	113
CRISTOBALITE.....	89
OPAL.....	19

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	102 (I)	113 (D)	113 (D)	109	3

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
H) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4

BASED ON: STANDARD ESTIMATE

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J). 0.85		STD. DEV. = 0.24

REFERENCES: MARINER AND OTHERS, 1974B; 1975; WATERS, 1968; HODGE, 1941

COMPILED BY: MARINER, R.

KAHNEETAH HOT SPRINGS , OREGON

FIELD NAME..... BELKNAP HOT SPRINGS
 KGRA OR OTHER NAME..... BELKNAP-FOLEY HOT SPRINGS KGRA
 CIRCULAR REFERENCE..... 181

GEOGRAPHIC LOCALITY

STATE..... OREGON
 COUNTY..... LANE
 LATITUDE..... 44-11.6 N
 LONGITUDE..... 122-03.2 W
 MAPS..... MCKENZIE BRIDGE 1162,500

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
16S	06E	11 SE OF NW	WILLAMETTE

GENERAL INFORMATION

WARNING FIGURE..... 6
 WARNING NUMBER..... 18
 ELEVATION (M)..... 824
 SURFACE ACTIVITY..... HOT SPRINGS
 NO. OF SPRINGS..... 3
 SPRING TEMPERATURES (C)..... 64 TO 71
 DISCHARGE (L/MIN)..... 300
 ROCK TYPES: OLIVINE BASALT

CHEMISTRY

SAMPLE SOURCE.... MARINER AND OTHERS, 1974, 1975

TEMP (C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
71	96	210	0.2	690	15	17		170	1300
F	n	PH		DEL O(18) S04		DEL O(18) H2O		DEL O H2O	
1.2	6.4	7.62		+0.35		-11.74		-95.8	

GEOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	113
NA-K-CA (4/3).....	82
NA-K.....	56
SILICA	
ADIABATIC.....	131
CONDUCTIVE.....	135
CHALCEDONY.....	108
CRISTOBALITE.....	84
OPAL.....	15
SULFATE	
CONDUCTIVE.....	148
ONE-STEP STEAM LOSS....	138
CONTINUOUS STEAM LOSS..	139

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	82 (I)	148 (K)	108 (D)	113	14

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ON: STANDARD ESTIMATE					

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J). 0.88		STD. DEV. = 0.28

COMMENTS: MAY BE PART OF A LARGER SYSTEM WHICH INCLUDES FOLEY HOT SPRINGS

REFERENCES: MARINER AND OTHERS, 1974B, 1975; WARING, 1965; PECK AND OTHERS, 1964

COMPILED BY: MARINER, R.

HELKNAH HOT SPRINGS , OREGON

FIELD NAME..... FOLEY HOT SPRINGS
KGRA OR OTHER NAME..... BELKNAP-FOLEY HOT SPRINGS KGRA
CIRCULAR REFERENCE..... 182

GEOGRAPHIC LOCALITY

STATE..... OREGON
COUNTY..... LANE
LATITUDE..... 44-09.8 N
LONGITUDE..... 122-05.9 W
MAPS..... MCKENZIE BRIDGE 1162,500

TOWNSHIP RANGE SECTION BASE & MERIDIAN
16S 06E 28 NW OF NW WILLAMETTE

GENERAL INFORMATION

WAKING FIGURE..... 6
WAKING NUMBER..... 19
ELEVATION (M)..... 518
SURFACE ACTIVITY..... HOT SPRINGS
NO. OF SPRINGS..... 4
SPRING TEMPERATURES (C)..... 72 TO 79
ROCK TYPES: BASALT

CHEMISTRY

SAMPLE SOURCE.... R. BOWEN, UNPUB. ANALYSIS
COLLECTION DATE.. 1976/03/08

TEMP(C)	SiO2	CA	MG	NA	K	HC03	C03	S04	CL
78	60	494	0.8	475	11.2	16		550	1304
F	B	PH 8.1		DEL 0(18) S04	DEL 0(18) H2O		DEL 0 H2O		

GEOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 106
 NA-K-CA (4/3)..... 52
 NA-K..... 61

SILICA

ADIABATIC..... 110
 CONDUCTIVE..... 111
 CHALCEDONY..... 81
 CRISTOBALITE..... 60
 OPAL..... -7

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)

MINIMUM
 81 (D)

MAXIMUM
 111 (A)

MOST LIKELY
 106 (I)

MEAN
 99

STD. DEV.
 7

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIAHATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4
VOLUME (KM**3).....	3.3	STD. DEV. = 0.9			
THERMAL ENERGY (10**18 J).	0.76	STD. DEV. = 0.22			

COMMENTS: MAY BE PART OF THE SAME SYSTEM AS BELKNAP HOT SPRINGS 6KM NE OF FOLEY H.S.

REFERENCES: WARING, 1965

COMPILED BY: MARINER, R.

FOLEY HOT SPRINGS , OREGON

FIELD NAME..... MCCREDIE (WININO) HOT SPRINGS
KGRA OR OTHER NAME..... MCCREDIE HOT SPRINGS KGRA
CIRCULAR REFERENCE..... 183

GEOGRAPHIC LOCALITY

STATE..... OREGON
COUNTY..... LANE
LATITUDE..... 43-42.6 N
LONGITUDE..... 122-17.3 W
MAPS..... OAKRIDGE 1162,500

TOWNSHIP RANGE SECTION
21S 04E 36 NW

BASE & MERIDIAN
WILLAMETTE

GENERAL INFORMATION

WARNING FIGURE..... 6
WARNING NUMBER..... 22
ELEVATION (M)..... 634
SURFACE ACTIVITY..... HOT SPRINGS
NO. OF SPRINGS..... 15
DISCHARGE (L/MIN)..... 76
ROCK TYPES: ANDESITE, DACITE, AND RHYODACITE TUFFS, DOMES, AND FLOWS

CHEMISTRY

SAMPLE SOURCE..... MARINER AND OTHERS, 1975

TEMP(C)	SI02	CA	MG	NA	K	HC03	CO3	S04	CL
73	79	460	0.9	1000	22	21		240	2200

F	B	PH	DEL 0(18) S04	DEL 0(18) H2O	DEL 0 H2O
2.7	18	7.29			-94.0

GEOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 114
 NA-K-CA (4/3)..... 81
 NA-K..... 56

SILICA

ADIABATIC..... 122
 CONDUCTIVE..... 124
 CHALCEDONY..... 96
 CRISTOBALITE..... 74
 OPAL..... 6

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)

MINIMUM
 81 (I)

MAXIMUM
 96 (D)

MOST LIKELY
 96 (D)

MEAN
 91

STD. DEV.
 4

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE

F) CRISTOBALITE

K) SULFATE GEOTHERMOMETER

B) QUARTZ CONDUCTIVE, PH-CORRECTED

G) AMORPHOUS SILICA

L) SURFACE TEMPERATURE

C) QUARTZ ADIABATIC

H) NA-K

M) WELL TEMPERATURE

D) CHALCEDONY

I) NA-K-CA

N) MIXING MODEL

E) CHALCEDONY, PH-CORRECTED

J) NA-K-CA, MG-CORRECTED

O) RENNER AND OTHERS, 1976

DEPTH TO TOP (KM) MINIMUM 0.5
 THICKNESS (KM) 1.0
 SUBSURFACE AREA (KM**2) 1
 BASED ON: STANDARD ESTIMATE

MAXIMUM 2.0
 MOST LIKELY 1.5
 2.5
 2

MEAN
 STD. DEV.
 1.7 0.3
 2.0 0.4

VOLUME (KM**3)..... 3.3
 THERMAL ENERGY(10**18 J). 0.68

STD. DEV. = 0.9
 STD. DEV. = 0.19

REFERENCES: WARING, 1965; MARINER AND OTHERS, 1975

COMPILED BY: BROOK, C.

MCCREDIE (WININO) HOT SPRINGS , OREGON

FIELD NAME..... NEWBERRY CALDERA
 KGRA OR OTHER NAME..... NEWBERRY CALDERA KGRA
 CIRCULAR REFERENCE..... 184

GEOGRAPHIC LOCALITY

STATE..... OREGON
 COUNTY..... DESCHUTES
 LATITUDE..... 43-43.0 N
 LONGITUDE..... 121-14.0 W
 MAPS..... CRESCENT 1:250,000; PAULINA PEAK 1:24,000

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
21S	13E	29	WILLAMETTE

GENERAL INFORMATION

WAVING FIGURE..... 6
 WAVING NUMBER..... 32.33
 ELEVATION (M)..... 1950
 SURFACE ACTIVITY..... HOT SPRINGS
 NO. OF SPRINGS..... SEVERAL IN 2 GROUPS
 SPRING TEMPERATURES (C)..... 21 TO 62
 DISCHARGE (L/MIN)..... 38
 ROCK TYPES: PLEISTOCENE AND HOLOCENE ANDESITE AND BASALT; CALDERA STRUCTURE

CHEMISTRY

SAMPLE SOURCE.... MARINER AND OTHERS, 1975

TEMP (C)	SiO2	CA	MG	NA	K	HCO3	CO3	SO4	CL
62	36	38	16	32	3.8	184		58	0.4
F	B	PH		DEL O (18) SO4		DEL O (18) H2O		DEL O H2O	
0.2	0.9	6.49				-9.42		-76.2	

GEOOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	155
NA-K-CA (4/3).....	44
NA-K.....	205
SILICA	
ADIABATIC.....	90
CONDUCTIVE.....	87
CHALCEDONY.....	56
CRISTOBALITE.....	37
OPAL.....	-26

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	180	280	230	230	20

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	10	50	25	28.3	8.2
BASED ON: GEOLOGIC INFERENCE					

VOLUME (KM**3).....	47.2	STD. DEV. = 16.5
THERMAL ENERGY(10**18 J). 27.41		STD. DEV. = 9.99

COMMENTS: CHEMICAL ANALYSIS FROM HOT SPRINGS AT EAST LAKE. CHEMICAL COMPOSITION OF HOT SPRINGS AT BOTH EAST LAKE AND PAULINA LAKE INDICATES THAT THE WATERS ARE HEATED LAKE WATERS; GEOTHERMOMETRY IS UNRELIABLE. TEMPERATURE ESTIMATES ARE BASED ON COMPARISON WITH OTHER QUATERNARY CALDERAS.

REFERENCES: WARING, 1965; MARINER AND OTHERS, 1975; USGS FILE DATA

COMPILED BY: BROOK, C.

NEWHERRY CALDERA, OREGON

FIELD NAME..... UMPQUA HOT SPRINGS
CIRCULAR REFERENCE..... 185

GEOGRAPHIC LOCALITY

STATE..... OREGON
COUNTY..... DOUGLAS
LATITUDE..... 43-17.5 N
LONGITUDE..... 122-22.0 W
MAPS..... TOKETEE FALLS 1162,500

TOWNSHIP RANGE SECTION
26S 04E 20

BASE & MERIDIAN
WILLAMETTE

GENERAL INFORMATION

WARNING FIGURE..... 6
WARNING NUMBER..... 24
ELEVATION (M)..... 799
SURFACE ACTIVITY..... HOT SPRINGS
ASSOCIATED DEPOSITS..... TRAVERTINE
NO. OF SPRINGS..... 2
SPRING TEMPERATURES (C)..... 41 TO 46
DISCHARGE (L/MIN)..... 19
ROCK TYPES: QUATERNARY BASALT OVERLYING TERTIARY ANDESITIC TUFFS

CHEMISTRY

SAMPLE SOURCE..... USGS FILE DATA

TEMP(C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
46	90	340	41	2400	63	1380		190	3500
F	H	PH		DEL 0(18) S04	DEL 0(18) H2O	DEL D H2O			
1.5	41	6.37							

GEOOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	135
NA-K-CA (4/3).....	141
NA-K.....	67
SILICA	
ADIABATIC.....	128
CONDUCTIVE.....	131
CHALCEDONY.....	104
CRISTOBALITE.....	81
OPAL.....	12

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	100 (J)	131 (A)	104 (D)	112	7

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ON: STANDARD ESTIMATE					

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**10 J). 0.87		STD. DEV. = 0.25

COMMENTS: CARBON DIOXIDE CHARGED WATER, GEOTHERMOMETERS MAY NOT BE RELIABLE.

REFERENCES: WARING, 1965; USGS FILE DATA

COMPILED BY: MARINER, R. AND BROOK, C.

