STATE OF MONTANA
Thomas L. Judge, Governor

BUREAU OF MINES AND GEOLOGY
S. L. Groff, Director

SPECIAL PUBLICATION 79
July 1978

GEOTHERMAL DATA-BASE STUDY: MINE-WATER TEMPERATURES

Final Report

by

D. C. Lawson and J. L. Sonderegger

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RLO-2426-T2-3

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D. C. Lawson and J. L. Sonderegger
Montana Bureau of Mines and Geology
Montana College of Mineral Science and Technology
Butte, Montana

May 16, 1976 - May 15, 1978

PREPARED FOR THE U.S. ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION UNDER CONTRACT EY-76-C-06-2426

MONTANA COLLEGE OF MINERAL SCIENCE AND TECHNOLOGY
Butte, Montana
1978

Distributed by

Montana Bureau of Mines and Geology

Room 206, Main Hall

Montana College of Mineral Science and Technology

Butte, Montana 59701

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ABSTRACT

Investigation of about 1,600 mines and prospects for perennial discharge resulted in the measurement of temperature, pH, specific conductance, and discharge at 80 sites to provide information for a geothermal data base. Measurements were made in the fall, winter, and late spring or early summer to provide information about seasonal variability. None of the temperatures measured exceeded the mean annual air temperature by 15 °F, but three areas were noted where discharges were anomalously warm, based upon high temperatures, slight temperature variation, and quantity of discharge.

The most promising area, at the Gold Bug mine in the Little Rockies, discharges water averaging 7.3 °C (12.1 °F) above the mean annual air temperature. The discharge may represent water heated during circulation within the syenite intrusive body. If the syenite is enriched in uranium and thorium, an abnormal amount of heat would be produced by radioactive decay. Alternatively, the water may move through deep permeable sedimentary strata, such as the Madison Group, and be discharged to the surface through fractures in the pluton.

INTRODUCTION

Reconnaissance studies involving the measurement of ground-water temperatures at springs and mines are one of several methods commonly employed to establish a data base that can be used to evaluate geothermal potential (Coombs and Muffler, 1973). The U.S. Geological Survey had some data on water temperatures at depth from mines in Butte (see Robertson and others, 1976, Table 1); very few mine-water temperature measurements were available for the rest of Montana. An expanded data base of mine-water temperatures in Montana seemed likely to be useful in depicting areas for further geothermal investigation.

The major difficulty in such a study is obtaining permission to collect samples, especially if they are to be collected underground from inactive mines. The senior author has been employed by the Montana Bureau of Mines and Geology (MBMG) for more than twenty years; because he knows many of the mine owners personally, obtaining permission to enter the mines and to measure discharge characteristics was greatly simplified.

Including subdistricts, there are 250 hardrock mining areas in Montana. Approximately 1,600 mines and prospects were inspected for discharge. At only 368 of these sites could a measurable discharge be found during the fall of 1976. In some districts, water was a common mining problem, and nearly all of the mines in these districts had perennial discharge, but in other districts, all mines checked in the fall were dry. Where multiple sampling sites were available, mines that were in close proximity and in the same host rock were grouped, and the most accessible high-discharge mine was picked as the sample site, because of the severity of winter sampling conditions. No anomalously warm discharges were deleted in selecting the sampling sites. This final group consisted of 80 mines and prospects. Temperature, specific conductance, pH, and discharge were measured in the fall, winter, and spring to provide information about the seasonal variability, especially of temperature and discharge.

Sample sites ranged in altitude from about 2,900 feet (885 meters) to 9,840 feet (3,000 meters). Air temperatures while the measurements were made ranged from 90 °F (32 °C) to −23 °F (−31 °C), a difference of 113 °F (63 °C). Snow pack at some locations was as great as 10 feet (3 meters) during winter sampling, and a few sites were "unlocatable" because of drifts of 20 feet or more.

ACKNOWLEDGMENTS

We thank the many mine owners and operators who granted permission for this study. Without their generous cooperation the underground measurements and many of the portal measurements could not have been obtained. We especially thank Gunnar Johnson, Bun Stark, Hugh King, the Bullock Brothers, Emett Clary, Carl Berg, Don Jenkins, Bill Hand, Jim Young, Kester Counts, The Anaconda Company, Peter Antonioli, Vernon Smith, and Donald Cripe.

We also thank Phil Farnes of the Soil Conservation Service, Snow Survey unit, for climatological data from their stations. Bob Bergantino of the Montana Bureau of Mines and Geology provided extensive assistance with the climatic data. Dale Loucks and Don Barbula assisted with the field work and data compilation. The authors, however, are solely responsible for the assumptions and the methods used to obtain calculated values and for the interpretation of all data. Manuscript reviews by Dr. Ralph King, Dr. Richard Berg, and Joseph Donovan resulted in greater clarity and brevity of presentation.

METHODOLOGY AND RESULTS

Water temperatures were measured with a mercury thermometer with 1 °C divisions until the second winter-sampling period (1978), when a new thermometer with ½ °C divisions was used. Precision for all measurements is believed to be ½ °C and accuracy to be within 1 °C. Both thermometers agreed within 0.3 °C with a calorimeter thermometer at various temperatures.

At first the pH value of the water was tested using Dual-Tint pH paper color coded in 0.3-unit increments. Some fading was encountered, but we believe that the values are accurate to ±0.5 pH units and are generally better than ±0.3 units. In 1978, ColorpHast papers were used with complete satisfaction. These values are probably within the ±0.1 pH unit accuracy claimed by the manufacturer.

The specific conductance of the mine waters was measured using a Yellow Springs Model 33 salinity-conductivity meter, using the standard 10-foot probe lead. This meter is very rugged; the ability to null the meter compensated for thermal effects to the meter's electronics. Satisfactory results were obtained, provided that the probe was kept moist and calibration solutions were carried along to check for drift (contamination of the platinum black electrodes). Nevertheless, a few readings from middle to late September, 1976, seem to be spuriously low. The data are presented in the Appendix and are listed in fall-winter-spring sequence, with raw and corrected conductance values. Temperature corrections employed in this study were taken from the U.S. Department of Agriculture, Agriculture Handbook No. 60 (1954, p. 90).

Two different methods of discharge measurement were employed, depending upon the conditions encountered. Where possible, the discharge was confined by building a dam and causing the discharge to exit through either a 2- or 4-inch diameter plastic pipe. The time required to fill a 3-gallon bucket was measured three times with a stopwatch, and the average time was used to calculate the discharge rate. This method is generally precise to about 2 or 3 percent. If the senior author questioned whether complete containment without seepage loss or adsorption was achieved, these values are not reported to three places.

If the volume of discharge was too great or if the flow could not be contained properly to employ the bucket and stopwatch method, the discharge was calculated from measured times for a wood chip to float a measured length of the channel. For this method a straight stretch of the discharge channel 12 to 20 feet

in length and even slope (gradient) was chosen. At the top, middle, and bottom of the measured channel stretch, the width and water depth were measured at each side and the middle of the channel. Figure 1 shows a typical cross section of a drainage channel. The area of the channel (A) was approximated using equation (1)

$$A = (W/2)\,(D_1 + D_3) + (W/4)[(D_2 - D_1) + (D_2 - D_3)] \quad (1)$$

as shown by the dashed lines in Figure 1. The average cross-sectional area was calculated using the three sets of measurements

$$A = (A_1 + A_2 + A_3)/3 \text{ ft}^2 \quad (2)$$

Similarly the average velocity was calculated from three measurements of the time required for a small wooden chip to float the length of the measured stretch

$$v = d/[(t_1 + t_2 + t_3)/3] \text{ ft/sec} \quad (4)$$

where v is the average velocity, d is the measured channel length, and each t is an elapsed time for the chip to travel the measured channel length.

Because in most discharge channels the ratio of width to depth at the center (W to D_2) was 10 or greater, corrections for the large amount of bottom surface relative to cross-sectional area as well as for the greater-than-average velocity of the centerline surface had to be considered. Kulin and Compton (1975, p. 63) recommended a correction term of about 0.83 for large dish-shaped sections with rough beds and a float that does not extend significantly beneath the water surface. The authors have chosen to reduce this factor to 0.75 in view of the sampling conditions. The discharge rate was calculated as

$$Q = 0.75 \times A \times v \times 448.8 \text{ gal/min} \quad (5)$$

where Q is the discharge and 448.8 is a term to convert cubic feet per second to gallons per minute. Discharge measurements made by this method are marked by an asterisk (*) in the Appendix; we believe that all of these measurements are accurate to ±20 percent, and that most of the measurements are within 10 percent of the true value.

All of the waters tested were acid, the pH values ranging from 3.5 (Glengarry mine, Park County) to 6.8. Of 230 determinations, 19 were less than 5.0, 150 ranged from 5.0 to 5.9, and 61 from 6.0 to 6.8. The modal pH value is 5.9 and the median pH value is 5.8. Because the first pH paper used was graduated in

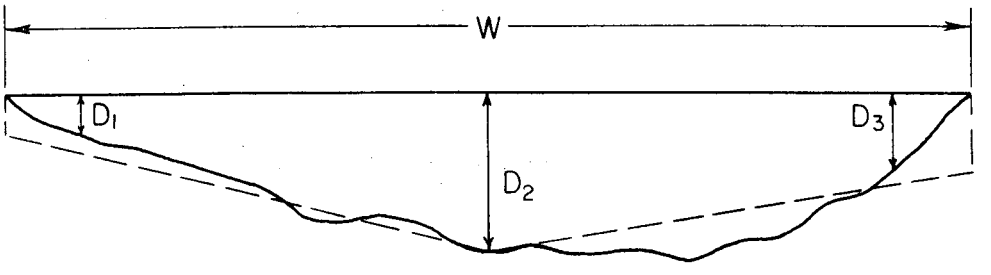

Figure 1.—Cross section of a typical discharge channel (vertical scale exaggerated).

