SELECTED HYDROGEOLOGIC DATA FOR THE SOUTHWEST GLENDIVE PRELIMINARY LOGICAL MINING UNIT AND ADJACENT AREAS, DAWSON COUNTY, MONTANA

By Robert S. Roberts

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CONVERSION FACTORS

The following factors can be used to convert inch-pound units in this report to the International System (SI) of units.

Multiply inch-pound unit	By	To obtain SI unit
acre	4,047	square meter
acre-foot	1,233	cubic meter
foot	0.3048	meter
gallon per minute	0.06309	liter per second
inch	25.40	millimeter
mile	1.609	kilometer

Temperature can be converted from degrees Celsius (°C) to degrees Fahrenheit (°F) by the equation:

$$°F = 9/5\ (°C) + 32$$

Sea level: In this report "sea level" refers to the National Geodetic Vertical Datum of 1929 (NGVD of 1929)--A geodetic datum derived from a general adjustment of the first-order level nets of both the United States and Canada, formerly called "Mean Sea Level of 1929."

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ABSTRACT

Hydrogeologic data were collected from a coal area in Dawson County, Montana, to provide a basis for identifying and characterizing the ground-water resources. Inventory records for 72 domestic, stock, irrigation, unused, and observation wells are tabulated in the report; the data were collected principally from 1977 through 1981. The location of each well is shown on a map. Natural-gamma geophysical logs, lithologic logs, and water-level measurements are also included for selected wells. Twenty-six analyses of ground water identify the chemical-constituent concentrations and physical properties of water from sampled wells.

INTRODUCTION

East-central Montana contains numerous, shallow deposits of coal, much of which is under Federal ownership. As part of the process of determining the suitability of Federal coal for surface coal mining, the U.S. Bureau of Land Management evaluates coal tracts on the basis of potential effects to the water resources, among other considerations. Mining of coal by surface-mining methods could significantly affect the water resources of an area, both areally and with time. Therefore, the U.S. Geological Survey was requested to identify and characterize the water resources and evaluate the potential hydrologic effects of mining in the Southwest Glendive Preliminary Logical Mining Unit in Dawson County (fig. 1). The Peuse coal bed, of lignite grade, is the thickest, most extensive, and hence most economically recoverable coal in this mining unit. The coal bed, which was named for the Peuse coal mine in sec. 13, T. 16 N., R. 53 E., is the lowermost major lignite bed in the Tongue River Member of the Paleocene Fort Union Formation in the study area (Banet, 1979).

The study was begun in March 1981, in cooperation with the U.S. Bureau of Land Management, by drilling seven observation wells. The wells were intended for subsequent use in determining aquifer characteristics, measuring water levels, and sampling of the water for chemical analysis. Shortly after well completion, the study was discontinued owing to a lack of continued funding.

The purpose of this report is to make available the hydrogeologic data that have been collected from the area during this and previous studies. Well records are from onsite well inventory, office files of the U.S. Geological Survey, and published reports. The natural-gamma geophysical logs, most lithologic logs, and the water-level measurements were obtained onsite; some lithologic logs are drillers' logs from office files. Chemical analyses are from laboratory or onsite measurements and from published reports.