UMPOUA HOT SPRINGS, OREGON

FIELD NAME..... KLAMATH HILLS AREA
 KGRA OR OTHER NAME..... KLAMATH FALLS KGRA
 CIRCULAR REFERENCE..... 186

GEOGRAPHIC LOCALITY

STATE..... OREGON
 COUNTY..... KLAMATH
 LATITUDE..... 42-03.0 N
 LONGITUDE..... 121-44.5 W
 MAPS..... KLAMATH FALLS 1162,500; MERRILL 1162,500

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
40S	09E	34 NE	WILLAMETTE

GENERAL INFORMATION

ELEVATION (M)..... 1256
 SURFACE ACTIVITY..... NONE, FOUND BY DRILLING
 ASSOCIATED DEPOSITS..... SILICIFIED ROCKS
 NO. OF WELLS..... SEVERAL
 WELL DEPTHS (M)..... 47 TO 127
 MAXIMUM WELL TEMP (C)..... 93 AT DEPTH (M) 1277
 ROCK TYPES: LACUSTRINE AND FLUVIATILE TUFFACEOUS DEPOSITS OVERLYING BASALT
 GEOPHYSICS: GRAVITY, MAGNETIC, HEAT FLOW

CHEMISTRY

SAMPLE SOURCE.... SAMMEL, 1976 (LISKEY WELL)
 COLLECTION DATE.. 1974/05/09

TEMP (C)	SI02	CA	MG	NA	K	HC03	CO3	S04	CL
93	90	15	LT 0.1	200	4.0	48	2	360	59
F	H	PH		DEL O(18) S04		DEL O(18) H2O		DEL D H2O	
		8.9		-2.13		-14.95		-116.6	

GEO THERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	111
NA-K-CA (4/3).....	82
NA-K.....	51
SILICA	
ADIABATIC.....	128
CONDUCTIVE.....	131
CHALCEDONY.....	104
CRISTOBALITE.....	81
OPAL.....	12
SULFATE	
CONDUCTIVE.....	138
ONE-STEP STEAM LOSS....	133
CONTINUOUS STEAM LOSS..	134

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	104 (D)	138 (K)	131 (A)	124	7

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.05	1.5	0.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	9	9	6.3	1.9

BASED ON: AREAS OF 60 C ISOTHERM, CONVECTIVE HEAT FLOW, AND ALTERATION

VOLUME (KM**3).....	10.6	STD. DEV. = 3.8
THERMAL ENERGY(10**18 J). 3.12		STD. DEV. = 1.13

COMMENTS: LOCATED ABOUT 20 KM SOUTH OF KLAMATH FALLS; GEOLOGY AND SYSTEM CHARACTERISTICS ARE SIMILAR. 9 KM**2 AREA OF SILICIFIED ROCKS. HOT WATER FROM ONE WELL USED IN GREENHOUSE.

REFERENCES: PETERSON AND MCINTYRE, 1970; SAMMEL, 1976

COMPILED BY: MARINER, R. AND BROOK, C.

KLAMATH HILLS AREA, OREGON

FIELD NAME..... KLAMATH FALLS AREA
 KGRA OR OTHER NAME..... KLAMATH FALLS KGRA
 CIRCULAR REFERENCE..... 187

GEOGRAPHIC LOCALITY

STATE..... OREGON
 COUNTY..... KLAMATH
 LATITUDE..... 42-14.0 N
 LONGITUDE..... 121-46.0 W
 MAPS..... KLAMATH FALLS 1162,500; MERRILL 1162,500

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
38S	09E	21	WILLAMETTE

GENERAL INFORMATION

WAKING FIGURE..... 6
 WAKING NUMBER..... 27, 28
 ELEVATION (M)..... 1525
 SURFACE ACTIVITY..... HOT SPRINGS, HOT WATER WELLS
 ASSOCIATED DEPOSITS..... SINTER
 NO. OF SPRINGS..... SEVERAL AT OLENE GAP
 SPRING TEMPERATURES (C)..... 74
 DISCHARGE (L/MIN)..... 30
 NO. OF WELLS..... SEVERAL
 WELL DEPTHS (M)..... 41 TO 551
 MAXIMUM WELL TEMP (C)..... 99 AT DEPTH (M) 530
 ROCK TYPES: LACUSTRINE AND FLUVIATILE TUFFACEOUS DEPOSITS OVERLYING BASALT
 GEOPHYSICS: GRAVITY, MAGNETIC, HEAT FLOW, AMT

CHEMISTRY

SAMPLE SOURCE.... SAMMEL, 1976 (WELL OIT #6)
 COLLECTION DATE.. 1975/03/31

TEMP(C)	SI02	CA	MG	NA	K	HC03	CO3	S04	CL
88	90	24.2	LT 0.1	195	3.9	44		400	58
F	H	PH		DEL 0(18) S04		DEL 0(18) H2O		DEL D H2O	
		8.2		-4.82		-13.73			

GEOOTHERMOMETERS (C)

CATION

NA-K-CA (1/3).....	108
NA-K-CA (4/3).....	71
NA-K.....	51

SILICA

ADIAHATIC.....	128
CONDUCTIVE.....	131
CHALCEDONY.....	104
CRISTOBALITE.....	81
OPAL.....	12

SULFATE

CONDUCTIVE.....	196
ONE-STEP STEAM LOSS....	179
CONTINUOUS STEAM LOSS..	183

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	99 (M)	131 (A)	104 (D)	111	7

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIAHATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.04	0.5	0.2		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	6	150	50	68.7	30.1

BASED ON: 60 C ISOTHERM AND AMT SURVEY

VOLUME (KM**3).....	114.4	STD. DEV. = 55.4
THERMAL ENERGY(10**18 J),	29.77	STD. DEV. = 14.61

COMMENTS: AREA INCLUDES SPRINGS AT OLENE GAP; HOT SPRINGS AT KLAMATH FALLS ARE INACTIVE. ABOUT 8 KM**2 AREA OF SILIFICATION AT KLAMATH FALLS. LUND AND OTHERS (1974) REPORT MAXIMUM WELL TEMPERATURE OF 113 C. OXYGEN ISOTOPES AND SULFATE GEOTHERMOMETER FOR OLENE GAP SPRING. HIGH SULFATE TEMPERATURES PROBABLY INDICATE A VERY DEEP AQUIFER IN A STACKED SYSTEM (SAMMEL, UNPUB. DATA). LARGE AREA OF WARM WATER. THERMAL WATER PROBABLY ASCENDS ALONG FAULTS AND SPREADS OUT IN NEAR-SURFACE AQUIFERS. STEAM REPORTED IN SOME WELLS.

REFERENCES: SAMMEL, 1976; LUND AND OTHERS, 1974; MARINER AND OTHERS, 1974; PETERSON AND MCINTYRE, 1970; USGS FILE DATA

COMPILED BY: MARINER, R. AND BROOK, C.

KLAMATH FALLS AREA, OREGON

FIELD NAME..... SUMMER LAKE HOT SPRINGS
 KGRA OR OTHER NAME..... SUMMER LAKE HOT SPRING KGRA
 CIRCULAR REFERENCE..... 188

GEOGRAPHIC LOCALITY

STATE..... OREGON
 COUNTY..... LAKE
 LATITUDE..... 42-43.5 N
 LONGITUDE..... 120-38.7 W
 MAPS..... SLIDE MTN. 1124,000

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
33S	17E	12 NE	WILLAMETTE

GENERAL INFORMATION

WARNING FIGURE..... 6
 WARNING NUMBER..... 42
 ELEVATION (M)..... 1307
 SURFACE ACTIVITY..... HOT SPRINGS
 ASSOCIATED DEPOSITS..... SINTER
 NO. OF SPRINGS..... 3
 SPRING TEMPERATURES (C)..... 43
 DISCHARGE (L/MIN)..... 75
 ROCK TYPES: TERTIARY ANDESITE overlain by QUAT. AND TERTIARY SEDIMENTARY ROCKS
 GEOPHYSICS: AMT

CHEMISTRY

SAMPLE SOURCE.... MARINER AND OTHERS, 1974, 1975

TEMP (C)	SI02	CA	MG	NA	K	HCO3	CO3	SO4	CL
43	94	2.1	0.1	390	4.6	406	10	120	280
F	B	PH		DEL O(18) SO4		DEL O(18) H2O		DEL O H2O	
2.2	6.9	8.43		-4.00		-13.32		-115.0	

GEO THERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 112
 NA-K-CA (4/3)..... 149
 NA-K..... 22

SILICA

ADIABATIC..... 130
 CONDUCTIVE..... 134
 CHALCEDONY..... 107
 CRISTOBALITE..... 83
 OPAL..... 14

SULFATE

CONDUCTIVE..... 189
 ONE-STEP STEAM LOSS.... 162
 CONTINUOUS STEAM LOSS.. 169

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	107 (D)	134 (A)	112 (I)	118	6

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
H) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIAHATIC	M) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	8	5	4.7	1.4
BASED ON: AMT SURVEY					

VOLUME (KM**3)..... 7.8 STD. DEV. = 2.8
 THERMAL ENERGY(10**18 J). 2.16 STD. DEV. = 0.80

COMMENTS: SULFATE GEOTHERMOMETER GIVES 109 C AND MAY INDICATE A VERY DEEP RESERVOIR IN A STACKED SYSTEM.

REFERENCES: MARINER AND OTHERS, 1974B; 1975; WALKER, 1963; WARING, 1965

COMPILED BY: MARINER, R.

SUMMER LAKE HOT SPRINGS , OREGON

FIELD NAME..... LAKEVIEW AREA (HUNTERS AND BARRY RANCH HOT SPRINGS)
 KGRA OR OTHER NAME..... LAKEVIEW KGRA
 CIRCULAR REFERENCE..... 189

GEOGRAPHIC LOCALITY

STATE..... OREGON
 COUNTY..... LAKE
 LATITUDE..... 42-12.0 N
 LONGITUDE..... 120-21.6 W
 MAPS..... LAKE VIEW NW 1124,000

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
39S	20E	15	WILLAMETTE

GENERAL INFORMATION

WARNING FIGURE..... 6
 WARNING NUMBER..... 45,47
 AREA OF SURFACE EXPRESSION (KM**2). 5.0
 ELEVATION (M)..... 1464
 SURFACE ACTIVITY..... HOT SPRINGS, GEYSERING WELL
 ASSOCIATED DEPOSITS..... TRAVERTINE AND SINTER
 NO. OF SPRINGS..... 16
 SPRING TEMPERATURES (C)..... 88 TO 96
 DISCHARGE (L/MIN)..... 2500
 NO. OF WELLS..... 2
 WELL DEPTHS (M)..... 189 TO 1658
 ROCK TYPES: QUATERNARY TO LATE TERTIARY BASALTS AND ANDESITES

CHEMISTRY

SAMPLE SOURCE.... MARINER AND OTHERS, 1974

TEMP(C)	SI02	CA	MG	NA	K	HCO3	CO3	SO4	CL
96	140	13	0.1	210	8.5	79		260	120
F	D	PH		DEL O(18) SO4	DEL O(18) H2O	DEL D H2O			
4.4	6.9	7.77		-3.69	-14.32	-119.0			

GEOOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	143
NA-K-CA (4/3).....	114
NA-K.....	98
SILICA	
ADIABATIC.....	149
CONDUCTIVE.....	157
CHALCEDONY.....	133
CRISTOBALITE.....	107
OPAL.....	35
SULFATE	
CONDUCTIVE.....	168
ONE-STEP STEAM LOSS....	158
CONTINUOUS STEAM LOSS..	160

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	143 (I)	158 (K)	149 (C)	150	3

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	2.0	1.8	0.3
SUBSURFACE AREA (KM**2)	2	15	8	8.3	2.7

BASED ON: SPRING DISTRIBUTION

VOLUME (KM**3).....	15.3	STD. DEV. = 5.6
THERMAL ENERGY(10**18 J). 5.57		STD. DEV. = 2.04

COMMENTS: WATER COMPOSITION FROM HUNTERS HOT SPRINGS; BARRY RANCH INCLUDED IN THE AREA. SEVERAL SHALLOW WELLS NEAR HUNTERS HOT SPRINGS HAVE BEEN DEVELOPED FOR RESIDENTIAL HEATING.

REFERENCES: MARINER AND OTHERS, 1974B; 1975; WALKER, 1963; WARING, 1965; PETERSON AND MCINTYRE, 1970

COMPILED BY: MARINER, R.