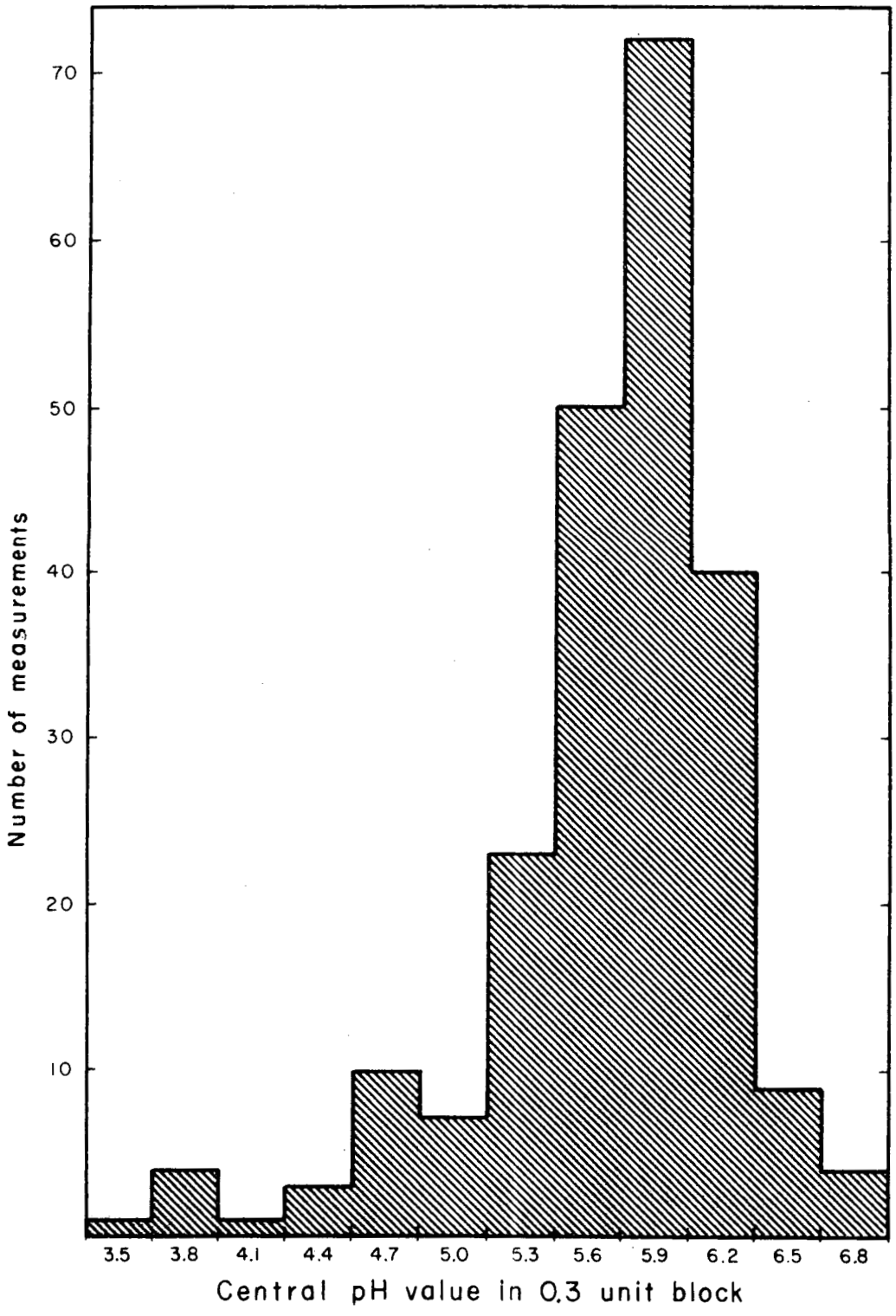

Figure 2.—Histogram depicting the frequency of pH measurements, in 0.3-unit increments.

0.3 pH unit increments, it was necessary to use the same increment size in constructing a histogram showing the frequency of the measured pH values (Fig. 2). For most of the samples, the pH is buffered by carbon dioxide, and a slight increase in pH is caused by carbonic acid attacking silicate and carbonate minerals. In the low pH waters, this effect is reversed by the oxidation of sulfide minerals.

Most of Montana's thermal springs are slightly to moderately basic (Sonderegger, Bergantino, and Miller, 1977). Consequently, should any of these discharges contain, in part, thermal water from depth, it is probable that the pH has been lowered by mixing with shallow meteoric water.

The specific-conductance measurements (232) are presented in a histogram (Fig. 3). Most of these mine discharges (70 percent) had a specific conductance of 500 micromhos per centimeter (μmho/cm) or less; the modal value is in the 201-300 μmho/cm range, and the median value is in the 301-400 μmho/cm range. Montana's thermal springs range in specific conductance from about 200 to 2,200 μmho/cm; the major value of these measurements is for comparison with thermal springs in adjacent areas to estimate roughly the range of possible dilution involved.

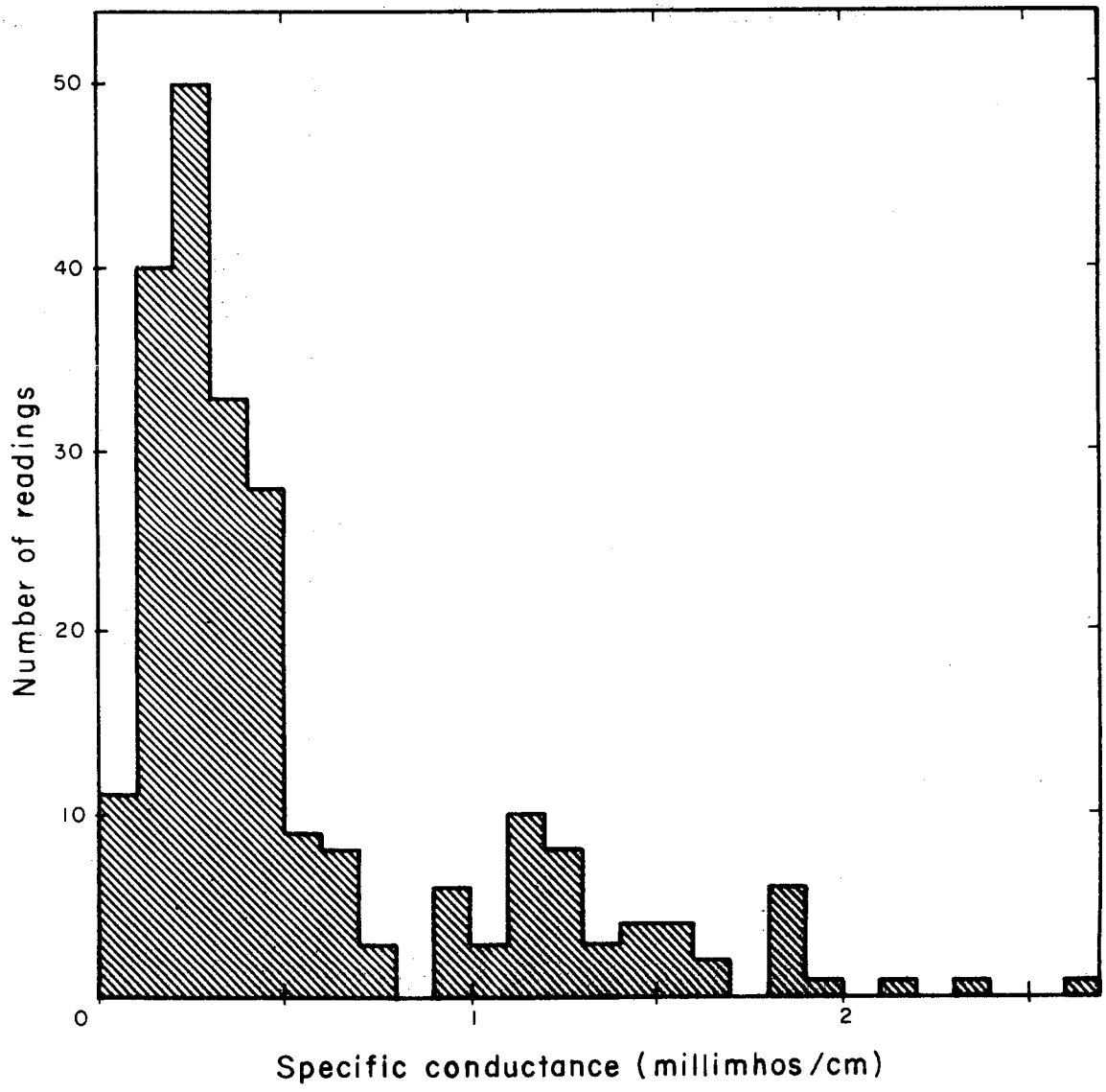

Figure 3.—Histogram depicting the frequency of specific conductance values, in 100-μmhos/cm increments.

The temperature data were originally to be compared to a computer fit of mean annual air temperatures. The following equation in degrees centigrade (°C) was derived by multiple regression analysis of climatic data compiled by R. N. Bergantino from 88 weather stations in central and western Montana:

$$T = 32.0722 - 0.001427(\text{Alt.}) - 0.9233(\text{Lat.}) + 0.2039(\text{Long.}) \quad (6)$$

where Alt. is the altitude in feet, Lat. is the latitude in decimal degrees, and Long. is the longitude in decimal degrees; the standard error of estimate was 0.957 °C and the adjusted standard error of estimate was 0.974 °C. The scarcity of data for stations above 6,000 feet prevented us from using the equation for some data points.

An attempt to fill the data gap for high altitudes by using data from the U.S. Soil Conservation Service Snow Survey records (P. E. Farnes, pers. commun., 1978) showed that the 42-inch-depth soil temperatures ranged from −2 to +8 degrees Fahrenheit relative to the mean annual air temperature and did not provide sufficiently homogeneous data to warrant extending our calculations to high altitudes.