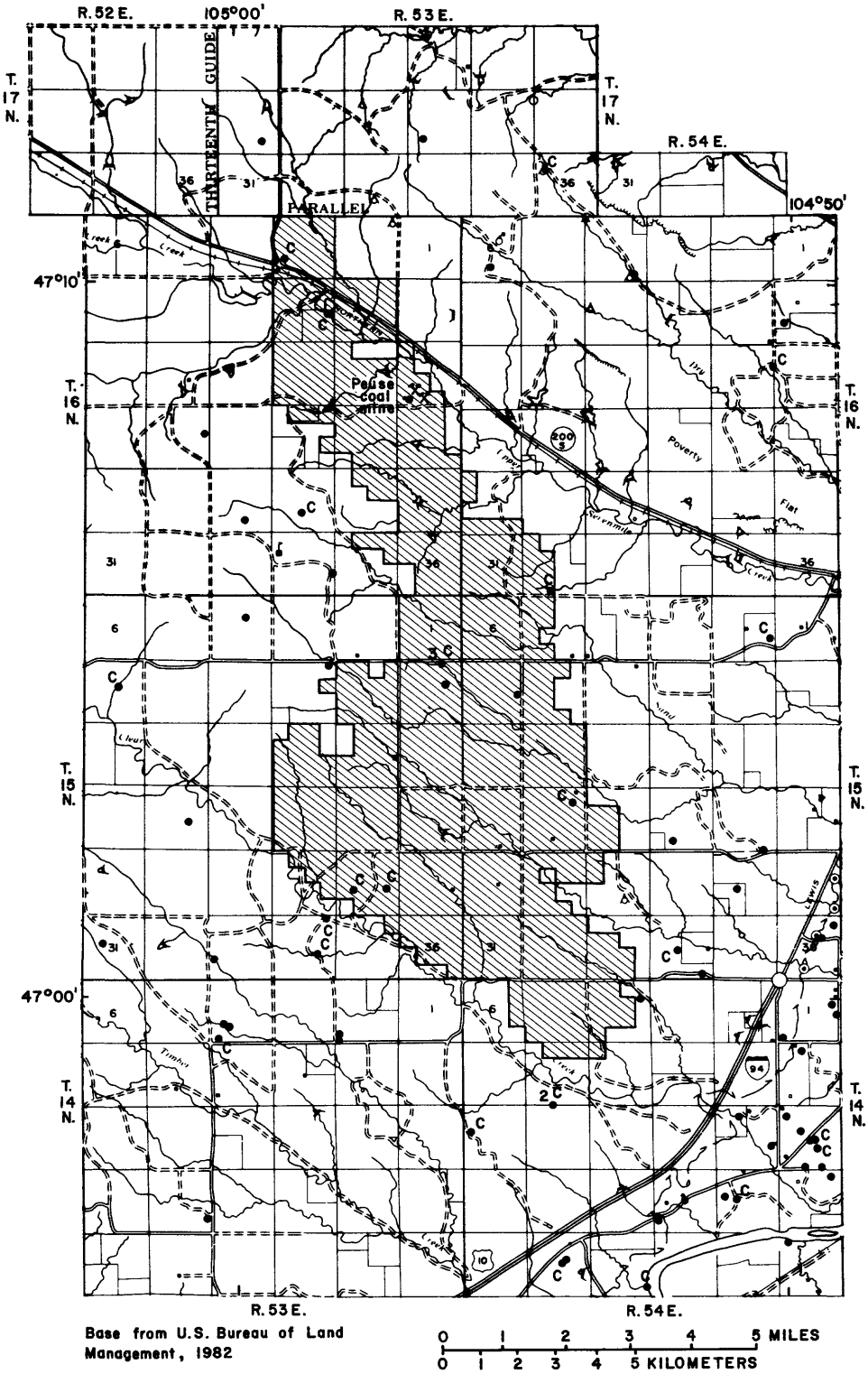
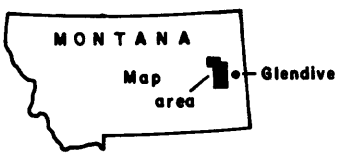


Figure 1.--Location of study area, the Southwest Glendive Preliminary Logical Mining Unit, and inventoried wells.

EXPLANATION

SOUTHWEST GLENDIVE PRELIMINARY LOGICAL MINING UNIT

•c WELL--Numeral indicates number of wells at same general location, if more than one. Letter indicates chemical analysis in table 5



Appreciation is expressed to those well owners who permitted access to their wells for inventory and collection of water samples. Landowners who gave permission to install observation wells and periodically measure water levels are also acknowledged. Geological Survey personnel who contributed to data collection include Neal E. McClymonds (retired), who measured water levels and prepared lithologic logs from drill cuttings, and Thomas E. Reed, who prepared most of the geophysical logs.

WELL-NUMBERING SYSTEM

In this report, locations are numbered according to geographic position within the rectangular grid system used by the U.S. Bureau of Land Management (fig. 2). The location (local) number consists of as many as 14 characters. The first three characters specify the township and its position north (N) of the Montana Base Line. The next three characters specify the range and its position east (E) of the Montana Principal Meridian. The next two characters are the section number. The next one to four characters designate the quarter section (160-acre tract), quarter-quarter section (40-acre tract), quarter-quarter-quarter section (10-acre tract), and quarter-quarter-quarter-quarter section (2.5-acre tract), respectively, in which the well is located. The subdivisions of the section are designated A, B, C, and D in a counterclockwise direction, beginning in the northeast quadrant. The last two characters form a sequence number based on the order of inventory. For example, as shown in figure 2, well 15N53E12ABAB01 is the first well inventoried in the NW¼NE¼NW¼NE¼ sec. 12, T. 15 N., R. 53 E.