LAKEVIEW AREA (HUNTERS AND BARRY RANCH HOT SPRINGS, OREGON

FIELD NAME..... CRUMPS SPRING
KGRA OR OTHER NAME..... CRUMP GEYSER KGRA
CIRCULAR REFERENCE..... 190

GEOGRAPHIC LOCALITY

STATE..... OREGON
COUNTY..... LAKE
LATITUDE..... 42-13.8 N
LONGITUDE..... 119-53.0 W
MAPS..... ADEL 1124,000

TOWNSHIP RANGE SECTION BASE & MERIDIAN
38S 24E 34 SW WILLAMETTE

GENERAL INFORMATION

WAKING FIGURE..... 6
WAKING NUMBER..... 49C, 49D
AREA OF SURFACE EXPRESSION (KM**2). 1.0
ELEVATION (M)..... 1525
SURFACE ACTIVITY..... HOT SPRINGS AND SEEPS, GEYSERING WELL
ASSOCIATED DEPOSITS..... SINTER
NO. OF SPRINGS..... SEVERAL IN 2 GROUPS
SPRING TEMPERATURES (C)..... 37 TO 78
DISCHARGE (L/MIN)..... 0 TO 50
NO. OF WELLS..... 1
WELL DEPTHS (M)..... 504
MAXIMUM WELL TEMP (C)..... 121 AT DEPTH (M) 201
ROCK TYPES: MIOCENE TO PLIOCENE BASALT overlain BY QUATERNARY ALLUVIUM

CHEMISTRY

SAMPLE SOURCE.... MARINER AND OTHERS, 1974, 1975

TEMP (C)	SiO2	CA	MG	NA	K	HC03	CO3	SO4	CL
78	180	16	0.2	280	11	153		200	240
F	R	PH		DEL 0(18) SO4	DEL 0(18) H2O	DEL D H2O			
4.9	13.6	7.26		-4.71	-13.28	-115.5			

GEOOTHERMOMETERS (C)

CATION

NA-K-CA (1/1)..... 144
 NA-K-CA (4/3)..... 122
 NA-K..... 96

SILICA

ADIAHATIC..... 162
 CONDUCTIVE..... 173
 CHALCEDONY..... 151
 CRISTOBALITE..... 123
 OPAL..... 50

SULFATE

CONDUCTIVE..... 202
 ONE-STEP STEAM LOSS.... 182
 CONTINUOUS STEAM LOSS.. 186

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	144 (I)	185	173 (A)	167	9

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIAHATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.2	2.0	1.0		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	8	4	4.3	1.4
BASED ON: AMT SURVEY					

VOLUME (KM**3)..... 7.2 STD. DEV. = 2.8
 THERMAL ENERGY(10**18 J). 2.97 STD. DEV. = 1.16

COMMENTS: A SHALLOW WELL (CRUMPS GEYSER) ERUPTS EVERY FEW HOURS.

REFERENCES: MARINER AND OTHERS, 1974B; 1975; WALKER AND REPENNING, 1965; PETERSON, 1959; WARING, 1965; USGS FILE DATA

COMPILED BY: MARINER, R. AND BROOK, C.

CRUMPS SPRING , OREGON

FIELD NAME..... FISHER HOT SPRING
KGRA OR OTHER NAME..... CRUMP GEYSER KGRA
CIRCULAR REFERENCE..... 191

GEOGRAPHIC LOCALITY

STATE..... OREGON
COUNTY..... LAKE
LATITUDE..... 42-17.9 N
LONGITUDE..... 119-46.5 W
MAPS..... CRUMP LAKE 1124,000

TOWNSHIP RANGE SECTION BASE & MERIDIAN
38S 25E 10 NW OF NW WILLAMETTE

GENERAL INFORMATION

WARNING FIGURE..... 6
WARNING NUMBER..... 49A
ELEVATION (M)..... 1385
SURFACE ACTIVITY..... HOT SPRINGS
NO. OF SPRINGS..... 1
SPRING TEMPERATURES (C)..... 68
DISCHARGE (L/MIN)..... 75
ROCK TYPES: MIOCENE TO PLIOCENE BASALT overlain BY QUATERNARY ALLUVIUM

CHEMISTRY

SAMPLE SOURCE.... MARINER AND OTHERS, 1974

TEMP(C)	SI02	CA	MG	NA	K	HCO3	CO3	SO4	CL
68	77	8.4	1.0	92	7.9	105	1	59	56
F	R	PH		DEL O(18) SO4	DEL O(18) H2O	DEL D H2O			
3.5	2.2	7.93				-117.0			

GEOOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 169
 NA-K-CA (4/3)..... 112
 NA-K..... 167

SILICA

ADIABATIC..... 121
 CONDUCTIVE..... 123
 CHALCEDONY..... 95
 CRISTOBALITE..... 72
 OPAL..... 4

RESERVOIR PROPERTIES

SUBSURFACE TEMP (C)

MINIMUM

95 (D)

MAXIMUM

123 (A,J)

MOST LIKELY

123 (A,J)

MEAN

114

STD. DEV.

7

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE

B) QUARTZ CONDUCTIVE, PH-CORRECTED

C) QUARTZ ADIABATIC

D) CHALCEDONY

E) CHALCEDONY, PH-CORRECTED

F) CRISTOBALITE

G) AMORPHOUS SILICA

H) NA-K

I) NA-K-CA

J) NA-K-CA, MG-CORRECTED

K) SULFATE GEOTHERMOMETER

L) SURFACE TEMPERATURE

M) WELL TEMPERATURE

N) MIXING MODEL

O) RENNER AND OTHERS, 1976

DEPTH TO TOP (KM)

MINIMUM

0.5

MAXIMUM

2.0

MOST LIKELY

1.5

MEAN

1.7

STD. DEV.

0.3

THICKNESS (KM)

1.0

2.5

1.5

2.0

0.4

SUBSURFACE AREA (KM**2)

1

3

2

2.0

0.4

BASED ON: STANDARD ESTIMATE

VOLUME (KM**3)..... 3.3

STD. DEV. = 0.9

THERMAL ENERGY(10**18 J). 0.89

STD. DEV. = 0.26

REFERENCES: MARINER AND OTHERS, 1974B, 1975; WALKER AND REPENNING, 1965

COMPILED BY: MARINER, R.

FISHER HOT SPRING , OREGON

FIELD NAME..... WEBERG HOT SPRINGS
CIRCULAR REFERENCE..... 192

GEOGRAPHIC LOCALITY

STATE..... OREGON
COUNTY..... GRANT
LATITUDE..... 44-00.0 N
LONGITUDE..... 119-38.8 W
MAPS..... BURNS 1:250,000

TOWNSHIP RANGE SECTION
18S 26E 18

BASE & MERIDIAN
WILLAMETTE

GENERAL INFORMATION

ELEVATION (M)..... 1525
SURFACE ACTIVITY..... HOT SPRINGS
NO. OF SPRINGS..... 1
SPRING TEMPERATURES (C)..... 46
DISCHARGE (L/MIN)..... 40
ROCK TYPES: ARKOSIC SANDSTONE AND VOLCANIC ROCKS OF JURASSIC AGE.

CHEMISTRY

SAMPLE SOURCE.... MARINER AND OTHERS, 1974, 1975

TEMP (C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
46	82	38	7.8	610	36	439	1	204	24
F	B	PH		DEL 0(18) S04	DEL 0(18) H2O	DEL 0 H2O			
3.9	15	6.53			-15.14	-122.1			

GEOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	169
NA-K-CA (4/3).....	162
NA-K.....	130
SILICA	
ADIABATIC.....	124
CONDUCTIVE.....	126
CHALCEDONY.....	99
CRISTOBALITE.....	76
OPAL.....	7

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	99 (D)	126 (A)	100 (J)	108	6

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ON: STANDARD ESTIMATE					

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J). 0.84		STD. DEV. = 0.24

COMMENTS: CO2 CHARGED WATER, CHEMICAL GEOTHERMOMETERS MAY BE UNRELIABLE.

REFERENCES: MARINER AND OTHERS, 1974B, 1975

COMPILED BY: MARINER, R.

WEBERG HOT SPRINGS, OREGON

FIELD NAME..... HARNEY LAKE AREA
CIRCULAR REFERENCE..... 193

GEOGRAPHIC LOCALITY

STATE..... OREGON
COUNTY..... HARNEY
LATITUDE..... 43-10.9 N
LONGITUDE..... 119-03.2 W
MAPS..... BURNS 11250,000

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
27S	29E	36	WILLAMETTE

GENERAL INFORMATION

WAKING FIGURE..... 6
WAKING NUMBER..... 64
ELEVATION (M)..... 1250
SURFACE ACTIVITY..... HOT SPRINGS
SPRING TEMPERATURES (C)..... 68
DISCHARGE (L/MIN)..... 550
ROCK TYPES: PLIOCENE BASALT, TUFFS AND WELDED TUFFS
GEOPHYSICS: HEAT FLOW

CHEMISTRY

SAMPLE SOURCE.... MARINER AND OTHERS, 1974

TEMP (C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
68	92	12	1.8	630	13	566	1	140	590
F	R	PH		DEL 0(18) S04	DEL 0(18) H2O	DEL 0 H2O			
3.3	11.3	7.26				-128.5			

GEOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	130
NA-K-CA (4/3).....	150
NA-K.....	53
SILICA	
ADIAHATIC.....	129
CONDUCTIVE.....	133
CHALCEDONY.....	105
CRISTOBALITE.....	82
OPAL.....	13

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	105 (D,J)	133 (A)	105 (D,J)	114	7

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
H) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIAHATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ON: STANDARD ESTIMATE					

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J). 0.89		STD. DEV. = 0.26

REFERENCES: MARINER AND OTHERS, 1974B, 1975; WALKER AND SWANSON, 1967; GREENE AND OTHERS, 1972; BOWEN AND OTHERS, 1977

COMPILED BY: MARINER, R.

HARNEY LAKE AREA, OREGON

FIELD NAME..... CRANE HOT SPRINGS
CIRCULAR REFERENCE..... 194

GEOGRAPHIC LOCALITY

STATE..... OREGON
COUNTY..... HARNEY
LATITUDE..... 43-26.4 N
LONGITUDE..... 118-38.4 W
MAPS..... CRANE 1162.500

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
24S	33E	34 SW OF NE	WILLAMETTE

GENERAL INFORMATION

WARNING FIGURE..... 6
WARNING NUMBER..... 53
ELEVATION (M)..... 1254
SURFACE ACTIVITY..... HOT SPRINGS
NO. OF SPRINGS..... 2
SPRING TEMPERATURES (C)..... 50 TO 78
DISCHARGE (L/MIN)..... 550
ROCK TYPES: PLIOCENE AND PLEISTOCENE PYROCLASTIC ROCKS; PLIOCENE BASALT AND ANDESITE

CHEMISTRY

SAMPLE SOURCE..... MARINER AND OTHERS, 1974, 1975

TEMP (C)	SI02	CA	MG	NA	K	HCO3	CO3	SO4	CL
78	83	3.7	0.1	170	3.9	202	3	86	79
F	H	PH		DEL O(18) SO4	DEL O(18) H2O	DEL D H2O			
9.0	7.9	8.10			-16.17	-133.5			

GEOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	124
NA-K-CA (4/3).....	113
NA-K.....	59
SILICA	
ADIAHATIC.....	124
CONDUCTIVE.....	127
CHALCEDONY.....	99
CRISTOBALITE.....	76
UPAL.....	8

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	99 (D)	127 (A)	124 (I)	117	6

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ON: STANDARD ESTIMATE					

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**10 J). 0.91		STD. DEV. = 0.26

REFERENCES: LEONARD, 1970; GREENE AND OTHERS, 1972; MARINER AND OTHERS, 1974B, 1975

COMPILED BY: MARINER, R.

CRANE HOT SPRINGS • OREGON

FIELD NAME..... RIVERSIDE AREA
CIRCULAR REFERENCE..... 195

GEOGRAPHIC LOCALITY

STATE..... OREGON
COUNTY..... MALHEUR
LATITUDE..... 43-28.0 N
LONGITUDE..... 118-11.3 W
MAPS..... BURNS 11250,000

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
24S	37E	20	WILLAMETTE

GENERAL INFORMATION

WAKING FIGURE..... 6
WAKING NUMBER..... 84
ELEVATION (M)..... 1098
SURFACE ACTIVITY..... HOT SPRINGS
NO. OF SPRINGS..... SEVERAL
SPRING TEMPERATURES (C)..... 41 TO 63
DISCHARGE (L/MIN)..... 200
ROCK TYPES: MIOCENE BASALT
GEOPHYSICS: HEAT FLOW

CHEMISTRY

SAMPLE SOURCE.... MARINER AND OTHERS, 1974, 1975

TEMP(C)	SI02	CA	MG	NA	K	HCO3	CO3	SO4	CL
63	110	34	0.5	240	9.7	160		290	140
F	H	PH		DEL 0(18) SO4	DEL 0(18) H2O	DEL 0 H2O			
4.8	6.6	7.43			-15.15	-134.0			

GEOOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	137
NA-K-CA (4/3).....	96
NA-K.....	98
SILICA	
ADIABATIC.....	137
CONDUCTIVE.....	143
CHALCEDONY.....	116
CRISTOBALITE.....	92
OPAL.....	22

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	96 (I)	143 (A)	116 (D)	118	10

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
H) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ON: STANDARD ESTIMATE					

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J). 0.93		STD. DEV. = 0.28

REFERENCES: MARINER AND OTHERS, 1974B, 1975I WALKER AND REPENNING, 1965I WARING, 1965

COMPILED BY: MARINER, R.