The next step was to plot the temperature data for each season against the altitude of the sampling site and to sketch an "upper normal temperature" curve. Next a composite plot was prepared depicting the observed temperature range versus altitude. A portion of this plot, which we believe includes all of the significant anomalies, is presented as Figure 4. The three sites that we believe constitute real anomalies are labeled A, B, and C, in order of their importance. An additional five sites, which probably represent the upper range of normal temperature variation but which might also be worth further investigation, are listed as D through H in their estimated order of importance.

The data for these eight mines are presented in Table 1. Discussion of the three most important sites follows a review of the setting of Montana's known thermal springs. The reader is cautioned that none of these mining sites discharges water that is 15 °F above the calculated mean annual air temperature, the standard definition of a thermal spring in the United States (Waring, 1965, p. 4).

The complete data compilation is presented in the Appendix. Measurements are listed sequentially for fall, winter, and late spring to early summer seasons to aid comparison between sites. The sampling sites are listed alphabetically, by county, district, subdistrict, and mine name.

We offer the following observations about sampling factors:

(1) Unless an annual range of variation in temperature is essential, samples should be collected during the fall, low-base-flow period before late fall rains or snow (with subsequent melting) occur. This greatly reduces the logistical problems and expense.

(2) For winter sampling conditions, underground, no measurable temperature variation of the water was detected beyond 100 feet from the portal.

(3) Generally, the smaller discharges showed greater annual variation in temperature. When measuring the temperatures of flows less than 5 gpm, the aspect, the length of the drift, and the time of day should be considered. Diffuse discharge (seepage) from collapsed prospects or other shallow sources can be significantly altered by ground temperature.

(4) Discharge volumes showed a wider variation than the other parameters, particularly during winter sampling, owing to freezing, snow, and the need to move the discharge measuring point because of limited accessibility.

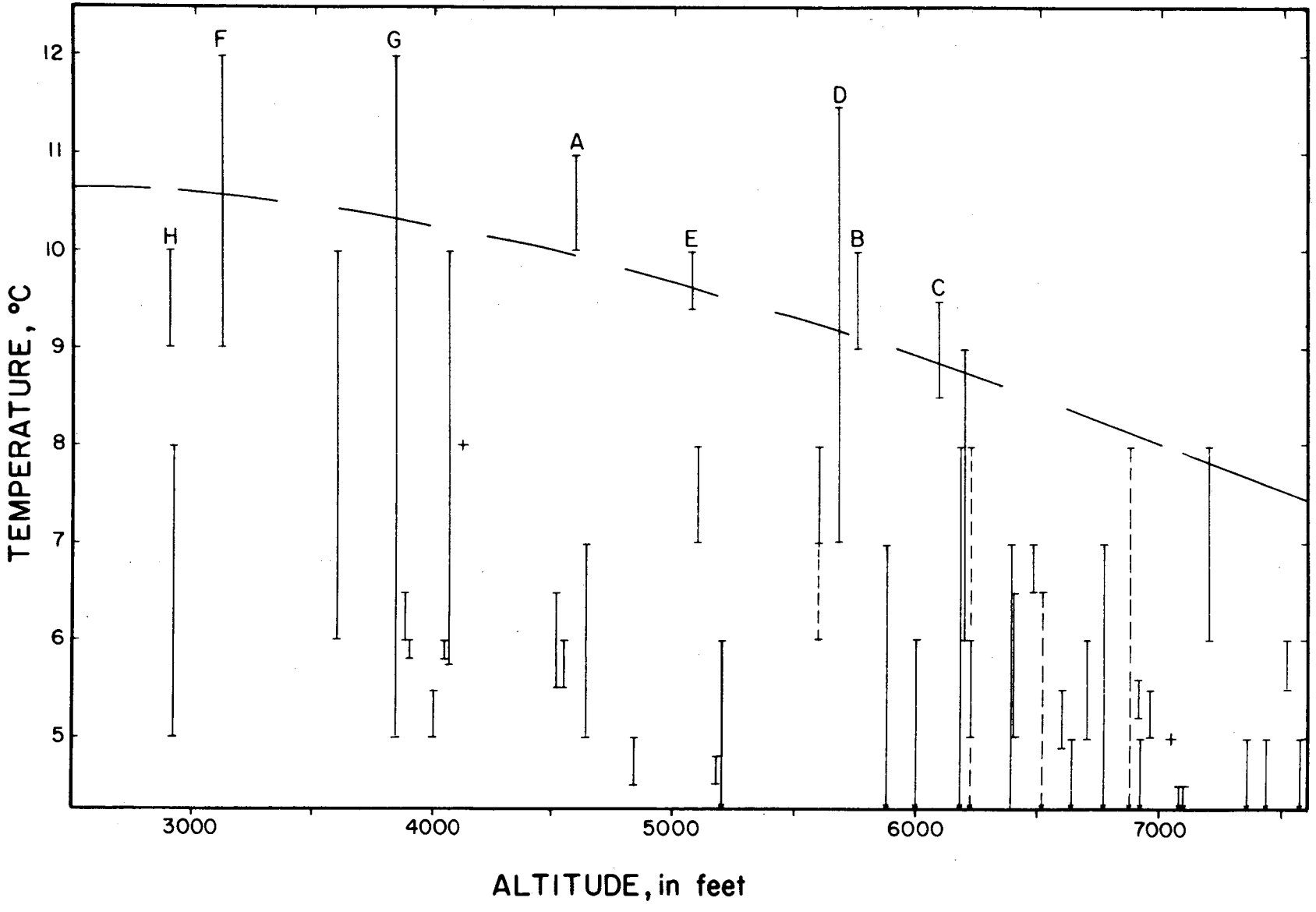

Figure 4.—Plot of measured temperatures versus altitude. Letters denote sites listed in Table 1; the dashed curved line represents the estimated normal high range for discharge temperatures; the symbol + represents a site where all measured temperatures were the same.

DISCUSSION

Most of Montana's known thermal springs are located either on valley margins or in valleys. This is not surprising, in view of the fact that western Montana's mountain ranges and intermontane valleys are the result of epeirogenic uplift and block faulting (Perry, 1962). The present mountain ranges are blocks of the crust that have moved upward relative to adjacent blocks. Most if not all of the intermontane valleys represent downdropped blocks.

The faults that cause this physiographic separation of land into mountains and valleys must extend to great depth, as shown by the thickness of sediments filling the valley basins. These fault systems provide natural conduit systems for heated water from thousands of feet below the land surface to rise upward. Because most of the major faults bound the valleys (i.e., are at the margins of the valleys), one would expect most of the thermal springs to rise along the valley margins. A brief inspection of Witkind's map (1975) of known and suspected active faults in Montana will show that most of these faults are along valley margins. A significant percentage of the known thermal springs occurs along valleys where Witkind has denoted active faults.

Some mountain hot springs may also be related to active faults. The Elkhorn hot spring in the Pioneer Mountains, northwest of Dillon at an altitude of 7,200 feet, is on a logical extension of the unnamed fault along the Wise River Valley shown by Witkind (1975).

The purpose of this discussion is to point out that the mountainous areas, where most of the mining activity in Montana has been undertaken, are not necessarily the best areas to prospect for geothermal energy. Only where ascending thermal waters can find no outlet along the valley margins, at lower elevations, will they continue to rise and be discharged in the mountains.

Table 1.—Mine discharges at temperatures above average.

	Mine name	County	Altitude (feet)	Calculated mean annual air temp., °C	Water temperature °C	Discharge (gpm)	Specific conductance (μmho/cm)	pH	ΔT (observed—calculated), °C
A.	Gold Bug	Phillips	4600	3.4	11	650	633	6.2	7.6
					10	614	649	5.9	6.6
					11	90	523	5.9	7.6
B.	Swansea	Lewis and Clark	5760	3.5	10	23	155	5.9	6.5
					9	30	159	5.9	5.5
					10	10.6	167	5.3	6.5
C.	Iron Mountain	Beaverhead	6190	4.4	9.5	192	150	5.7	5.1
					9.0	367	190	5.6	4.6
					8.5	505	200	6.2	4.1
D.	Waterlode	Madison	5080	5.55	10.0	5	254	6.2	4.45
					9.5	4	250	6.0	3.95
					9.4	3.2	258	6.1	3.85
E.	Double Mac	Lincoln	3120	6.6	12	6	282	5.6	5.4
					11	5	275	5.8	4.4
					9	4.5	304	5.7	2.4
F.	Nancy Lee	Mineral	3840	6.4	10	2.9	1270	5.9	3.6
					5	—	1597	6.2	−1.4
					12	8.75	1877	5.9	5.6
G.	Luken Hazel (Lower)	Lincoln	2900	6.9	10	24	1235	6.2	3.1
					9	24	514	6.2	2.1
					9	25	384	6.3	2.1

GOLD BUG MINE

The Gold Bug mine, in Phillips County, was selected as the best prospect for further study because:

(1) The difference between calculated and observed temperatures was the greatest.

(2) The amount of temperature variation recorded was small (1 °C).

(3) The discharge, although varying significantly, was sufficiently large to assure that diurnal and short-term climatic effects were not significant.

The geology of this area was mapped by Knechtel (1959); the mine is located in syenite porphyry believed to be of early Tertiary age. The sedimentary rocks around the Little Rocky Mountains have been domed up by the intrusion of the porphyry, and erosion has exposed rocks of Precambrian, Paleozoic, and Mesozoic age. Warm springs around the dome constitute a significant low-temperature resource (Sonderegger, Bergantino, and Miller, 1977); these springs discharge from zones adjacent to the Mississippian-Jurassic contact.

Alkalic magmas commonly are enriched in radioactive elements, particularly uranium and thorium (Gabelman, 1977), and the decay of these elements will release significant quantities of heat. Consquently, it is not possible, from the data available, to determine whether the water discharged at the Gold Bug mine represents water from a deeper sedimentary source such as the Madison Group or water that has circulated within the porphyry and has been heated by radioactive decay.

SWANSEA MINE

The Swansea mine (lower adit) in Lewis and Clark County was selected as the second-best prospect for further study because:

(1) The difference between calculated and observed temperatures was the second greatest.

(2) The amount of temperature variation was small (1 °C).

(3) The discharge, although not large, was deemed adequate, and the lowest temperature (winter sampling) was accompanied by the greatest discharge.

The geology of this area has been mapped by Melson (1971); the portal was observed to be in the intrusive Silver Bell stock, which ranges in composition from quartz monzonite to granodiorite. The drift runs along the contact between the intrusive body and the host rock (Precambrian siltstone and mudstone, which are dolomitic to calcareous, and have been altered to hornfels). Geochemical soil sampling in the area (McClernan, 1974) suggests that disseminated sulfide minerals may be present.

The most probable explanation for the warm water is that (1) the Silver Bell stock was emplaced at a fairly shallow level, possibly connected by feeders to a larger parent body at depth, which is generally believed to result in greater fracturing in the host and in the outer shell of the intrusive body; (2) its emplacement was controlled by zones of structural weakness, which resulted in extensive faulting and fracturing, as shown by the fact that the contact-zone ores and gangue definitely fill open spaces (McClernan, oral commun., 1978); and (3) a deep circulation pattern for meteoric water, heated at depth, has been established. The age of the intrusion is believed to be similar to that of the Boulder batholith, roughly 76 to 72 million years before present, based upon "main series" dates presented by Tilling (1973). Because this area lies northwest of the Marysville known geothermal resource area along the trend of the Montana Lineament, it is possible that the intrusive body is of a younger age and that high heat-flow values may also be present in this area.

IRON MOUNTAIN MINE

The Iron Mountain mine, in Beaverhead County, was placed third on the prospect list because the 1 °C range of variation and the large discharge values (192 to 505 gpm) are promising factors, although the difference between calculated and observed temperatures was the lowest of the three anomalous areas.

The geology of the area was mapped by Myers (1952); the adit sampled is south-southwest of the shaft shown on the map and is about 6 feet above the creek. Winchell (1914) reported that the main tunnel passed through 500 feet of quartz monzonite before encountering limestone. He also reported that mining was along the contact between the quartz monzonite and the limestone, which strikes east and dips 50° to the north, the dip decreasing with depth (p. 67). Winchell also noted that the ore postdates the solidification of the intrusive body, that faulting occurs along the contact, and that sulfides have been deposited within the fault gouge (p. 67-68).

The quartz monzonite stock may have been emplaced within a zone of structural weakness. The topographic feature known as the Argenta Flats is a Quaternary alluvial fan, bounded by Tertiary terraces to the northeast and southwest. The northeastern boundary, along which Rattlesnake Creek flows, has a sharp topographic boundary forming a very steep hillside with about 100 feet of relief adjacent to the creek. The southwestern boundary, close to the town of Argenta and the mine, seems to be faceted, suggesting late Tertiary faulting. The areas northeast, northwest, and southwest of Argenta are extensively faulted (Myers, 1952; Ross, Andrews, and Witkind, 1955); this easterly flowing portion of the Rattlesnake Creek drainage seems to have been developed along an east-west boundary that constituted the southern limit of the Pioneer Mountains batholith.

The faulting and possible boundary relationship to the major intrusive body suggest that deep circulation along faults and fractures provides the major control for the ascent of warmer water from depth.

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APPENDIX

Deposit name: IRON MOUNTAIN
District: ARGENTA County: BEAVERHEAD
Location: Township 6 N. Range 10 W. Section 30
Latitude: 45°16′60″ Longitude: 112°52′33″
Map name: ARGENTA Series: 7½ minute
Altitude of portal (ft.): 6190; of sampling point, same
Distance from portal to sampling point (ft.): 235

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
7/8/76	9.5	5.7	150 xf_t = 214	192*
2/24/78	9	5.6	195 xf_t = 282	367*
5/19/77	8.5	6.2	200 xf_t = 294	505*

Deposit name: NEW DEPARTURE
District: BLUE WING County: BEAVERHEAD
Location: Township 7 S. Range 11 W. Section 26
Latitude: 45°11′43″ Longitude: 112°54′56″
Map name: BANNACK Series: 7½ minute
Altitude of portal (ft.): 6770; of sampling point, same
Distance from portal to sampling point (ft.): at portal

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
7/8/76	7	—	250 xf_t = 382	9
2/20/78	4	6.0	300 xf_t = 498	4
5/19/77	4	5.6	312 xf_t = 518	3.6

Deposit name: GAR (COMET)
District: ELKHORN County: BEAVERHEAD
Location: Township 4 S. Range 12 W. Section 26
Latitude: 45°27′25″ Longitude: 113°2′53″
Map name: POLARIS Series: 15 minute
Altitude of portal (ft.): 8800; of sampling point, same
Distance from portal to sampling point (ft.): at portal

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
9/21/76	3	5.3	30 xf_t = 51	2.25
2/21/78	3	5.5	40 xf_t = 68	2
7/8/77	4	5.4	30 xf_t = 50	3

Deposit name: LOWER ELKHORN
District: ELKHORN County: BEAVERHEAD
Location: Township 4 S. Range 12 W. Section 14
Latitude: 45°29'9" Longitude: 113°2'53"
Map name: POLARIS Series: 15 minute
Altitude of portal (ft.): 7520; of sampling point, same
Distance from portal to sampling point (ft.): at portal (unsafe)

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
9/21/76	6	5.0	120 xf_t = 188	281*
2/24/78	5.5	5.1	120 xf_t = 191	278*
6/16/77	5.5	5.0	130 xf_t = 207	289*

Deposit name: SILVER QUEEN
District: JAKE CREEK County: BEAVERHEAD
Location: Township 10 S. Range 7 W. Section 17
Latitude: 44°57'51" Longitude: 112°29'14"
Map name: PRICE CREEK Series: 7½ minute
Altitude of portal (ft.): 7050; of sampling point, same
Distance from portal to sampling point (ft.): 50

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
8/15/77	5	6.2	220 xf_t = 355	2.69
2/25/78	5	6.1	230 xf_t = 371	1.75
5/18/77	5	6.0	210 xf_t = 339	2.25

Deposit name: MARIETTA
District: PARK (Indian Creek subdistrict) County: BROADWATER
Location: Township 7 N. Range 1 W. Section 15
Latitude: 46°21'42" Longitude: 111°42'46"
Map name: TOWNSEND Series: 15 minute
Altitude of portal (ft.): 7080; of sampling point, same
Distance from portal to sampling point (ft.): at adit

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
8/18/76	4.5	5.3	180 xf_t = 294	13
1/28/78	4	5.3	200 xf_t = 332	10
5/23/77	4	5.3	200 xf_t = 332	31.2

Deposit name: EAST PACIFIC
District: WINSTON (Beaver Creek subdistrict) County: BROADWATER
Location: Township 8 N. Range 1 W. Section 26
Latitude: 46°25'14" Longitude: 111°41'30"
Map name: TOWNSEND Series: 15 minute
Altitude of portal (ft.): 5880; of sampling point, same
Distance from portal to sampling point (ft.): at portal

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
9/22/77	4	5.8	260 xf_t = 432	4.5
3/24/77	4	5.9	840 xf_t = 1394	6
5/23/77	7	5.6	250 xf_t = 382	10

Deposit name: LOWER KLEINSCHMIDT
District: WINSTON County: BROADWATER
Location: Township 7 N. Range 1 W. Section 3
Latitude: 46°23'28" Longitude: 111°42'46"
Map name: TOWNSEND Series: 15 minute
Altitude of portal (ft.): 7360; of sampling point, same
Distance from portal to sampling point (ft.): at portal (caved)

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
8/19/76	5	5.9	335 xf_t = 540	23*
3/24/77	3	5.9	700 xf_t = 1196	20*
5/23/77	4.5	5.8	188 xf_t = 308	24*

Deposit name: LOWER BIG SEVEN
District: NEIHART County: CASCADE
Location: Township 14 N. Range 8 E. Section 27
Latitude: 46°56'44" Longitude: 110°41'33"
Map name: NEIHART Series: 7½ minute
Altitude of portal (ft.): 7000; of sampling point, same
Distance from portal to sampling point (ft.): at portal (caved)

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
8/16/76	3	4.7	280 xf_t = 479	142*
3/13/77	2	5.0	700 xf_t = 1239	86*
6/15/77	3	5.0	600 xf_t = 1025	100*

Deposit name: McKAY CREEK
District: NEIHART County: CASCADE
Location: Township 14 N. Range 8 E. Section 16
Latitude: 46°58'28" Longitude: 110°42'47"
Map name: NEIHART Series: 7½ minute
Altitude of portal (ft.): 6600; of sampling point, same
Distance from portal to sampling point (ft.): caved at portal

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
8/16/76	5.5	5.6	230 xf_t = 366	3
1/29/78	4.9	5.5	780 xf_t = 1262	2
5/29/77	5.5	5.6	790 xf_t = 1257	2.5

Deposit name: SILVER DYKE
District: NEIHART County: CASCADE
Location: Township 14 N. Range 8 E. Section 10
Latitude: 46°59'20" Longitude: 110°41'33"
Map name: NEIHART Series: 7½ minute
Altitude of portal (ft.): 6880; of sampling point, same
Distance from portal to sampling point (ft.): at portal

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
8/16/76	8	5.6	1250 xf_t = 1860	25.5
2/3/77	2	5.6	1050 xf_t = 1860	10.36
5/29/77	7	5.6	1750 xf_t = 2674	28.13

Deposit name: STAR
District: NEIHART County: CASCADE
Location: Township 14 N. Range 8 E. Section 29
Latitude: 46°56'44" Longitude: 110°44'2"
Map name: NEIHART Series: 7½ minute
Altitude of portal (ft.): 5600; of sampling point, same
Distance from portal to sampling point (ft.): locked (at portal)

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
8/16/76	8	6.5	460 xf_t = 684	60*
2/3/77	6	6.2	600 xf_t = 941	30
5/29/77	8	5.6	980 xf_t = 1458	24