RIVERSIDE AREA, OREGON

FIELD NAME..... MICKEY SPRINGS
KGRA OR OTHER NAME..... ALVORD KGRA
CIRCULAR REFERENCE..... 196

GEOGRAPHIC LOCALITY

STATE..... OREGON
COUNTY..... HARNEY
LATITUDE..... 42-40.5 N
LONGITUDE..... 118-20.7 W
MAPS..... ADEL 11250,000

TOWNSHIP RANGE SECTION
33S 35E 13

BASE & MERIDIAN
WILLAMETTE

GENERAL INFORMATION

AREA OF SURFACE EXPRESSION (KM**2). 0.1
ELEVATION (M)..... 1238
SURFACE ACTIVITY..... HOT SPRINGS AND MUD POTS
ASSOCIATED DEPOSITS..... SINTER
NO. OF SPRINGS..... 4 TO 6
SPRING TEMPERATURES (C)..... 73
DISCHARGE (L/MIN)..... 100
ROCK TYPES: MIOCENE ANDESITIC TUFF-BRECCIA, BASALTS, AND ANDESITE
GEOPHYSICS: GRAVITY, MAGNETIC, AMT, HEAT FLOW

CHEMISTRY

SAMPLE SOURCE.... MARINER AND OTHERS, 1974, 1975

TEMP(C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
73	200	0.9	0.1	550	35	774	11	230	240

F	H	PH	DEL O(18) S04	DEL O(18) H2O	DEL D H2O
16	10.5	8.05	-7.91	-13.42	-124.3

GEOOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	207
NA-K-CA (4/3).....	330
NA-K.....	136
SILICA	
ADIABATIC.....	168
CONDUCTIVE.....	180
CHALCEDONY.....	159
CRISTOBALITE.....	130
OPAL.....	56
SULFATE	
CONDUCTIVE.....	273
ONE-STEP STEAM LOSS....	227
CONTINUOUS STEAM LOSS..	240

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	180 (A)	227 (K)	207 (I)	205	10

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	18	4	7.7	3.7
BASED ON: AMT SURVEY					

VOLUME (KM**3).....	12.8	STD. DEV. = 6.7
THERMAL ENERGY(10**18 J). 6.54		STD. DEV. = 3.46

REFERENCES: MARINER AND OTHERS, 1974B, 1975I, WALKER AND REPENNING, 1965I USGS FILE DATA

COMPILED BY: MARINER, R.

MICKEY SPRINGS, OREGON

FIELD NAME..... ALVORD HOT SPRINGS
KGRA OR OTHER NAME..... ALVORD KGRA
CIRCULAR REFERENCE..... 197

GEOGRAPHIC LOCALITY

STATE..... OREGON
COUNTY..... HARNEY
LATITUDE..... 42-32.6 N
LONGITUDE..... 118-31.6 W
MAPS..... ADEL 11250,000

TOWNSHIP RANGE SECTION
34S 34E 33

BASE & MERIDIAN
WILLAMETTE

GENERAL INFORMATION

WARNING FIGURE..... 6
WARNING NUMBER..... 68
AREA OF SURFACE EXPRESSION (KM**2). 0.5
ELEVATION (M)..... 1250
SURFACE ACTIVITY..... HOT SPRINGS
NO. OF SPRINGS..... SEVERAL
SPRING TEMPERATURES (C)..... 76
DISCHARGE (L/MIN)..... 500
ROCK TYPES: MIOCENE RHYODACITE, BASALT AND ANDESITE
GEOPHYSICS: GRAVITY, MAGNETIC, HEAT FLOW, AMT

CHEMISTRY

SAMPLE SOURCE.... MARINER AND OTHERS, 1974, 1975

TEMP (C)	SI02	CA	MG	NA	K	HC03	CO3	S04	CL
76	120	12	2.2	960	69	1196	1	220	780
F	H	PH		DEL O(18) S04	DEL O(18) H2O	DEL O H2O			
10.2	30	6.73		-6.05	-13.23	-123.6			

GEOOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	199
NA-K-CA (4/3).....	257
NA-K.....	148
SILICA	
ADIABATIC.....	141
CONDUCTIVE.....	148
CHALCEDONY.....	122
CRISTOBALITE.....	97
OPAL.....	26
SULFATE	
CONDUCTIVE.....	231
ONE-STEP STEAM LOSS....	201
CONTINUOUS STEAM LOSS..	209

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	148 (M)	231 (K)	164 (J)	181	18

UNCODEN TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	6	2	3.0	1.1
BASED ON: AMT SURVEY					

VOLUME (KM**3).....	5.0	STD. DEV. = 2.1
THERMAL ENERGY(10**18 J). 2.24		STD. DEV. = 0.96

REFERENCES: MARINER AND OTHERS, 1974B, 1975; WALKER AND REPENNING, 1965; WARING, 1965; USGS FILE DATA

COMPILED BY: MARINER, R.

ALVORD HOT SPRINGS, OREGON

FIELD NAME..... HOT (HORAX) LAKE AREA
KGRA OR OTHER NAME..... ALVOND KGRA
CIRCULAR REFERENCE..... 198

GEOGRAPHIC LOCALITY

STATE..... OREGON
COUNTY..... HARNEY
LATITUDE..... 42-20.1 N
LONGITUDE..... 118-36.0 W
MAPS..... ADEL 11250,000

TOWNSHIP RANGE SECTION
37S 33E 15

BASE & MERIDIAN
WILLAMETTE

GENERAL INFORMATION

WARNING FIGURE..... 6
WARNING NUMBER..... 69.70
AREA OF SURFACE EXPRESSION (KM**2). 0.1
ELEVATION (M)..... 1235
SURFACE ACTIVITY..... HOT SPRINGS
ASSOCIATED DEPOSITS..... SINTER
NO. OF SPRINGS..... SEVERAL
SPRING TEMPERATURES (C)..... 36 TO 96
DISCHARGE (L/MIN)..... 3500
ROCK TYPES: QUATERNARY ALLUVIUM AND PLAYA DEPOSITS, MIOCENE TO PLIOCENE BASALTS
GEOPHYSICS: GRAVITY, MAGNETIC, HEAT FLOW, AMT

CHEMISTRY

SAMPLE SOURCE.... MARINER AND OTHERS, 1974
FLOW (L/MIN)..... 15

TEMP(C)	SI02	CA	MG	NA	K	HCO3	CO3	SO4	CL
96	160	14	0.3	450	28	374	4	434	250
F	R	PH		DEL O(18) SO4		DEL O(18) H2O		DEL D H2O	
7.2	14	7.30		-8.58		-14.36		-125.4	

GEOOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	176
NA-K-CA (4/3).....	178
NA-K.....	134
SILICA	
ADIABATIC.....	156
CONDUCTIVE.....	165
CHALCEDONY.....	142
CRISTOBALITE.....	115
OPAL.....	42
SULFATE	
CONDUCTIVE.....	265
ONE-STEP STEAM LOSS....	231
CONTINUOUS STEAM LOSS..	240

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	165 (C)	231 (K)	176 (I)	191	14

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	10	4	5.0	1.9
BASED ON: AMF SURVEY					

VOLUME (KM**3).....	8.3	STD. DEV. = 3.5
THERMAL ENERGY(10**18 J). 3.95		STD. DEV. = 1.71

COMMENTS: SAMPLED SPRING ALONG FRACTURE NORTH OF HOT LAKE. NO EVIDENCE OF MIXING OF WATERS ISSUING ALONG THE FRACTURE.

REFERENCES: MARINER AND OTHERS, 1974B, 1975; WALKER AND REPENNING, 1965; WARING, 1965; USGS FILE DATA

COMPILED BY: MARINER, R.

HOT (HORAX) LAKE AREA , OREGON

FIELD NAME..... TROUT CREEK AREA
CIRCULAR REFERENCE..... 199

GEOGRAPHIC LOCALITY

STATE..... OREGON
COUNTY..... HARNEY
LATITUDE..... 42-11.4 N
LONGITUDE..... 118-23.0 W
MAPS..... ADEL 11250,000

TOWNSHIP RANGE SECTION
39S 37E 16

BASE & MERIDIAN
WILLAMETTE

GENERAL INFORMATION

WAKING FIGURE..... 6
WAKING NUMBER..... 72
ELEVATION (M)..... 1738
SURFACE ACTIVITY..... HOT SPRINGS AND SEEPS
NO. OF SPRINGS..... SEVERAL
SPRING TEMPERATURES (C)..... 52
DISCHARGE (L/MIN)..... 200
ROCK TYPES: MIOCENE TO PLIOCENE BASALT, ANDESITE, AND RHYOLITE FLOWS
GEOPHYSICS: HEAT FLOW

CHEMISTRY

SAMPLE SOURCE.... MARINER AND OTHERS, 1974, 1975

TEMP (C)	SI02	CA	MG	NA	K	HCO3	CO3	SO4	CL
52	105	18	0.8	270	10.8	439	1	204	24
F	B	PH		DEL O(18) SO4	DEL O(18) H2O	DEL O H2O			
12.8	0.89	6.77		-9.22	-16.17	-127.4			

GEOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 143
 NA-K-CA (4/3)..... 118
 NA-K..... 97

SILICA

ADIABATIC..... 135
 CONDUCTIVE..... 140
 CHALCEDONY..... 114
 CRISTOBALITE..... 89
 OPAL..... 19

SULFATE

CONDUCTIVE..... 235
 ONE-STEP STEAM LOSS... 196
 CONTINUOUS STEAM LOSS.. 207

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)

MINIMUM
 140 (A)

MAXIMUM
 180

MOST LIKELY
 143 (I)

MEAN
 154

STD. DEV.
 9

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE

B) QUARTZ CONDUCTIVE, PH-CORRECTED

C) QUARTZ ADIABATIC

D) CHALCEDONY

E) CHALCEDONY, PH-CORRECTED

F) CRISTOBALITE

G) AMORPHOUS SILICA

H) NA-K

I) NA-K-CA

J) NA-K-CA, MG-CORRECTED

K) SULFATE GEOTHERMOMETER

L) SURFACE TEMPERATURE

M) WELL TEMPERATURE

N) MIXING MODEL

O) RENNER AND OTHERS, 1976

DEPTH TO TOP (KM)

MINIMUM
 0.5

MAXIMUM
 2.0

MOST LIKELY
 1.5

MEAN

STD. DEV.

THICKNESS (KM)

1.0

2.5

1.5

1.7

0.3

SUBSURFACE AREA (KM**2)

1

3

2

2.0

0.4

BASED ON: STANDARD ESTIMATE

VOLUME (KM**3)..... 3.3

STD. DEV. = 0.9

THERMAL ENERGY(10**18 J). 1.25

STD. DEV. = 0.36

REFERENCES: MARINER AND OTHERS, 1974B, 1975; WALKER AND REPENNING, 1965; WARING, 1965; BOWEN AND OTHERS, 1977

COMPILED BY: MARINER, R.

TROUT CREEK AREA, OREGON

FIELD NAME..... MCDERMITT AREA
CIRCULAR REFERENCE..... 200

GEOGRAPHIC LOCALITY

STATE..... OREGON
COUNTY..... MALHEUR
LATITUDE..... 42-04.7 N
LONGITUDE..... 117-45.6 W
MAPS..... JORDAN VALLEY 1:250,000

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
40S	42E	25	WILLAMETTE

GENERAL INFORMATION

WAKING FIGURE..... 6
WAKING NUMBER..... 86
ELEVATION (M)..... 1891
SURFACE ACTIVITY..... HOT SPRINGS
NO. OF SPRINGS..... SEVERAL
SPRING TEMPERATURES (C)..... 52
DISCHARGE (L/MIN)..... 750
ROCK TYPES: TERTIARY AND QUATERNARY PEDIMENT GRAVELS, MIOCENE BASALT

CHEMISTRY

SAMPLE SOURCE.... MARINER AND OTHERS, 1974, 1975

TEMP (C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
52	72	0.6	0.1	130	1.0	237	13	52	14
F	H	PH		DEL 0(18) S04	DEL 0(18) H2O	DEL D H2O			
6.6	1.1	8.79			-16.95	-134.6			

GEOOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	90
NA-K-CA (4/3).....	104
NA-K.....	3
SILICA	
ADIAHATIC.....	118
CONDUCTIVE.....	120
CHALCEDONY.....	91
CRISTOBALITE.....	69
UPAL.....	1

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	84 (E)	120 (A)	90 (I)	98	8

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIAHATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ON: STANDARD ESTIMATE					

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J). 0.75		STD. DEV. = 0.22

COMMENTS: RESERVOIR TEMPERATURE MAY BE LESS THAN 90 DEG C.