Deposit name: UPPER BIG SEVEN
District: NEIHART County: CASCADE
Location: Township 14 N. Range 8 E. Section 28
Latitude: 46°56'44" Longitude: 110°42'47"
Map name: NEIHART Series: 7½ minute
Altitude of portal (ft.): 7040; of sampling point, same
Distance from portal to sampling point (ft.): at portal

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
8/20/77	3.75	5.4	1180 xf_t = 1976	26*
3/13/77	3	5.3	1230 xf_t = 2102	25*
6/15/77	3.75	5.3	950 xf_t = 1591	28*

Deposit name: BERTHA (GIES) MINE
District: WARM SPRINGS (Gilt Edge subdistrict) County: FERGUS
Location: Township 17 N. Range 20 E. Section 22
Latitude: 47°13'10" Longitude: 109°9'18"
Map name: JUDITH PEAK Series: 15 minute
Altitude of portal (ft.): 5100; of sampling point, same
Distance from portal to sampling point (ft.): 870

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
8/13/76	8	6.5	242 xf_t = 360	12
2/13/77	8	6.2	290 xf_t = 432	9.2
5/30/77	7	5.6	780 xf_t = 1192	10.2

Deposit name: MARRIETTA NO. 1
District: WARM SPRINGS (Gilt Edge subdistrict) County: FERGUS
Location: Township 17 N. Range 20 E. Section 27
Latitude: 47°12'18" Longitude: 109°9'18"
Map name: JUDITH PEAK Series: 15 minute
Altitude of portal (ft.): 4660; of sampling point, same
Distance from portal to sampling point (ft.): at portal (caved)

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
8/16/77	6	5.4	180 xf_t = 282	135*
1/30/78	5	5.3	190 xf_t = 306	120*
5/30/77	7	5.3	170 xf_t = 260	164*

Deposit name: JOSEPHINE
District: PHILIPSBURG (Flint Creek subdistrict) County: GRANITE
Location: Township 7 N. Range 13 W. Section 29
Latitude: 46°19'55" Longitude: 113°15'10"
Map name: FRED BURR LAKE Series: 7½ minute
Altitude of portal (ft.): 6650; of sampling point, same
Distance from portal to sampling point (ft.): at portal (caved)

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
10/14/76	5	5.6	130 xf_t = 210	11*
1/24/78	5	5.7	135 xf_t = 218	23*
7/17/77	5	5.3	80 xf_t = 129	25*

Deposit name: YOUNG AMERICAN
District: PHILIPSBURG County: GRANITE
Location: Township 7 N. Range 13 W. Section 33
Latitude: 46°19'3" Longitude: 113°13'55"
Map name: FRED BURR LAKE Series: 7½ minute
Altitude of portal (ft.): 6960; of sampling point, same
Distance from portal to sampling point (ft.): 20

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
10/14/76	5	5.6	110 xf_t = 177	0.75
2/15/78	5	5.0	110 xf_t = 177	0.4
7/15/77	5.5	5.7	120 xf_t = 191	0.5

Deposit name: CRYSTAL
District: BASIN (Cataract subdistrict) County: JEFFERSON
Location: Township 7 N. Range 5 W. Section 20
Latitude: 46°20'38" Longitude: 112°15'12"
Map name: BASIN Series: 15 minute
Altitude of portal (ft.): 7660; of sampling point, same
Distance from portal to sampling point (ft.): 60

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
9/22/77	4.8	3.8	700 xf_t = 1136	17.86
2/9/78	4.5	3.9	710 xf_t = 1162	14.28
5/24/77	4.8	3.8	690 xf_t = 1119	19*

Deposit name: MORNING MINE
District: BASIN (Cataract subdistrict) County: JEFFERSON
Location: Township 7 N. Range 5 W. Section 18
Latitude: 46°21'28" Longitude: 112°16'27"
Map name: BASIN Series: 15 minute
Altitude of portal (ft.): 7880; of sampling point, same
Distance from portal to sampling point (ft.): at portal (caved)

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
9/22/77	2.5	6.2	50 xf_t = 87	4.31
2/9/78	2	6.3	60 xf_t = 106	3.33
5/24/77	2.5	6.3	55 xf_t = 96	6.25

Deposit name: PROSPECT SW¼ of SE¼
District: BASIN (Cataract subdistrict) County: JEFFERSON
Location: Township 7 N. Range 5 W. Section 29
Latitude: 46°19'48" Longitude: 112°15'12"
Map name: BASIN Series: 15 minute
Altitude of portal (ft.): 6520; of sampling point, same
Distance from portal to sampling point (ft.): at portal (caved)

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
9/22/77	6.5	6.2	240 xf_t = 372	3.5
2/9/78	2.5	6.3	255 xf_t = 444	2
5/24/77	6.5	6.2	240 xf_t = 372	3.06

Deposit name: ELKHORN COMMUNITY SPRING
District: ELKHORN County: JEFFERSON
Location: Township 6 N. Range 3 W. Section 11
Latitude: 46°17'11" Longitude: 111°56'33"
Map name: CLANCY Series: 15 minute
Altitude of portal (ft.): 6640; of sampling point, same
Distance from portal to sampling point (ft.): at portal

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
10/10/76	5	5.9	165 xf_t = 266	6
2/19/77	4	5.3	195 xf_t = 324	5
5/18/77	4	5.6	172 xf_t = 286	5.41

Deposit name: CAPE NOME
District: BARKER County: JUDITH BASIN
Location: Township 16 N. Range 9 E. Section 31
Latitude: 47°6'13" Longitude: 110°38'1"
Map name: BARKER Series: 7½ minute
Altitude of portal (ft.): 6180; of sampling point, same
Distance from portal to sampling point (ft.): 165

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
8/15/76	4.5	5.9	80 xf_t = 131	1.3
2/27/78	2	5.8	95 xf_t = 168	0.26
5/29/77	8	5.8	130 xf_t = 193	0.5

Deposit name: CARTER-DAVIS
District: BARKER County: JUDITH BASIN
Location: Township 15 N. Range 9 E. Section 6
Latitude: 47°5'23" Longitude: 110°37'47"
Map name: BARKER Series: 7½ minute
Altitude of portal (ft.): 6220; of sampling point, same
Distance from portal to sampling point (ft.): at portal

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
8/15/76	6	5.9	225 xf_t = 353	60
3/12/77	5	5.9	230 xf_t = 371	10
5/29/77	5	5.6	235 xf_t = 379	31

Deposit name: LOWER TIGER DRIFT
District: BARKER County: JUDITH BASIN
Location: Township 15 N. Range 9 E. Section 6
Latitude: 47°5'23" Longitude: 110°37'47"
Map name: MIXES BALDY Series: 7½ minute
Altitude of portal (ft.): 6220; of sampling point, same
Distance from portal to sampling point (ft.): at portal (caved)

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
8/15/76	8	3.8	150 xf_t = 223	2.25
3/12/77	0	5.8	130 xf_t = 248	.25
5/29/77	7	4.1	345 xf_t = 527	.25

Deposit name: UPPER TIGER MINE
District: BARKER County: JUDITH BASIN
Location: Township 15 N. Range 9 E. Section 5
Latitude: 47°5'23" Longitude: 110°36'31"
Map name: MIXES BALDY Series: 7½ minute
Altitude of portal (ft.): 6520; of sampling point, same
Distance from portal to sampling point (ft.): at portal (caved)

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
8/15/76	4	5.9	270 xf_t = 448	21
2/27/78	3.5	5.8	1080 xf_t = 1820	18
5/29/77	3.5	5.3	1110 xf_t = 1870	25.7

Deposit name: SWANSEA
District: GOULD-STEMPLE (Poorman subdistrict) County: LEWIS AND CLARK
Location: Township 13 N. Range 7 W. Section 18
Latitude: 46°53'6" Longitude: 112°32'20"
Map name: SWEDE GULCH Series: 7½ minute
Altitude of portal (ft.): 5760; of sampling point, same
Distance from portal to sampling point (ft.): at portal (unsafe)

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
9/18/76	10	5.9	110 xf_t = 155	23*
2/11/77	9	5.9	110 xf_t = 159	30
5/28/77	10	5.3	118 xf_t = 167	10.58

Deposit name: ANACONDA
District: HEDDLESTON (Blackfoot subdistrict) County: LEWIS AND CLARK
Location: Township 15 N. Range 6 W. Section 28
Latitude: 47°1'40" Longitude: 112°22'7"
Map name: ROGERS PASS Series: 7½ minute
Altitude of portal (ft.): 6200; of sampling point, same
Distance from portal to sampling point (ft.): at portal (caved)

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
9/16/76	9	4.7	290 xf_t = 420	2.5
2/11/77	6	4.6	1000 xf_t = 1569	14.5
5/28/77	7	4.8	620 xf_t = 947	4.46

Deposit name: MIKE HORSE
District: HEDDLESTON (Blackfoot subdistrict) County: LEWIS AND CLARK
Location: Township 15 N. Range 6 W. Section 28
Latitude: 47°1'40" Longitude: 112°22'7"
Map name: ROGERS PASS Series: 7½ minute
Altitude of portal (ft.): 5680; of sampling point, same
Distance from portal to sampling point (ft.): at portal (caved)

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
9/16/76	8.5	5.9	800 xf_t = 1174	128*
2/11/77	7	5.6	1200 xf_t = 1834	12*
5/28/77	11.5	5.6	1700 xf_t = 2309	103*

Deposit name: LITTLE ANNIE
District: CABINET County: LINCOLN
Location: Township 27 N. Range 31 W. Section 27
Latitude: 48°4'27" Longitude: 115°34'40"
Map name: HOWARD LAKE Series: 7½ minute
Altitude of portal (ft.): 5620; of sampling point, 5621.5
Distance from portal to sampling point (ft.): 150

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
8/9/77	4	4.6	150 xf_t = 249	1
12/10/77	4	4.6	150 xf_t = 249	0.9
7/23/76	4	4.4	145 xf_t = 241	1.25

Deposit name: SILVER BUTTE (OLD WILLIAMS CLAIM)
District: CABINET County: LINCOLN
Location: Township 25 N. Range 30 W. Section 7
Latitude: 47°56'18" Longitude: 115°30'50"
Map name: GOAT PEAK Series: 7½ minute
Altitude of portal (ft.): 4840; of sampling point, same
Distance from portal to sampling point (ft.): at portal

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
10/16/77	5	5.4	60 xf_t = 97	0.5
12/11/77	4.5	5.8	70 xf_t = 115	0.5
7/22/76	4.5	5.3	58 xf_t = 95	0.75

Deposit name: DOUBLE MAC
District: LIBBY (SNOWSHOE) County: LINCOLN
Location: Township 29 N. Range 32 W. Section 12
Latitude: 48°17'27" Longitude: 115°38'0"
Map name: LITTLE HOODOO MOUNTAIN Series: 7½ minute
Altitude of portal (ft.): 3120; of sampling point, 3130.5
Distance from portal to sampling point (ft.): 1050

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
8/9/77	11	5.8	200 xf_t = 275	5
12/10/77	9	5.7	210 xf_t = 304	4.5
7/12/76	12	5.6	210 xf_t = 282	6

Deposit name: LUKEN HAZEL (LOWER)
District: LIBBY (SNOWSHOE) County: LINCOLN
Location: Township 29 N. Range 31 W. Section 5
Latitude: 48°18'18" Longitude: 115°35'25"
Map name: LITTLE HOODOO MOUNTAIN Series: 7½ minute
Altitude of portal (ft.): 2900; of sampling point, same
Distance from portal to sampling point (ft.): at caved portal

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
7/12/76	10	6.2	875 xf_t = 1235	24
2/10/77	9	6.2	355 xf_t = 514	24
6/24/77	9	6.3	265 xf_t = 384	25

Deposit name: INDEPENDENCE
District: TOBACCO RIVER County: LINCOLN
Location: Township 37 N. Range 26 W. Section 22
Latitude: 48°57'21" Longitude: 114°57'51"
Map name: KSANKA PEAK Series: 7½ minute
Altitude of portal (ft.): 6390; of sampling point, same
Distance from portal to sampling point (ft.): at portal (caved)

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
7/21/76	5	5.8	95 xf_t = 153	.66
3/5/77	0	5.9	130 xf_t = 248	.25
6/24/77	7	5.6	120 xf_t = 173	.5

Deposit name: ROCK LAKE BARITE
District: TOBACCO RIVER County: LINCOLN
Location: Township 35 N. Range 26 W. Section 6
Latitude: 48°49'32" Longitude: 115°0'22"
Map name: EUREKA SOUTH Series: 7½ minute
Altitude of portal (ft.): 2920; of sampling point, same
Distance from portal to sampling point (ft.): 150

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
7/14/76	8	5.7	225 xf_t = 335	0.1
12/11/77	5	5.8	260 xf_t = 419	0.5
6/23/77	7	5.6	250 xf_t = 382	0.9

Deposit name: MADISON ASBESTOS MINE
District: none County: MADISON
Location: Township 12 S. Range 2 E. Section 25
Latitude: 44°45'34" Longitude: 111°25'33"
Map name: HEBGEN DAM Series: 15 minute
Altitude of portal (ft.): 7720; of sampling point, same
Distance from portal to sampling point (ft.): at portal

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
10/11/76	5	5.6	140 xf_t = 226	50
3/13/77	(completely dry)	—	— xf_t = —	—
7/19/77	(completely dry)	—	— xf_t = —	—

Deposit name: B & H MINE
District: BISMARK County: MADISON
Location: Township 3 S. Range 4 W. Section 7
Latitude: 45°35'24" Longitude: 112°8'32"
Map name: WATERLOO Series: 15 minute
Altitude of portal (ft.): 8160; of sampling point, same
Distance from portal to sampling point (ft.): at portal (caved)

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
10/2/76	5	5.9	240 xf_t = 387	32*
12/15/77	4	5.7	780 xf_t = 1295	23*
5/20/77	4	5.6	800 xf_t = 1328	23*

Deposit name: PETE & JOE (UPPER)

District: BISMARK County: MADISON

Location: Township 3 S. Range 4 W. Section 8

Latitude: 45°35'24" Longitude: 112°7'17"

Map name: WATERLOO Series: 15 minute

Altitude of portal (ft.): 9280; of sampling point, same

Distance from portal to sampling point (ft.): 30

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
10/2/76	5.5	5.6	100 xf_t = 159	56.9
12/15/77**	2.5	5.8	140 xf_t = 244	0.5
7/18/77	2.5	5.9	130 xf_t = 226	1

**Likely blockage in tunnel after 10/2/76.

Deposit name: PROSPECT NW¼ of SE¼

District: BISMARK County: MADISON

Location: Township 3 S. Range 4 W. Section 7

Latitude: 45°35'24" Longitude: 112°8'32"

Map name: WATERLOO Series: 15 minute

Altitude of portal (ft.): 8460; of sampling point, same

Distance from portal to sampling point (ft.): at portal

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
9/23/77	3	5.6	130 xf_t = 222	1.25
2/7/78	2	5.7	135 xf_t = 239	1
7/18/77	3	5.6	130 xf_t = 222	4.8

Deposit name: PROSPECT SW¼ of SE¼

District: BISMARK County: MADISON

Location: Township 3 S. Range 4 W. Section 7

Latitude: 45°35'24" Longitude: 112°8'32"

Map name: WATERLOO Series: 15 minute

Altitude of portal (ft.): 8640; of sampling point, same

Distance from portal to sampling point (ft.): at portal (caved)

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
9/23/77	2	5.6	110 xf_t = 195	18.2
2/7/78	2	5.7	110 xf_t = 195	10
7/18/77	2	5.6	100 xf_t = 177	22.2

Deposit name: WATERLODE
District: NORRIS (Little Hot Springs subdistrict) County: MADISON
Location: Township 3 S. Range 1 E. Section 19
Latitude: 45°33'40" Longitude: 111°46'18"
Map name: NORRIS Series: 15 minute
Altitude of portal (ft.): 5080; of sampling point, same
Distance from portal to sampling point (ft.): at portal (caved)

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
8/31/76	10	6.2	180 xf_t = 254	5
2/26/78	9.4	6.1	180 xf_t = 258	3.25
5/18/77	9.5	6.0	175 xf_t = 250	4

Deposit name: STRAWBERRY MINE
District: PONY County: MADISON
Location: Township 2 S. Range 3 W. Section 14
Latitude: 45°39'45" Longitude: 111°56'9"
Map name: HARRISON Series: 15 minute
Altitude of portal (ft.): 6480; of sampling point, same
Distance from portal to sampling point (ft.): at portal

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
9/23/77	7	5.9	730 xf_t = 1115	21.4
2/27/78	6.5	6.0	730 xf_t = 1130	14.3
5/21/77	6.5	5.9	720 xf_t = 1115	33.3

Deposit name: WILLOW CREEK MINE
District: PONY County: MADISON
Location: Township 2 S. Range 3 W. Section 15
Latitude: 45°39'45" Longitude: 111°57'22"
Map name: HARRISON Series: 15 minute
Altitude of portal (ft.): 7640; of sampling point, same
Distance from portal to sampling point (ft.): at portal (caved)

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
9/23/77	4	6.2	140 xf_t = 232	1.25
2/27/78	3	6.3	145 xf_t = 248	0.75
5/21/77	4	6.2	140 xf_t = 232	2

Deposit name: ATLANTIC & PACIFIC MINE
District: POTOSI County: MADISON
Location: Township 2 S. Range 3 W. Section 21
Latitude: 45°38'53" Longitude: 111°58'36"
Map name: HARRISON Series: 15 minute
Altitude of portal (ft.): 7680; of sampling point, same
Distance from portal to sampling point (ft.): at portal

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
9/23/77	4	4.3	750 xf_t = 1245	2.33
2/27/78	4	4.6	740 xf_t = 1228	1
5/21/77	4	4.5	730 xf_t = 1212	2.5

Deposit name: RED PINE
District: SHERIDAN (Indian Creek subdistrict) County: MADISON
Location: Township 4 S. Range 4 W. Section 3
Latitude: 45°31'1" Longitude: 112°4'50"
Map name: WATERLOO Series: 15 minute
Altitude of portal (ft.): 7600; of sampling point, same
Distance from portal to sampling point (ft.): at portal

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
10/3/76	5	5.4	70 xf_t = 113	238*
5/20/77	5	5.3	70 xf_t = 113	284*
6/28/77	5	5.4	70 xf_t = 113	268*

Deposit name: UNCLE SAM
District: SHERIDAN (Mill Creek subdistrict) County: MADISON
Location: Township 4 S. Range 3 W. Section 17
Latitude: 45°29'16" Longitude: 111°59'53"
Map name: COPPER MOUNTAIN Series: 7½ minute
Altitude of portal (ft.): 7570; of sampling point, same
Distance from portal to sampling point (ft.): at portal

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
10/3/76	5	5.9	250 xf_t = 403	4.9*
5/20/77	2.5	6.5	355 xf_t = 617	3.3*
6/28/77	4.5	6.2	330 xf_t = 540	4.1*

Deposit name: BELLE MINE
District: VIRGINIA CITY (Alder Gulch subdistrict) County: MADISON
Location: Township 6 S. Range 3 W. Section 35
Latitude: 45°16'8" Longitude: 111°55'60"
Map name: VIRGINIA CITY Series: 15 minute
Altitude of portal (ft.): 6000; of sampling point, same
Distance from portal to sampling point (ft.): at portal

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
7/18/77	6	6.5	1000 xf_t = 1569	1
2/7/78	4	6.6	1000 xf_t = 1660	0.5
6/4/77	6	6.4	970 xf_t = 1522	1.5

Deposit name: (Mine name unknown.) NW¼ of SE¼
District: VIRGINIA CITY (Alder Gulch subdistrict) County: MADISON
Location: Township 7 S. Range 3 W. Section 14
Latitude: 45°13'31" Longitude: 111°55'58"
Map name: VARNEY Series: 15 minute
Altitude of portal (ft.): 6920; of sampling point, same
Distance from portal to sampling point (ft.): at portal