REFERENCES: MARINER AND OTHERS, 1974B; 1975; WALKER AND REPENNING, 1966; WARING, 1965

COMPILED BY: MARINER, R.

MCDERMITT AREA, OREGON

FIELD NAME..... MEDICAL HOT SPRINGS
CIRCULAR REFERENCE..... 201

GEOGRAPHIC LOCALITY

STATE..... OREGON
COUNTY..... UNION
LATITUDE..... 45-01.1 N
LONGITUDE..... 117-37.5 W

TOWNSHIP RANGE SECTION
06S 41E 25 NE

BASE & MERIDIAN
MEDICAL SPRINGS 1124,000

GENERAL INFORMATION

WARNING FIGURE..... 6
WARNING NUMBER..... 12
ELEVATION (M)..... 1060
SURFACE ACTIVITY..... HOT SPRINGS
NO. OF SPRINGS..... 2 GROUPS
SPRING TEMPERATURES (C)..... 60
DISCHARGE (L/MIN)..... 200
ROCK TYPES: MIOCENE BASALTS AND ANDESITES; PALEOZOIC METAVOLCANIC ROCKS

CHEMISTRY

SAMPLE SOURCE.... MARINER AND OTHERS 1974, 1975

TEMP (C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
60	80	72	0.2	190	7.0	26		400	77
1.2	2.2	PH 8.23		DEL 0(18) S04		DEL 0(18) H2O -16.99		DEL 0 H2O -130.2	

GEOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 125
 NA-K-CA (4/3)..... 66
 NA-K..... 91

SILICA

ADIAHATIC..... 122
 CONDUCTIVE..... 125
 CHALCEDONY..... 97
 CRISTOBALITE..... 74
 OPAL..... 6

RESERVOIR PROPERTIES

SUBSURFACE TEMP (C)

MINIMUM

66 (I)

MAXIMUM

125 (A)

MOST LIKELY

97 (D)

MEAN

96

STD. DEV.

12

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE

B) QUARTZ CONDUCTIVE, PH-CORRECTED

C) QUARTZ ADIABATIC

D) CHALCEDONY

E) CHALCEDONY, PH-CORRECTED

F) CRISTOBALITE

G) AMORPHOUS SILICA

H) NA-K

I) NA-K-CA

J) NA-K-CA, MG-CORRECTED

K) SULFATE GEOTHERMOMETER

L) SURFACE TEMPERATURE

M) WELL TEMPERATURE

N) MIXING MODEL

O) RENNER AND OTHERS, 1976

DEPTH TO TOP (KM)

MINIMUM

0.5

MAXIMUM

2.0

MOST LIKELY

1.5

MEAN

1.7

STD. DEV.

0.3

THICKNESS (KM)

1.0

2.5

1.5

2.0

0.4

SUBSURFACE AREA (KM**2)

1

3

2

2.0

0.4

BASED ON: STANDARD ESTIMATE

VOLUME (KM**3)..... 3.3

STD. DEV. = 0.9

THERMAL ENERGY(10**18 J), 0.73

STD. DEV. = 0.23

REFERENCES: MARINER AND OTHERS, 1974B, 1975; WALKER, 1973; WARING, 1965

COMPILED BY: MARINER, R.

MEDICAL HOT SPRINGS , OREGON

FIELD NAME..... LITTLE VALLEY AREA
CIRCULAR REFERENCE..... 202

GEOGRAPHIC LOCALITY

STATE..... OREGON
COUNTY..... MALHEUR
LATITUDE..... 43-53.5 N
LONGITUDE..... 117-30.0 W
MAPS..... HARPER 1162,500

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
19S	43E	30 NW	WILLAMETTE

GENERAL INFORMATION

WAKING FIGURE..... 6
WAKING NUMBER..... 76
ELEVATION (M)..... 756
SURFACE ACTIVITY..... HOT SPRINGS
NO. OF SPRINGS..... SEVERAL
DISCHARGE (L/MIN)..... 550
ROCK TYPES: PLIOCENE BASALTS, VOLCANIC DERIVED SEDIMENTARY ROCK

CHEMISTRY

SAMPLE SOURCE.... MARINER AND OTHERS, 1974, 1975

TEMP(C)	SiO2	CA	MG	NA	K	HCO3	CO3	SO4	CL
70	115	3.2		160	3.2	127	1	110	74
F	H	PH		DEL O(18) SO4	DEL O(18) H2O	DEL D H2O			
6.8	4.7	8.71		-8.63	-16.52	-139.7			

GEOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	118
NA-K-CA (4/3).....	109
NA-K.....	51
SILICA	
ADIABATIC.....	139
CONDUCTIVE.....	145
CHALCEDONY.....	119
CRISTOBALITE.....	95
OPAL.....	24
SULFATE	
CONDUCTIVE.....	215
ONE-STEP STEAM LOSS....	189
CONTINUOUS STEAM LOSS..	195

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	118 (D,I)	145 (A)	118 (D,I)	127	6

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
H) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ON: STANDARD ESTIMATE					

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J). 1.01		STD. DEV. = 0.29

COMMENTS: SULFATE ISOTOPE GEOTHERMOMETER INDICATES A HIGHER TEMPERATURE (215 DEG C) AND MAY INDICATE A DEEP SYSTEM.

REFERENCES: MARINER AND OTHERS, 1974B; 1975; CORCORAN AND OTHERS, 1962

COMPILED BY: MARINER, R.

LITTLE VALLEY AREA, OREGON

FIELD NAME..... NEAL HOT SPRINGS
CIRCULAR REFERENCE..... 203

GEOGRAPHIC LOCALITY

STATE..... OREGON
COUNTY..... MALHEUR
LATITUDE..... 44-01.4 N
LONGITUDE..... 117-27.6 W
MAPS..... JAMIESON 1162,500

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
18S	43E	09 NW	WILLAMETTE

GENERAL INFORMATION

WARNING FIGURE..... 6
WARNING NUMBER..... 75
ELEVATION (M)..... 793
SURFACE ACTIVITY..... HOT SPRINGS
ASSOCIATED DEPOSITS..... SINTER
SPRING TEMPERATURES (C)..... 87
DISCHARGE (L/MIN)..... 100
ROCK TYPES: MIOCENE(?) FLOWS(BASALTIC)

CHEMISTRY

SAMPLE SOURCE.... MARINER AND OTHERS, 1974, 1975

TEMP(C)	SI02	CA	MG	NA	K	HCO3	CO3	SO4	CL
87	180	8.8	0.2	190	16	198		120	120
F	H	PH		DEL O(18) SO4	DEL O(18) H2O	DEL O H2O			
9.4	4.1	7.32		-8.37	-16.52	-138.7			

GEOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	181
NA-K-CA (4/3).....	151
NA-K.....	165
SILICA	
ADIABATIC.....	162
CONDUCTIVE.....	173
CHALCEDONY.....	151
CRISTOBALITE.....	123
OPAL.....	50
SULFATE	
CONDUCTIVE.....	210
ONE-STEP STEAM LOSS....	189
CONTINUOUS STEAM LOSS..	194

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	173 (A)	210 (K)	181 (I)	188	8

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ON: STANDARD ESTIMATE					

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY (10**18 J).	1.56	STD. DEV. = 0.44

REFERENCES: MARINER AND OTHERS, 1974B, 1975; WARING, 1965; WALKER, 1973

COMPILED BY: MARINER, R.

NEAL HOT SPRINGS, OREGON

FIELD NAME..... VALE HOT SPRINGS
KGRA OR OTHER NAME..... VALE HOT SPRINGS KGRA
CIRCULAR REFERENCE..... 204

GEOGRAPHIC LOCALITY

STATE..... OREGON
COUNTY..... MALHEUR
LATITUDE..... 43-59.4 N
LONGITUDE..... 117-14.0 W
MAPS..... VALE EAST 1:24,000; ROISE 1:250,000

TOWNSHIP RANGE SECTION BASE & MERIDIAN
18S 45E 20 WILLAMETTE

GENERAL INFORMATION

WARNING FIGURE..... 6
WARNING NUMBER..... 77
ELEVATION (M)..... 671
SURFACE ACTIVITY..... HOT SPRINGS
NO. OF SPRINGS..... TWO GROUPS
SPRING TEMPERATURES (C)..... 73 TO 97
DISCHARGE (L/MIN)..... 76
ROCK TYPES: TUFFACEOUS LACUSTRINE DEPOSITS OVERLYING TERTIARY BASALT AND RHYOLITE
GEOPHYSICS: GRAVITY, HEAT FLOW, AMT, MAGNETIC

CHEMISTRY

SAMPLE SOURCE.... MARINER AND OTHERS, 1975

TEMP (C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
73	130	19	0.8	310	16	143		100	360
F	II	PH		DEL O (18) S04	DEL O (18) H2O	DEL O H2O			
6.1	9.4	7.47		-3.91	-15.00	-135.0			

GEOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	157
NA-K-CA (4/3).....	135
NA-K.....	118
SILICA	
ADIABATIC.....	145
CONDUCTIVE.....	152
CHALCEDONY.....	127
CRISTOBALITE.....	102
OPAL.....	31
SULFATE	
CONDUCTIVE.....	161
ONE-STEP STEAM LOSS....	149
CONTINUOUS STEAM LOSS..	151

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	152 (A)	161 (K)	157 (I)	157	2

UNCODER TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	10	150	50	70.0	29.4
BASED ON: AMT SURVEY					

VOLUME (KM**3).....	116.7	STD. DEV. = 54.5
THERMAL ENERGY(10**18 J). 44.62		STD. DEV. = 20.85

COMMENTS: SULFATE ISOTOPES ON A SAMPLE COLLECTED BY H. YOUNG FROM A 90 DEG C SPRING; SULFATE DETERMINATION ON THE SAMPLE COLLECTED BY MARINER AND OTHERS INDICATED 201 DEG C. AREA INCLUDES COW HOLLOW HEAT FLOW ANOMALY.

REFERENCES: MARINER AND OTHERS, 1975; HOOVER AND LONG, 1975; BOWEN AND BLACKWELL, 1975

COMPILED BY: MARINER, R. AND BROOK, C.

VALE HOT SPRINGS, OREGON

Utah

FIELD NAME..... ABRAHAM (BAKER, CRATER) HOT SPRINGS
KGRA OR OTHER NAME..... CRATER SPRINGS KGRA
CIRCULAR REFERENCE..... 205

GEOGRAPHIC LOCALITY

STATE..... UTAH
COUNTY..... JUAB
LATITUDE..... 39-36.8 N
LONGITUDE..... 112-43.9 W
MAPS..... BAKER HOT SPRINGS 1:24,000

TOWNSHIP RANGE SECTION BASE & MERIDIAN
14S 08W 10 SALT LAKE

GENERAL INFORMATION

WAKING FIGURE..... 7
WAKING NUMBER..... 24
ELEVATION (M)..... 1408
SURFACE ACTIVITY..... HOT SPRINGS AND WARM, MOIST VAPORS
ASSOCIATED DEPOSITS..... TRAVERTINE
NO. OF SPRINGS..... 4
SPRING TEMPERATURES (C)..... 43 TO 84
DISCHARGE (L/MIN)..... MORE THAN 1000
ROCK TYPES: QUATERNARY BASALT OVERLYING LACUSTRINE DEPOSITS
GEOPHYSICS: GRAVITY, MAGNETIC, RESISTIVITY, AMT

CHEMISTRY

SAMPLE SOURCE.... MARINER AND OTHERS, 1977
FLOW (L/MIN)..... 1000
COLLECTION DATE.. 1974/12/15

TEMP (C)	SiO2	CA	MG	NA	K	HCO3	CO3	SO4	CL
84	69	340	52	830	57	156	LT 1	680	1500
F	B	PH		DEL O(18) SO4	DEL O(18) H2O	DEL D H2O			
2.5	0.86	6.48		+12.77	-16.09	-126.3			

GEOOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	164
NA-K-CA (4/3).....	121
NA-K.....	144
SILICA	
ADIABATIC.....	116
CONDUCTIVE.....	117
CHALCEDONY.....	89
CRISTOBALITE.....	67
OPAL.....	-1
SULFATE	
CONDUCTIVE.....	22
ONE-STEP STEAM LOSS....	25
CONTINUOUS STEAM LOSS..	26

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	86 (J)	117 (A)	89 (D)	97	7

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	6	4	3.7	1.0

BASED ON: AMT AND GRAVITY SURVEYS

VOLUME (KM**3).....	6.1	STD. DEV. = 2.1
THERMAL ENERGY(10**10 J). 1.36		STD. DEV. = 0.48

COMMENTS: THE VERY LOW TEMPERATURE ESTIMATED FROM THE SO4 GEOTHERMOMETER MAY INDICATE A LOW TEMPERATURE SOURCE FOR THE SULFATE ONLY.