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
7/18/77	5.6	5.6	178 xf_t = 282	1
2/26/78	5.2	5.8	180 xf_t = 289	0.5
5/20/77	5.6	5.6	180 xf_t = 285	1.25

Deposit name: MARIETTA
District: VIRGINIA CITY (Barton Gulch subdistrict) County: MADISON
Location: Township 7 S. Range 3 W. Sections 15 and 22
Latitude: 45°13'8" Longitude: 111°57'6"
Map name: VARNEY Series: 15 minute
Altitude of portal (ft.): 7800; of sampling point, same
Distance from portal to sampling point (ft.): at portal

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
10/4/76	4	5.9	390 xf_t = 647	20
2/26/78	4.8	5.7	185 xf_t = 300	40
9/18/77	5.0	5.6	178 xf_t = 287	40

Deposit name: EASTERN PACIFIC
District: VIRGINIA CITY (Brown's Gulch subdistrict) County: MADISON
Location: Township 7 S. Range 3 W. Section 9
Latitude: 45°14'24" Longitude: 111°58'23"
Map name: VARNEY Series: 15 minute
Altitude of portal (ft.): 7440; of sampling point, same
Distance from portal to sampling point (ft.): at portal (caved)

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
10/3/76	5	6.2	570 xf_t = 919	17*
2/26/78	4	5.0	270 xf_t = 448	23*
6/12/77	4	5.3	228 xf_t = 378	26*

Deposit name: NELLIE BLY
District: VIRGINIA CITY (Highland subdistrict) County: MADISON
Location: Township 7 S. Range 3 W. Sections 1 and 12
Latitude: 45°14'54" Longitude: 111°54'40"
Map name: VARNEY Series: 15 minute
Altitude of portal (ft.): 6400; of sampling point, same
Distance from portal to sampling point (ft.): at portal

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
10/4/76	5	5.9	830 xf_t = 1339	10
2/26/78**	5.5	5.7	310 xf_t = 493	6.25
6/4/77	6.5	5.6	315 xf_t = 488	9.2

**Snow absorbance, 2/26/78, may have had greater discharge.

Deposit name: BELLE OF THE CASTLE (NORTH)
District: CASTLE MOUNTAIN County: MEAGHER
Location: Township 8 N. Range 8 E. Section 2
Latitude: 46°28'59" Longitude: 110°41'21"
Map name: CASTLE TOWN Series: 7½ minute
Altitude of portal (ft.): 6920; of sampling point, same
Distance from portal to sampling point (ft.): at portal

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
8/17/76	5	5.9	110 xf_t = 177	2
1/6/77	4	5.7	190 xf_t = 315	1.5
5/24/77	4	5.6	185 xf_t = 307	2

Deposit name: BELLE OF THE CASTLE (SOUTH)
District: CASTLE MOUNTAIN County: MEAGHER
Location: Township 8 N. Range 8 E. Section 2
Latitude: 46°28'59" Longitude: 110°41'21"
Map name: CASTLE TOWN Series: 7½ minute
Altitude of portal (ft.): 6880; of sampling point, same
Distance from portal to sampling point (ft.): at portal

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
8/17/76	4.5	5.6	100 xf_t = 164	1.8
1/6/77	4	5.7	130 xf_t = 216	2.0
5/24/77	4	5.7	120 xf_t = 199	2.2

Deposit name: YELLOWSTONE
District: CASTLE MOUNTAIN County: MEAGHER
Location: Township 8 N. Range 8 E. Section 11
Latitude: 46°28'7" Longitude: 110°41'21"
Map name: CASTLE TOWN Series: 7½ minute
Altitude of portal (ft.): 6700; of sampling point, same
Distance from portal to sampling point (ft.): 900

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
8/17/76	5	5.9	280 xf_t = 452	8
2/18/77	6	6.3	150 xf_t = 235	4
5/10/77	5.5	6.8	130 xf_t = 207	15

Deposit name: NANCY LEE
District: KEYSTONE County: MINERAL
Location: Township 18 N. Range 26 W. Section 31
Latitude: 47°16'36" Longitude: 114°57'29"
Map name: PLAINS Series: 15 minute
Altitude of portal (ft.): 3840; of sampling point, same
Distance from portal to sampling point (ft.): at portal (pipe discharge)

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
7/28/76	10	5.9	900 xf_t = 1270	2.9
2/9/77**	5	6.2	990 xf_t = 1597	—
6/17/77	12	5.9	1400 xf_t = 1877	8.75

**Could not get accurate discharge; pipe shut off to prevent icing road.

Deposit name: BRYAN
District: PACKER CREEK County: MINERAL
Location: Township 20 N. Range 31 W. Section 28
Latitude: 47°27'52" Longitude: 115°32'58"
Map name: SALTESE Series: 15 minute
Altitude of portal (ft.): 4550; of sampling point, same
Distance from portal to sampling point (ft.): at portal (caved)

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
7/16/77	6	5.6	280 xf_t = 439	3
1/25/78	5.5	5.7	270 xf_t = 430	2.5
6/16/77	6	5.6	280 xf_t = 439	4

Deposit name: HEMLOCK
District: PACKER CREEK County: MINERAL
Location: Township 19 N. Range 31 W. Section 2
Latitude: 47°26'8" Longitude: 115°30'28"
Map name: SALTESE Series: 15 minute
Altitude of portal (ft.): 3600; of sampling point, same
Distance from portal to sampling point (ft.): at portal (caved)

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
7/16/77	10	5.9	700 xf_t = 988	0.5
1/26/78	6	5.9	680 xf_t = 1067	0.41
6/14/77	8	5.9	680 xf_t = 1012	1

Deposit name: LITTLE ANACONDA
District: SPRING GULCH County: MINERAL
Location: Township 18 N. Range 26 W. Section 35
Latitude: 47°16'36" Longitude: 114°52'24"
Map name: PLAINS Series: 15 minute
Altitude of portal (ft.): 5200; of sampling point, same
Distance from portal to sampling point (ft.): 12

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
10/13/76	5.5	6.2	220 xf_t = 350	2.9
12/10/76	0	5.9	180 xf_t = 344	0.5
6/16/77	6	5.9	600 xf_t = 941	1

Deposit name: MEADOW MOUNTAIN
District: PACKER CREEK County: MINERAL
Location: Township 20 N. Range 31 W. Section 36
Latitude: 47°27'0" Longitude: 115°29'8"
Map name: HAUGAN Series: 15 minute
Altitude of portal (ft.): 4040; of sampling point, same
Distance from portal to sampling point (ft.): at portal (caved)

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
7/27/76	6	6.3	165 xf_t = 259	7.2
1/26/78	5.8	6.4	165 xf_t = 260	10.5
5/17/77	6	6.3	170 xf_t = 267	13.6

Deposit name: MEADOW MOUNTAIN MINES
District: PACKER CREEK County: MINERAL
Location: Township 20 N. Range 31 W. Section 35
Latitude: 47°27'0" Longitude: 115°30'25"
Map name: SALTESE Series: 15 minute
Altitude of portal (ft.): 4000; of sampling point, same
Distance from portal to sampling point (ft.): at portal (caved)

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
7/16/77	5.5	5.8	280 xf_t = 445	0.50
1/25/78	5	5.9	270 xf_t = 436	0.75
6/16/77	5.5	5.8	270 xf_t = 430	1

Deposit name: WABASH
District: PACKER CREEK County: MINERAL
Location: Township 20 N. Range 31 W. Section 36
Latitude: 47°27'0" Longitude: 115°29'8"
Map name: HAUGAN Series: 15 minute
Altitude of portal (ft.): 3880; of sampling point, same
Distance from portal to sampling point (ft.): at portal (caved)

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
7/16/77	6.5	5.7	250 xf_t = 387	3.6
1/25/78	6	5.8	260 xf_t = 408	3.0
6/16/77	6	5.7	250 xf_t = 392	4.5

Deposit name: ROCK ISLAND
District: ROCK ISLAND County: MINERAL
Location: Township 19 N. Range 29 W. Section 4
Latitude: 47°0'0" Longitude: 114°38'21"
Map name: HAUGAN Series: 15 minute
Altitude of portal (ft.): 5120; of sampling point, 5121.3
Distance from portal to sampling point (ft.): 130

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
7/27/76	4.8	6.7	70 xf_t = 114	1.7
1/26/78	4.5	6.8	80 xf_t = 131	2.0
5/17/77	4.8	6.7	75 xf_t = 122	2.25

Deposit name: HIDDEN TREASURE
District: CLINTON County: MISSOULA
Location: Township 12 N. Range 16 W. Section 19
Latitude: 46°46'51" Longitude: 113°39'34"
Map name: CLINTON Series: 7½ minute
Altitude of portal (ft.): 4060; of sampling point, same
Distance from portal to sampling point (ft.): at portal

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
10/13/76	5.5	5.8	190 xf_t = 302	144
2/9/77	10	6.0	160 xf_t = 226	67
5/28/77	10	5.9	198 xf_t = 279	53

Deposit name: EMIGRANT
District: EMIGRANT County: PARK
Location: Township 7 S. Range 9 E. Section 7
Latitude: 45°14'28" Longitude: 110°40'4"
Map name: GARDINER Series: 15 minute
Altitude of portal (ft.): 8400; of sampling point, same
Distance from portal to sampling point (ft.): at portal (caved)

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
8/29/76	5	4.7	145 xf_t = 234	73
12/15/77	4.5	4.7	240 xf_t = 393	10.5
7/19/77	5	4.7	365 xf_t = 589	22

Deposit name: GALENA QUEEN
District: EMIGRANT County: PARK
Location: Township 7 S. Range 9 E. Section 4
Latitude: 45°15'21" Longitude: 110°37'36"
Map name: EMIGRANT Series: 15 minute
Altitude of portal (ft.): 7600; of sampling point, same
Distance from portal to sampling point (ft.): at portal (unsafe)