REFERENCES: MARINER AND OTHERS, 1977A; MUNDORFF, 1970; SMITH, 1974; SHUEY, 1974; JOHNSON, 1974; USGS FILE DATA; NASH AND OTHERS, 1978

COMPILED BY: MARINER, R. AND BROOK, C.

ABRAHAM (BAKER, CRATER) HOT SPRINGS , UTAH

FIELD NAME..... MONROE-RED HILL HOT SPRINGS
KGRA OR OTHER NAME..... MONROE-JOSEPH KGRA
CIRCULAR REFERENCE..... 206

GEOGRAPHIC LOCALITY

STATE..... UTAH
COUNTY..... SEVIER
LATITUDE..... 38-38.2 N
LONGITUDE..... 112-06.2 W
MAPS..... MONROE 1162,500

TOWNSHIP RANGE SECTION
25S 03W 10-11

BASE & MERIDIAN
SALT LAKE

GENERAL INFORMATION

WAKING FIGURE..... 7
WAKING NUMBER..... 48
AREA OF SURFACE EXPRESSION (KM**2), 0.1
ELEVATION (M)..... 1676
SURFACE ACTIVITY..... HOT SPRINGS
ASSOCIATED DEPOSITS..... TRAVERTINE
NO. OF SPRINGS..... 3 MAIN SPRINGS
SPRING TEMPERATURES (C)..... 41 TO 76
DISCHARGE (L/MIN)..... MORE THAN 1200
ROCK TYPES: PLIOCENE LATITE, BASALTIC ANDESITE, AND RHYOLITE
GEOPHYSICS: TEMPERATURE GRADIENT (D. CHAPMAN, UNPUB. DATA)

CHEMISTRY

SAMPLE SOURCE..... MARINER AND OTHERS, 1977
FLOW (L/MIN)..... 175
COLLECTION DATE.. 1974/12/16

TEMP(C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
76.5	58	240	34	590	60	416		890	660
F	D	PH		DEL O(18) S04		DEL O(18) H2O		DEL D H2O	
2.8	2.8	6.25		+8.21		-16.95		-127.3	

GEO THERMOMETERS (C)

CATION

NA-K-CA (1/3).....	180
NA-K-CA (4/3).....	123
NA-K.....	186

SILICA

ADIABATIC.....	109
CONDUCTIVE.....	109
CHALCEDONY.....	79
CRISTOBALITE.....	58
OPAL.....	-8

SULFATE

CONDUCTIVE.....	40
ONE-STEP STEAM LOSS....	42
CONTINUOUS STEAM LOSS..	42

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)

MINIMUM
79 (D)

MAXIMUM
114 (J)

MOST LIKELY
109 (A)

MEAN
101

STD. DEV.
8

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE

B) QUARTZ CONDUCTIVE, PH-CORRECTED

C) QUARTZ ADIABATIC

D) CHALCEDONY

E) CHALCEDONY, PH-CORRECTED

F) CRISTOBALITE

G) AMORPHOUS SILICA

H) NA-K

I) NA-K-CA

J) NA-K-CA, MG-CORRECTED

K) SULFATE GEOTHERMOMETER

L) SURFACE TEMPERATURE

M) WELL TEMPERATURE

N) MIXING MODEL

O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5		
SUBSURFACE AREA (KM**2)	1.5	5	2	1.7	0.3
				2.8	0.8
BASED ON SPRING AND SPRING DEPOSIT DISTRIBUTION AND UNPUB. TEMPERATURE GRADIENT SURVEY					

VOLUME (KM**3)..... 4.7

THERMAL ENERGY(10**18 J). 1.09

STD. DEV. = 1.6

STD. DEV. = 0.38

COMMENTS: ANALYSIS FOR RED HILL HOT SPRING, MONROE AND RED HILL HOT SPRINGS HAVE VIRTUALLY IDENTICAL CHEMICAL AND ISOTOPIC COMPOSITIONS AND ARE CONSIDERED TO BE PART OF THE SAME SYSTEM. GYPSUM AND JAROSITE MAY BE INTERFERING WITH THE SO4 GEOTHERMOMETER.

REFERENCES: MARINER AND OTHERS, 1977A; MUNDORFF, 1970; CALLAGHAN AND PARKER, 1961

COMPILED BY: MARINER, R. AND BROOK, C.

MONROE-RED HILL HOT SPRINGS , UTAH

FIELD NAME..... JOSEPH HOT SPRINGS
KGRA OR OTHER NAME..... MONROE-JOSEPH KGRA
CIRCULAR REFERENCE..... 207

GEOGRAPHIC LOCALITY

STATE..... UTAH
COUNTY..... SEVIER
LATITUDE..... 38-36.7 N
LONGITUDE..... 112-11.2 W
MAPS..... MONROE 1162,500

TOWNSHIP RANGE SECTION
25S 04W 20

BASE & MERIDIAN
SALT LAKE

GENERAL INFORMATION

WAKING FIGURE..... 7
WAKING NUMBER..... 49
ELEVATION (M)..... 1676
SURFACE ACTIVITY..... HOT SPRINGS
ASSOCIATED DEPOSITS..... TRAVERTINE
NO. OF SPRINGS..... SEVERAL
SPRING TEMPERATURES (C)..... 60 TO 64
DISCHARGE (L/MIN)..... 114
ROCK TYPES: PLIOCENE LATITE, RHYOLITE, AND BASALTIC ANDESITE
GEOPHYSICS: AMT

CHEMISTRY

SAMPLE SOURCE..... MARINER AND OTHERS, 1977
FLOW (L/MIN)..... LT 20
COLLECTION DATE.. 1974/12/17

TEMP (C)	SiO2	CA	MG	NA	K	HCO3	CO3	SO4	CL
63	90	260	44	1450	50	408		1200	1700
F	H	PH		DEL O(18) SO4	DEL O(18) H2O	DEL D H2O			
3.0	4.9	6.51			-17.32	-133.4			

GEOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	142
NA-K-CA (4/3).....	131
NA-K.....	86
SILICA	
ADIABATIC.....	128
CONDUCTIVE.....	131
CHALCEDONY.....	104
CRISTOBALITE.....	81
OPAL.....	12

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	87 (J)	131 (A)	104 (D)	107	9

UNCODER TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ON: STANDARD ESTIMATE					

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J),	0.83	STD. DEV. = 0.25

COMMENTS: ESTIMATED RESERVOIR TEMPERATURES ARE SIMILAR TO MONROE RED HILL SYSTEM 8 KM.ENE OF JOSEPH.

REFERENCES: MARINER AND OTHERS, 1977A; MUNDORFF, 1970; CALLAGHAN AND PARKER, 1961

COMPILED BY: MARINER, R. AND BROOK, C.

JOSEPH HOT SPRINGS, UTAH

FIELD NAME..... COVE FORT - SULPHURDALE
KGRA OR OTHER NAME..... COVE FORT - SULPHURDALE KGRA
CIRCULAR REFERENCE..... 208

GEOGRAPHIC LOCALITY

STATE..... UTAH
COUNTY..... MILLARD AND BEAVER
LATITUDE..... 38-36.4 N
LONGITUDE..... 112-33.0 W
MAPS..... COVE FORT 1:62,500

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
25S	06W	32	SALT LAKE

GENERAL INFORMATION

ELEVATION (M)..... 1951
SURFACE ACTIVITY..... H₂S GAS SEEPS
ASSOCIATED DEPOSITS..... SULFUR AND SINTER
NO. OF SPRINGS..... NONE
NO. OF WELLS..... 3
WELL DEPTHS (M)..... 582 TO 2226
MAXIMUM WELL TEMP (C)..... 179 AT DEPTH (M) 2226
ROCK TYPES: OLIGOCENE LATITE AND ANDESITE OVERLYING MESOZOIC AND PALEOZOIC SANDSTONE, SHALE, AND CARBONATE
RUCKS. PLISTOCENE(?) BASALT NEARBY
GEOPHYSICS: TEMPERATURE GRADIENT

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	150	180	170	167	6

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
R) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.6	2.0	1.5		
THICKNESS (KM)	1.0	2.4	1.5	1.6	0.3
SUBSURFACE AREA (KM**2)	15	35	22	24.0	4.1

BASED ON: TEMPERATURE GRADIENT SURVEY

VOLUME (KM**3).....	39.2	STD. DEV. = 9.8
THERMAL ENERGY(10**18 J).	16.05	STD. DEV. = 4.06

COMMENTS: MINIMUM, MAXIMUM, AND MOST LIKELY TEMPERATURES ARE BASED ON MEASURED TEMPERATURES FROM A SINGLE WELL AT 610, 2226, AND 1830 M RESPECTIVELY. SUBSURFACE TEMPERATURES MAY BE HIGHER IN OTHER LOCATIONS. SULFUR DEPOSITS IN ZONE 9 KM LONG.

REFERENCES: RODRIGUEZ, 1960; UNION OIL CO., 1976; N.J. STEFANIDES, PERSONAL COMMUNICATION, 1978

COMPILED BY: MARINER, R. AND BROOK, C.

COVE FORT - SULPHURDALE , UTAH

FIELD NAME..... ROOSEVELT (MCKEANS) HOT SPRINGS
KGRA OR OTHER NAME..... ROOSEVELT HOT SPRINGS KGRA
CIRCULAR REFERENCE..... 209

GEOGRAPHIC LOCALITY

STATE..... UTAH
COUNTY..... BEAVER
LATITUDE..... 38-30.0 N
LONGITUDE..... 112-50.9 W
MAPS..... RICHFIELD 11250,000

TOWNSHIP RANGE SECTION BASE & MERIDIAN
27S 09W 03 NW SALT LAKE

GENERAL INFORMATION

WAKING FIGURE..... 7
WAKING NUMBER..... 51
ELEVATION (M)..... 1585
SURFACE ACTIVITY..... SEEPS
ASSOCIATED DEPOSITS..... SINTER
NO. OF SPRINGS..... SEVERAL SEEPS
NO. OF WELLS..... 7
WELL DEPTHS (M)..... 382 TO 2234
MAXIMUM WELL TEMP (C)..... 269? AT DEPTH (M) 1867?
ROCK TYPES: TERTIARY GRANITE INTRUDED INTO PRECAMBRIAN GNEISS
GEOPHYSICS: GRAVITY, MAGNETIC, HEAT FLOW, RESISTIVITY, GROUND NOISE

CHEMISTRY

SAMPLE SOURCE.... MUNDORF, 1970
COLLECTION DATE.. 1957/09/11

TEMP (C)	S102	CA	MG	NA	K	HC03	C03	S04	CL
55	313	22		2500	488	156		73	4240
F	B	PH		DEL 0 (18) S04	DEL 0 (18) H2O	DEL 0 H2O			
7.5	38	7.9							

GEOOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	284
NA-K-CA (4/3).....	446
NA-K.....	278
SILICA	
ADIABATIC.....	195
CONDUCTIVE.....	213
CHALCEDONY.....	197
CRISTOBALITE.....	165
OPAL.....	88

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	243 (M)	284 (I)	269 (M)	265	8

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.1	2.0	0.8		
THICKNESS (KM)	1.5	2.5	2.0	2.0	0.2
SUBSURFACE AREA (KM**2)	6	50	15	23.7	9.5

BASED ON: AREA OF KNOWN PRODUCTION AND HEAT FLOW SURVEY (D. CHAPMAN, UNPUB. DATA)

VOLUME (KM**3).....	47.3	STD. DEV. = 19.7
THERMAL ENERGY(10**18 J). 31.99		STD. DEV. = 13.35

COMMENTS: SPRINGS ARE INACTIVE. SINTER DEPOSITS ALONG 4.8 KM TREND. MINIMUM AND MOST LIKELY TEMPERATURES ARE RECORDED MAXIMUM TEMPERATURES IN TWO WELLS AT 382 AND 1867 M, RESPECTIVELY. SEVEN WELLS ARE CAPABLE OF PRODUCING OVER 4.5×10^{15} KG/HR TOTAL MASS FLOW AT 260 C (CIANCANELLI AND CORMAN, 1978). 55 MW CAPACITY PROJECTED.

REFERENCES: MUNDORFF, 1970; PETERSON, 1973; CIANCANELLI AND CORMAN, 1978; THERMAL POWER CO., 1978; NASH AND OTHERS, 1978; K. DAVIS, PERSONAL COMMUNICATION, 1978

COMPILED BY: BROOK, C. AND MARINER, R.