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
8/29/76	3	5.6	80 xf_t = 137	48
12/15/77	3.5	5.4	260 xf_t = 438	10.4
6/14/77	3.5	5.3	250 xf_t = 421	12.5

Deposit name: BLACK WARRIOR
District: NEW WORLD (COOKE CITY) County: PARK
Location: Township 9 S. Range 14 E. Section 15
Latitude: 45°2'56" Longitude: 109°58'16"
Map name: COOKE CITY Series: 15 minute
Altitude of portal (ft.): 9720; of sampling point, same
Distance from portal to sampling point (ft.): caved at portal

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
8/26/76	3.5	5.8	250 xf_t = 421	.55
3/1/78	2	5.9	270 xf_t = 478	.45
7/20/77	2	6.5	325 xf_t = 575	1

Deposit name: GLENGARRY
District: NEW WORLD (COOKE CITY) County: PARK
Location: Township 9 S. Range 14 E. Section 2
Latitude: 45°4'40" Longitude: 109°57'5"
Map name: COOKE CITY Series: 15 minute
Altitude of portal (ft.): 9320; of sampling point, same (unsafe)
Distance from portal to sampling point (ft.): at portal

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
8/26/76	3	3.5	690 xf_t = 1179	143*
3/1/78	3	6.3	840 xf_t = 1436	67*
7/20/77	3	6.2	850 xf_t = 1453	56*

Deposit name: GOLD DUST
District: NEW WORLD (COOKE CITY) County: PARK
Location: Township 9 S. Range 14 E. Section 11
Latitude: 45°3'48" Longitude: 109°57'5"
Map name: COOKE CITY Series: 15 minute
Altitude of portal (ft.): 9240; of sampling point, same (at portal)
Distance from portal to sampling point (ft.): at portal

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
8/26/76	3	6.2	300 xf_t = 513	12
3/18/77**	0.5	5.9	480 xf_t = 902	—
7/20/77	3	6.2	850 xf_t = 1453	20

**Frozen up around portal; no accurate discharge measurement possible.

Deposit name: LITTLE DAISY
District: NEW WORLD (COOKE CITY) County: PARK
Location: Township 9 S. Range 14 E. Section 14
Latitude: 45°2'56" Longitude: 109°57'5"
Map name: COOKE CITY Series: 15 minute
Altitude of portal (ft.): 9840; of sampling point, same
Distance from portal to sampling point (ft.): at portal (caved)

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
9/1/77	2	6.3	450 xf_t = 796	4.5
3/1/78	2	6.4	440 xf_t = 779	3.8
7/19/77	2	6.3	440 xf_t = 779	5.3

Deposit name: PROSPECT NE¼ of NW¼
District: NEW WORLD (COOKE CITY) County: PARK
Location: Township 9 S. Range 14 E. Section 12
Latitude: 45°3'48" Longitude: 109°55'53"
Map name: COOKE CITY Series: 15 minute
Altitude of portal (ft.): 9840; of sampling point, same
Distance from portal to sampling point (ft.): at portal

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
7/19/77	5	5.9	60 xf_t = 97	1
2/11/78**	—	—	— xf_t = —	—
5/21/77	5	6.0	50 xf_t = 81	1.5

**Snowdrifts ≅ 20 feet; could not find portal.

Deposit name: PROSPECT CENTER of NE¼
District: NEW WORLD (COOKE CITY) County: PARK
Location: Township 9 S. Range 14 E. Section 10
Latitude: 45°3'48" Longitude: 109°58'16"
Map name: COOKE CITY Series: 15 minute
Altitude of portal (ft.): 9600; of sampling point, same
Distance from portal to sampling point (ft.): at portal (caved)

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
9/1/77	2.5	5.6	240 xf_t = 417	1
2/11/78**	—	—	— xf_t = —	—
8/26/76	2.5	5.6	230 xf_t = 400	1.33

**Snowdrifts > 20 feet; could not find portal.

Deposit name: PROSPECT NW¼ of SW¼
District: NEW WORLD (COOKE CITY) County: PARK
Location: Township 9 S. Range 15 E. Section 18
Latitude: 45°2'54" Longitude: 109°54'35"
Map name: COOKE CITY Series: 15 minute
Altitude of portal (ft.): 8960; of sampling point, same (unsafe portal)
Distance from portal to sampling point (ft.): at portal

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
8/26/76	7.5	6.2	80 xf_t = 121	0.5
3/1/78	3	5.9	390 xf_t = 666	0.20
7/20/77	3	5.9	400 xf_t = 684	0.25

Deposit name: GOLD BUG MINE
District: LITTLE ROCKIES (Landusky subdistrict) County: PHILLIPS
Location: Township 25 N. Range 24 E. Section 22
Latitude: 47°54'25" Longitude: 108°37'11"
Map name: ZORTMAN Series: 7½ minute
Altitude of portal (ft.): 4600; of sampling point, same
Distance from portal to sampling point (ft.): at portal (locked)

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
8/12/76	11	6.2	460 xf_t = 633	650*
2/16/77	10	5.9	460 xf_t = 649	614*
5/11/77	11	5.9	380 xf_t = 523	90*

Deposit name: BEAVER MINE
District: LITTLE ROCKIES (Zortman subdistrict) County: PHILLIPS
Location: Township 25 N. Range 25 E. Section 5
Latitude: 47°56'60" Longitude: 108°31'59"
Map name: ZORTMAN Series: 7½ minute
Altitude of portal (ft.): 4520; of sampling point, same
Distance from portal to sampling point (ft.): at portal (caved)

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
8/12/76	6.5	6.2	148 xf_t = 229	20
2/17/77	6	5.9	180 xf_t = 282	14
5/11/77	5.5	5.9	170 xf_t = 270	14.1

Deposit name: FLORA DAWN
District: FINN County: POWELL
Location: Township 12 N. Range 8 W. Section 20
Latitude: 46°46'49" Longitude: 112°37'45"
Map name: FINN Series: 7½ minute
Altitude of portal (ft.): 5600; of sampling point, same
Distance from portal to sampling point (ft.): at portal (caved)

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
9/18/76	8	5.9	320 xf_t = 476	105*
2/8/77	7	5.8	330 xf_t = 504	94*
6/23/77	7.8	5.9	330 xf_t = 494	125*

Deposit name: BROKEN HILL
District: BLUE CREEK County: SANDERS
Location: Township 27 N. Range 34 W. Section 10
Latitude: 48°7'4" Longitude: 115°57'44"
Map name: HERON Series: 7½ minute
Altitude of portal (ft.): 3900; of sampling point, same
Distance from portal to sampling point (ft.): 20 (caved)

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
7/24/76	6	5.6	35 xf_t = 55	35.6
12/11/77	5.8	5.6	95 xf_t = 150	2.86
6/25/77	6	5.7	100 xf_t = 157	35.8

Deposit name: EDDY CREEK
District: PLAINS County: SANDERS
Location: Township 20 N. Range 28 W. Section 14
Latitude: 47°29'32" Longitude: 115°7'35"
Map name: ST. REGIS Series: 15 minute
Altitude of portal (ft.): 4120; of sampling point, 4134
Distance from portal to sampling point (ft.): 1400 back

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
7/26/76	8	5.8	100 xf_t = 149	9
1/25/78	8	6.0	170 xf_t = 253	10
6/17/77	8	5.9	170 xf_t = 253	11.1

Deposit name: GRACE (PROSPECT)
District: BASIN CREEK County: SILVER BOW
Location: Township 1 N. Range 7 W. Section 22
Latitude: 45°49'20" Longitude: 112°27'21"
Map name: PIPESTONE PASS Series: 7½ minute
Altitude of portal (ft.): 7200; of sampling point, same
Distance from portal to sampling point (ft.): none

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
7/7/76	8	5.9	72 xf_t = 107	3
1/31/78	6	6.0	75 xf_t = 118	2
5/31/77	8	5.9	80 xf_t = 119	2.25

Deposit name: MOUAT
District: NYE County: STILLWATER
Location: Township 5 S. Range 15 E. Section 20
Latitude: 45°23'5" Longitude: 109°54'0"
Map name: MT. WOOD Series: 15 minute
Altitude of portal (ft.): 7100; of sampling point, same
Distance from portal to sampling point (ft.): main portal

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
9/3/77	4.5	6.2	300 xf_t = 491	27.3
12/15/77	1.5	5.9	360 xf_t = 651	17.9
7/22/77	4.5	6.2	170 xf_t = 278	23.3

Deposit name: BENBOW (NORTH PORTAL)
District: STILLWATER County: STILLWATER
Location: Township 5 S. Range 16 E. Section 31
Latitude: 45°21'21" Longitude: 109°47'53"
Map name: MT. WOOD Series: 15 minute
Altitude of portal (ft.): 8200; of sampling point, same
Distance from portal to sampling point (ft.): at portal

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
9/3/77	4.5	6.2	170 xf_t = 278	20.6
12/15/77	1.5	6.3	175 xf_t = 316	18.75
7/22/77	4.5	6.2	170 xf_t = 278	23.3

Deposit name: INDEPENDENCE
District: INDEPENDENCE County: SWEET GRASS
Location: Township 7 S. Range 12 E. Section 15
Latitude: 45°13'18" Longitude: 110°13'6"
Map name: CUTOFF MTN. Series: 15 minute
Altitude of portal (ft.): 9400; of sampling point, same
Distance from portal to sampling point (ft.): at portal (caved)

Date Mo./Day/Yr.	Water temp. (°C)	pH	Specific conductance (μmho/cm)	Flow (gpm)
8/28/76	3.5	5.6	40 xf_t = 67	1.25
4/10/77**	—	—	— xf_t = —	—
7/21/77	2.75	—	220 xf_t = 386	1.11

**Could not find portal in snowdrifts.

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FOR FURTHER INFORMATION, ADDRESS THE DIRECTOR, MONTANA BUREAU OF MINES AND GEOLOGY, MONTANA COLLEGE OF MINERAL SCIENCE AND TECHNOLOGY, BUTTE.