ROOSEVELT (MCKEANS) HOT SPRINGS , UTAH

FIELD NAME..... THERMO HOT SPRINGS
 KGRA OR OTHER NAME..... THERMO HOT SPRINGS KGRA
 CIRCULAR REFERENCE..... 210

GEOGRAPHIC LOCALITY

STATE..... UTAH
 COUNTY..... BEAVER
 LATITUDE..... 38-11. N
 LONGITUDE..... 113-12.2 W.
 MAPS..... THERMO 1162,500

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
30S	12W	28 SW OF NE	SALT LAKE

GENERAL INFORMATION

WARNING FIGURE..... 7
 WARNING NUMBER..... 52
 AREA OF SURFACE EXPRESSION (KM**2). 1.8
 ELEVATION (M)..... 1535
 SURFACE ACTIVITY..... HOT SPRINGS
 ASSOCIATED DEPOSITS..... TRAVERTINE
 NO. OF SPRINGS..... 20
 SPRING TEMPERATURES (C)..... 78 TO 89.5
 DISCHARGE (L/MIN)..... 500 OR MORE
 NO. OF WELLS..... 1
 ROCK TYPES: ALLUVIUM OVERLYING TERTIARY BASALT AND RHYOLITE FLOWS
 GEOPHYSICS: AMT

CHEMISTRY

SAMPLE SOURCE.... MARTINER AND OTHERS, 1977
 FLOW (L/MIN)..... 30
 COLLECTION DATE.. 1974/12/17

TEMP(C)	SiO2	CA	MG	NA	K	HCO3	CO3	SO4	CL
89.5	113	71	10	380	52	356	2	480	225
F	B	PH		DEL O(18) SO4	DEL O(18) H2O	DEL D H2O			
6.6	0.93	7.98		-2.52	-14.32	-118.3			

GEOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 202
 NA-K-CA (4/3)..... 152
 NA-K..... 224

SILICA

ADIABATIC..... 139
 CONDUCTIVE..... 144
 CHALCEDONY..... 118
 CRISTOBALITE..... 94
 OPAL..... 23

SULFATE

CONDUCTIVE..... 151
 ONE-STEP STEAM LOSS.... 144
 CONTINUOUS STEAM LOSS.. 145

RESERVOIR PROPERTIES SUBSURFACE TEMP (C)

MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
130 (J)	151 (K)	144 (A)	142	4

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
H) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2) BASED ON: AMT SURVEY	1	10	4	5.0	1.9

VOLUME (KM**3)..... 8.3 STD. DEV. = 3.5
 THERMAL ENERGY(10**18 J). 2.85 STD. DEV. = 1.21

REFERENCES: MARINER AND OTHERS, 1977A; MUNDORFF, 1970; PETERSON, 1973; NASH AND OTHERS, 1978; USGS FILE DATA

COMPILED BY: MARINER, R. AND BROOK, C.

THERMO HOT SPRINGS, UTAH

FIELD NAME..... NEWCASTLE AREA
KGRA OR OTHER NAME..... NEWCASTLE KGRA
CIRCULAR REFERENCE..... 211

GEOGRAPHIC LOCALITY

STATE..... UTAH
COUNTY..... IRON
LATITUDE..... 37-39.7 N
LONGITUDE..... 113-33.7 W
MAPS..... CEDAR CITY 1:250,000

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
36N	15W	20 NE OF NW	SALT LAKE

GENERAL INFORMATION

ELEVATION (M)..... 1605
SURFACE ACTIVITY..... NONE, FOUND BY DRILLING
NO. OF WELLS..... 1 DEEP IRRIGATION WELL
WELL DEPTHS (M)..... 152
MAXIMUM WELL TEMP (C)..... 108 AT DEPTH (M) 85
ROCK TYPES: ALLUVIUM OVERLYING TERTIARY ASH-FLOW TUFFS AND OTHER VOLCANIC ROCKS.
GEOPHYSICS: HEAT FLOW, AMT, MAGNETIC

CHEMISTRY

SAMPLE SOURCE.... RUSH, F., UNPUB. DATA
COLLECTION DATE.. 1975/12/24

TEMP (C)	SI02	CA	MG	NA	K	HCO3	CO3	SO4	CL
100	110	52	1.3	260	14	62		550	53
F	B	PH		DEL 0 (18) SO4	DEL 0 (18) H2O	DEL 0 H2O			
6.0	0.65	7.3							

GEO THERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	148
NA-K-CA (4/3).....	100
NA-K.....	121
SILICA	
ADIAHATIC.....	137
CONDUCTIVE.....	143
CHALCEDONY.....	116
CRISTOBALITE.....	92
OPAL.....	22

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	100 (I)	148 (I)	143 (A)	130	11

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
H) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIAHATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.1	2.0	1.0		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	8	2	3.7	1.5
BASED ON: HEAT FLOW SURVEY					

VOLUME (KM**3).....	6.1	STD. DEV. = 2.9
THERMAL ENERGY(10**18 J). 1.90		STD. DEV. = 0.91

COMMENTS: MINIMUM TEMPERATURE FOR 4/3 CA; MAXIMUM FOR 1/3 CA, SEVERAL SHALLOW WELLS CONTAIN THERMAL WATER.

REFERENCES: RUSH, 1977; SHUEY AND OTHERS, 1973

COMPILED BY: MARINER, R. AND BROOK, C.

NEWCASTLE AREA, UTAH

Washington

FIELD NAME..... BAKER HOT SPRING
CIRCULAR REFERENCE..... 212

GEOGRAPHIC LOCALITY

STATE..... WASHINGTON
COUNTY..... WHATCOM
LATITUDE..... 48-45.9 N
LONGITUDE..... 121-40.2 W
MAPS..... MT. SHUKSAN 1162,500

TOWNSHIP RANGE SECTION BASE & MERIDIAN
38N 09E 20 NW OF SW WILLAMETTE

GENERAL INFORMATION

WARNING FIGURE..... 2
WARNING NUMBER..... 1
ELEVATION (M)..... 439
SURFACE ACTIVITY..... HOT SPRING
ASSOCIATED DEPOSITS..... TRAVERTINE
NO. OF SPRINGS..... 17
SPRING TEMPERATURES (C)..... 42 TO 44
DISCHARGE (L/MIN)..... 26
ROCK TYPES: TERTIARY BASALT OVERLYING GRANITE

CHEMISTRY

SAMPLE SOURCE.... MARINER, R., UNPUB. DATA
COLLECTION DATE.. 1977/07/21

TEMP (C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
44	103	5.5	0.18	170	9.6	165		87	110
F	B	PH		DEL 0 (18) S04	DEL 0 (18) H2O	DEL 0 H2O			
3.2	2.7	8.56							

GEOOTHERMOMETERS (C)

CATION

NA-K-CA (1/3)..... 162
 NA-K-CA (4/3)..... 140
 NA-K..... 126

SILICA

ADIAHATIC..... 134
 CONDUCTIVE..... 139
 CHALCEDONY..... 112
 CRISTOBALITE..... 88
 OPAL..... 18

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SURFACE TEMP (C)	102 (E)	162 (I)	139 (A)	134	12

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIAHATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SURFACE AREA (KM**2)	1	3	2	2.0	0.4

BASED ON: STANDARD ESTIMATE

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J),	1.07	STD. DEV. = 0.32

COMMENTS: MAY BE A MIXED WATER, BUT MIXING MODELS DO NOT SOLVE.

REFERENCES: WARING, 1965; CAMPBELL AND OTHERS, 1970; LIVINGSTON, 1972

COMPILED BY: BROOK, C.

BAKER HOT SPRING, WASHINGTON

FIELD NAME..... GAMMA HOT SPRINGS
CIRCULAR REFERENCE..... 213

GEOGRAPHIC LOCALITY

STATE..... WASHINGTON
COUNTY..... SNOHOMISH
LATITUDE..... 48-10.0 N
LONGITUDE..... 121-02.0 W
MAPS..... GLACIER PEAK 1162,500

GENERAL INFORMATION

ELEVATION (M)..... 1220
SURFACE ACTIVITY..... HOT SPRINGS
DISCHARGE (L/MIN)..... 13
ROCK TYPES: DACITE TO RHYODACITE TUFFS

CHEMISTRY

SAMPLE SOURCE.... TAYLOR AND CROWDER, 1969
FLOW (L/MIN).... 13
COLLECTION DATE.. 1962/08/28

TEMP(C) S102 CA MG NA K HCO3 CO3 SO4 CL
60 150 47 2.6 491 77 269 43 728

F H PH DEL O(18) SO4 DEL O(18) H2O DEL D H2O
12 7.87

GEOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	219
NA-K-CA (4/3).....	191
NA-K.....	243
SILICA	
ADIABATIC.....	153
CONDUCTIVE.....	161
CHALCEDONY.....	137
CRISTOBALITE.....	111
OPAL.....	39

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	140	195 (J)	161 (A)	165	11

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ON: STANDARD ESTIMATE					

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**10 J). 1.35		STD. DEV. = 0.39

COMMENTS: RECENT ATTEMPTS TO LOCATE THIS SPRING HAVE NOT BEEN SUCCESSFUL. AREA IS WITHIN THE GLACIER PEAK WILDERNESS AREA.

REFERENCES: TABOR AND CROWDER, 1969

COMPILED BY: BROOK, C.

GAMMA HOT SPRINGS • WASHINGTON

FIELD NAME..... OHANAPECOSH HOT SPRINGS
CIRCULAR REFERENCE..... 214

GEOGRAPHIC LOCALITY

STATE..... WASHINGTON
COUNTY..... LEWIS
LATITUDE..... 46-44.2 N
LONGITUDE..... 121-33.6 W
MAPS..... PACKWOOD 1162,500

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
14N	10E	04 NE OF NW	WILLAMETTE

GENERAL INFORMATION

WARNING FIGURE..... 2
WARNING NUMBER..... 11
ELEVATION (M)..... 586
SURFACE ACTIVITY..... HOT SPRINGS
ASSOCIATED DEPOSITS..... TRAVERTINE
NO. OF SPRINGS..... 5
SPRING TEMPERATURES (C)..... 43 TO 49
DISCHARGE (L/MIN)..... 225
ROCK TYPES: BASALT

CHEMISTRY

SAMPLE SOURCE.... MARINER, R.; UNPUB. DATA
COLLECTION DATE.. 1977/07/24

TEMP (C)	SiO2	CA	MG	NA	K	HC03	CO3	SO4	CL
48	100	60	4.9	920	52	1060		170	880
F 5.2	B	PH 6.8		DEL 0(18) SO4 +0.32		DEL 0(18) H2O -15.26		DEL 0 H2O	

GEOOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	170
NA-K-CA (4/3).....	172
NA-K.....	126
SILICA	
ADIABATIC.....	133
CONDUCTIVE.....	137
CHALCEDONY.....	110
CRISTOBALITE.....	87
OPAL.....	17
SULFATE	
CONDUCTIVE.....	108
ONE-STEP STEAM LOSS....	101
CONTINUOUS STEAM LOSS..	102

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	108 (K)	137 (A)	135 (J)	127	7

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4

BASED ON: STANDARD ESTIMATE

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J). 1.00		STD. DEV. = 0.29

COMMENTS: LOCATED IN MT. RAINIER NATIONAL PARK.

REFERENCES: FISKE AND OTHERS, 1963; WARING, 1965; CAMPBELL AND OTHERS, 1970; LIVINGSTON, 1972

COMPILED BY: BROOK, C.

OHANAPICOSH HOT SPRINGS , WASHINGTON

Wyoming

FIELD NAME..... YELLOWSTONE CALDERA AREA
KGRA OR OTHER NAME..... YELLOWSTONE NATIONAL PARK
CIRCULAR REFERENCE..... 215

GEOGRAPHIC LOCALITY

STATE..... WYOMING
COUNTY..... YELLOWSTONE
LATITUDE..... 44-28.0 N
LONGITUDE..... 110-50. W
MAPS..... OLD FAITHFUL, WEST THUMB, CANYON VILLAGE, NORRIS JUNCTION, MADISON JUNCTION, AND
MAMMOTH 1162,500

GENERAL INFORMATION

WAKING FIGURE..... 5
WAKING NUMBER..... 1-96
AREA OF SURFACE EXPRESSION (KM**2)..... 355
ELEVATION (M)..... 2288
SURFACE ACTIVITY..... GEYSERS, FUMARoles, HOT SPRINGS, ACID-SULFATE SPRINGS
ASSOCIATED DEPOSITS..... SILTIER TRAVERTINE
NO. OF SPRINGS..... SEVERAL THOUSAND
SPRING TEMPERATURES (C)..... 50 TO 96
DISCHARGE (L/MIN)..... 185,000
NO. OF WELLS..... 13 RESEARCH WELLS
WELL DEPTHS (M)..... TO 332
MAXIMUM WELL TEMP (C)..... 237 AT DEPTH (M) 332
ROCK TYPES: PLEISTOCENE RHYOLITIC TUFFS, FLOWS, AND DOMES
GEOPHYSICS: GRAVITY, MAGNETIC, RESISTIVITY, HEAT FLOW, P-WAVE DELAY, SEISMIC NOISE, MICROEARTHQUAKE

RESERVOIR PROPERTIES
SUBSURFACE TEMP (C)

MINIMUM
230

MAXIMUM
300

MOST LIKELY
270

MEAN
267

STD. DEV.
14

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE

B) QUARTZ CONDUCTIVE, PH-CORRECTED

C) QUARTZ ADIABATIC

D) CHALCEDONY

E) CHALCEDONY, PH-CORRECTED

F) CRISTOBALITE

G) AMORPHOUS SILICA

H) NA-K

I) NA-K-CA

J) NA-K-CA, MG-CORRECTED

K) SULFATE GEOTHERMOMETER

L) SURFACE TEMPERATURE

M) WELL TEMPERATURE

N) MIXING MODEL

O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.3	2.5	2.0		
THICKNESS (KM)	1.0	2.0	2.0	1.7	0.2
SUBSURFACE AREA (KM**2)	375	1900	1000	1091.7	313.0

BASED ON: AREAS OF SURFACE ACTIVITY, CALDERA, CALDERA MINUS AREAS OF RESURGENT DOMES, RESPECTIVELY

VOLUME (KM**3)..... 1819.4 STD. DEV. = 586.3
THERMAL ENERGY(10**18 J). 1236.31 STD. DEV. = 405.20

COMMENTS: RESERVOIR ASSUMED TO BE Laterally Extensive and Interconnected. At least one Vapor-Dominated Area (Mud Volcano) of limited extent has developed over a small part of the hot-water system. Mixing models and sulfate-isotope geothermometers indicates possible temperatures of 360 C in the deep reservoir. Area withdrawn from commercial exploration because of National Park status.

REFERENCES: MCKENZIE AND TRUESDELL, 1977; FOURNIER AND OTHERS, 1976; WHITE AND OTHERS, 1975; TRUESDELL AND FOURNIER, 1976; MORGAN AND OTHERS, 1976; THOMPSON AND OTHERS, 1975; WHITE AND OTHERS, 1971; ALLEN AND DAY, 1935; EATON AND OTHERS, 1975

COMPILED BY: MARINER, R. AND BROOK, C.

YELLOWSTONE CALDERA AREA, WYOMING

FIELD NAME..... MUD VOLCANO AREA
KGRA OR OTHER NAME..... YELLOWSTONE NATIONAL PARK
CIRCULAR REFERENCE..... 215A

GEOGRAPHIC LOCALITY

STATE..... WYOMING
COUNTY..... YELLOWSTONE
LATITUDE..... 44-37.5 N
LONGITUDE..... 110-26.0 W
MAPS..... CANYON VILLAGE 1162,500

GENERAL INFORMATION

WAKING FIGURE..... 5
WAKING NUMBER..... 61A - 61D
AREA OF SURFACE EXPRESSION (KM**2)..... 5
ELEVATION (M)..... 2318
SURFACE ACTIVITY..... HOT SPRINGS, FUMAROLAS
ASSOCIATED DEPOSITS..... SINTER
NO. OF SPRINGS..... 50
SPRING TEMPERATURES (C)..... 22 TO 90
DISCHARGE (L/MIN)..... 100
NO. OF WELLS..... 1 RESEARCH HOLE
WELL DEPTHS (M)..... 106
MAXIMUM WELL TEMP (C)..... 191 AT DEPTH (M) 105
ROCK TYPES: GLACIAL DEPOSITS OVERLYING PLEISTOCENE RHYOLITE TUFFS AND FLOWS
GEOPHYSICS: GRAVITY, MAGNETIC, RESISTIVITY, MICROEARTHQUAKE, SEISMIC NOISE

RESERVOIR PROPERTIES
SUBSURFACE TEMP (C)

MINIMUM
200 (0)

MAXIMUM
240 (0)

MOST LIKELY
230 (0)

MEAN
223

STD. DEV.
8

UNCODDED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE

B) QUARTZ CONDUCTIVE, PH-CORRECTED

C) QUARTZ ADIABATIC

D) CHALCEDONY

E) CHALCEDONY, PH-CORRECTED

F) CRISTOBALITE

G) AMORPHOUS SILICA

H) NA-K

I) NA-K-CA

J) NA-K-CA, MG-CORRECTED

K) SULFATE GEOTHERMOMETER

L) SURFACE TEMPERATURE

M) WELL TEMPERATURE

N) MIXING MODEL

O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.1	0.3	0.2		
THICKNESS (KM)	1.2	1.4	1.3	1.3	0.0
SUBSURFACE AREA (KM**2)	4	10	5	6.3	1.3

BASED ON: ESTIMATES OF RENNER ET AL (1976)

VOLUME (KM**3).....	8.2	STD. DEV. = 1.7
THERMAL ENERGY(10**18 J).	4.63	STD. DEV. = 0.99

COMMENTS: VAPOR-DOMINATED SYSTEM OF PROBABLE LIMITED EXTENT OVERLYING YELLOWSTONE CALDERA HOT-WATER SYSTEM AT 1.5 KM DEPTH. WELL DATA FORMED BASIS OF VAPOR-DOMINATED MODEL PROPOSED BY WHITE AND OTHERS (1971).

REFERENCES: WHITE AND OTHERS, 1971; ZOHDY AND OTHERS, 1973; RENNER AND OTHERS, 1976

COMPILED BY: BROOK, C.

MUD VOLCANO AREA, WYOMING

FIELD NAME..... HUCKLEBERRY HOT SPRINGS
CIRCULAR REFERENCE..... 216

GEOGRAPHIC LOCALITY

STATE..... WYOMING
COUNTY..... TETON
LATITUDE..... 44-07.0 N
LONGITUDE..... 110-41.0 W
MAPS..... HUCKLEBERRY MTN. 1162,500

TOWNSHIP RANGE SECTION BASE & MERIDIAN
48N 115 08 NE OF NW 6TH PRINCIPAL MERIDIAN

GENERAL INFORMATION

WARNING FIGURE..... 2
WARNING NUMBER..... 100
ELEVATION (M)..... 2079
SURFACE ACTIVITY..... HOT SPRINGS
NO. OF SPRINGS..... 2 SMALL GROUPS
DISCHARGE (L/MIN)..... 380
ROCK TYPES: TERTIARY LAVA OVERLYING CRETACEOUS SHALE

CHEMISTRY

SAMPLE SOURCE.... USGS FILE DATA

TEMP(C)	SI02	CA	MG	NA	K	HC03	C03	S04	CL
71	124	12		201	7.8	372		12	102
F	H	PH		DEL 0(18) S04	DEL 0(18) H2O	DEL 0 H2O			
		7.1							

GEOOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	141
NA-K-CA (4/3).....	112
NA-K.....	95
SILICA	
ADIABATIC.....	143
CONDUCTIVE.....	150
CHALCEDONY.....	124
CRISTOBALITE.....	99
OPAL.....	28

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	124 (D,J)	150 (A)	124 (D,J)	133	6

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4

BASED ON: STANDARD ESTIMATE

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J). 1.06		STD. DEV. = 0.30

REFERENCES: RENNER AND OTHERS, 1976; WARING, 1965; HAGUE AND OTHERS, 1896, 1899

COMPILED BY: MARINEK, R.

HUCKLEBERRY HOT SPRINGS , WYOMING

FIELD NAME..... GRANITE HOT SPRINGS
CIRCULAR REFERENCE..... 217

GEOGRAPHIC LOCALITY

STATE..... WYOMING
COUNTY..... TETON
LATITUDE..... 43-22. N
LONGITUDE..... 110-27. W
MAPS..... GRANITE FALLS 1124,000

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
39N	113W	06	6TH PRINCIPAL MERIDIAN

GENERAL INFORMATION

WATERING FIGURE..... 2
WATERING NUMBER..... 102
ELEVATION (M)..... 2147
SURFACE ACTIVITY..... HOT SPRINGS
NO. OF SPRINGS..... 2
SPRING TEMPERATURES (C)..... 44
DISCHARGE (L/MIN)..... 1200
ROCK TYPES: GRANITE

CHEMISTRY

SAMPLE SOURCE.... USGS FILE DATA
COLLECTION DATE.. 1977/09/13

TEMP (C)	SI02	CA	MG	NA	K	HCO3	CO3	SO4	CL
44	62	29	5.6	210	11	198		160	150

F	H	PH	DEL 0(18) SO4	DEL 0(18) H2O	DEL 0 H2O
6.3	0.48	7.66			

GEOOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	148
NA-K-CA (4/3).....	103
NA-K.....	119
SILICA	
ADIABATIC.....	111
CONDUCTIVE.....	112
CHALCEDONY.....	83
CRISTOBALITE.....	62
OPAL.....	-5

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUBSURFACE TEMP (C)	83 (D,J)	112 (A)	83 (D,J)	93	7

UNCODED TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUBSURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ON: STANDARD ESTIMATE					

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J),	0.70	STD. DEV. = 0.21

COMMENTS: THERMAL WATER USED IN SWIMMING POOL.

REFERENCES: WARING, 1965

COMPILED BY: MARINER, R.

GRANITE HOT SPRINGS , WYOMING

FIELD NAME..... AUBURN HOT SPRINGS
CIRCULAR REFERENCE..... 218

GEOGRAPHIC LOCALITY

STATE..... WYOMING
COUNTY..... LINCOLN
LATITUDE..... 42-49.5 N
LONGITUDE..... 111-00.0 W
MAPS..... AUBURN 11125.000

TOWNSHIP	RANGE	SECTION	BASE & MERIDIAN
33N	119	23 SW OF NW	6TH PRINCIPAL MERIDIAN

GENERAL INFORMATION

WARNING FIGURE..... 2
WARNING NUMBER..... 103
ELEVATION (M)..... 1829
SURFACE ACTIVITY..... HOT SPRINGS
ASSOCIATED DEPOSITS..... TRAVERTINE MOUNDS
NO. OF SPRINGS..... SEVERAL
SPRING TEMPERATURES (C)..... 16 TO 59.5
DISCHARGE (L/MIN)..... 150
ROCK TYPES: TRIASSIC OR JURASSIC LIMESTONE

CHEMISTRY

SAMPLE SOURCE.... USGS FILE DATA
COLLECTION DATE.. 1977/09/14

TEMP (C)	SI02	CA	MG	NA	K	HC03	CO3	S04	CL
59.5	50	400	68	1550	160	920		1150	2050
F	B	PH		DEL 0 (18) S04	DEL 0 (18) H2O	DEL 0 H2O			
4.0	2.9	6.38							

GEOOTHERMOMETERS (C)

CATION	
NA-K-CA (1/3).....	196
NA-K-CA (4/3).....	174
NA-K.....	188
SILICA	
ADIABATIC.....	103
CONDUCTIVE.....	102
CHALCEDONY.....	72
CRISTOBALITE.....	51
OPAL.....	-14

RESERVOIR PROPERTIES	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
SUNSURFACE TEMP (C)	72 (D)	102 (A)	96 (J)	90	6

UNCODER TEMPERATURE INDICATES SUBJECTIVE JUDGEMENT

A) QUARTZ CONDUCTIVE	F) CRISTOBALITE	K) SULFATE GEOTHERMOMETER
B) QUARTZ CONDUCTIVE, PH-CORRECTED	G) AMORPHOUS SILICA	L) SURFACE TEMPERATURE
C) QUARTZ ADIABATIC	H) NA-K	M) WELL TEMPERATURE
D) CHALCEDONY	I) NA-K-CA	N) MIXING MODEL
E) CHALCEDONY, PH-CORRECTED	J) NA-K-CA, MG-CORRECTED	O) RENNER AND OTHERS, 1976

	MINIMUM	MAXIMUM	MOST LIKELY	MEAN	STD. DEV.
DEPTH TO TOP (KM)	0.5	2.0	1.5		
THICKNESS (KM)	1.0	2.5	1.5	1.7	0.3
SUNSURFACE AREA (KM**2)	1	3	2	2.0	0.4
BASED ON STANDARD ESTIMATE					

VOLUME (KM**3).....	3.3	STD. DEV. = 0.9
THERMAL ENERGY(10**18 J). 0.67		STD. DEV. = 0.2

COMMENTS: GAS DISCHARGE IS PRINCIPALLY CARBON DIOXIDE; WATERS ARE HIGH IN SULFIDE (25MG/L).

REFERENCES: RUBBY, 1958; WARRING, 1965

COMPILED BY: MARINER, R.

AUBURN HOT SPRINGS, WYOMING

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