DATA COLLECTION

A natural-gamma geophysical log is a record of the natural radioactivity of formations at various depths in a well bore. The log can be used, in conjunction with drill cuttings, to determine subsurface lithology in either cased or uncased holes. Natural-gamma logs for seven observation wells drilled during this study are shown in figures 3-9.

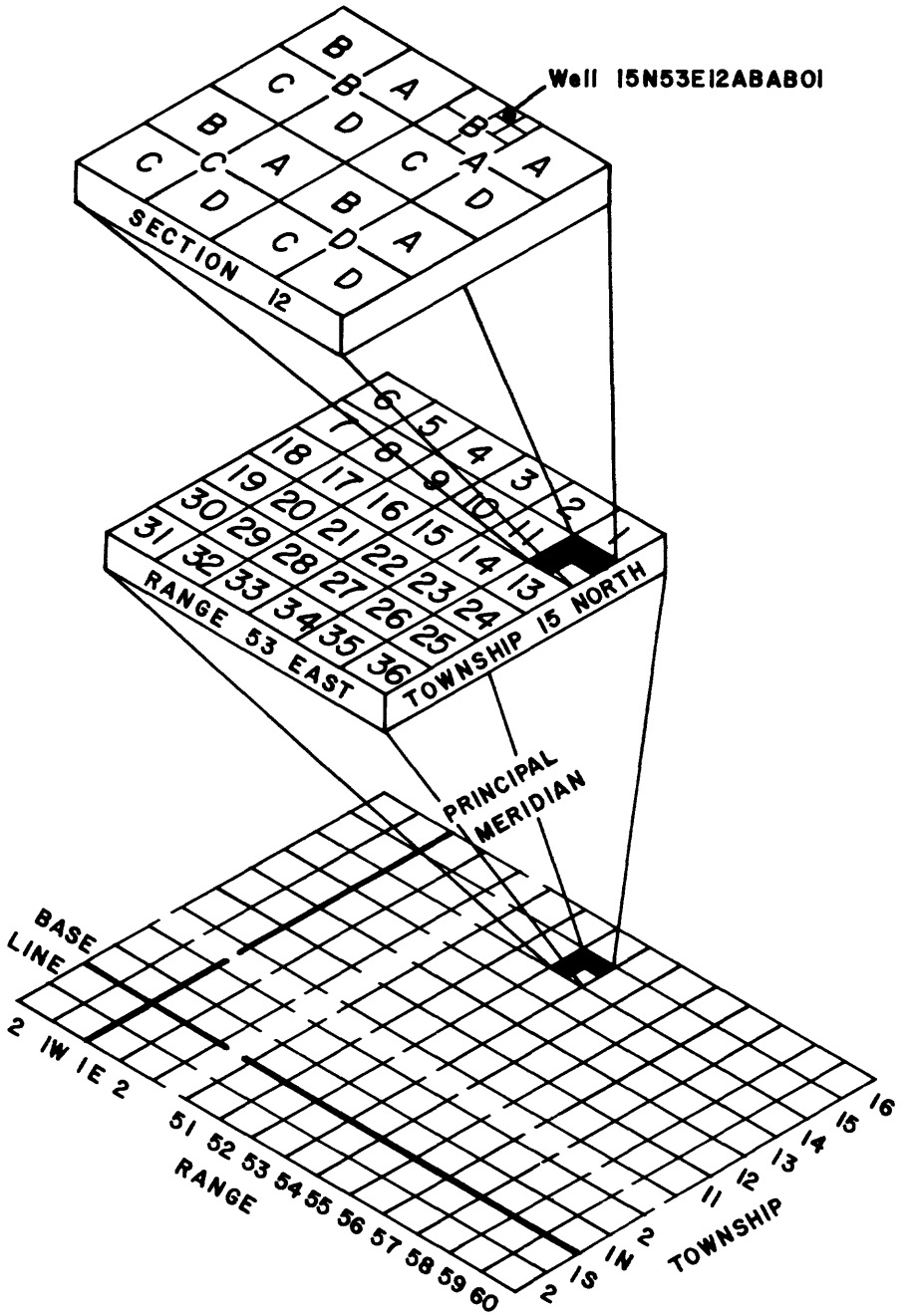


Figure 2.--Well-numbering system.

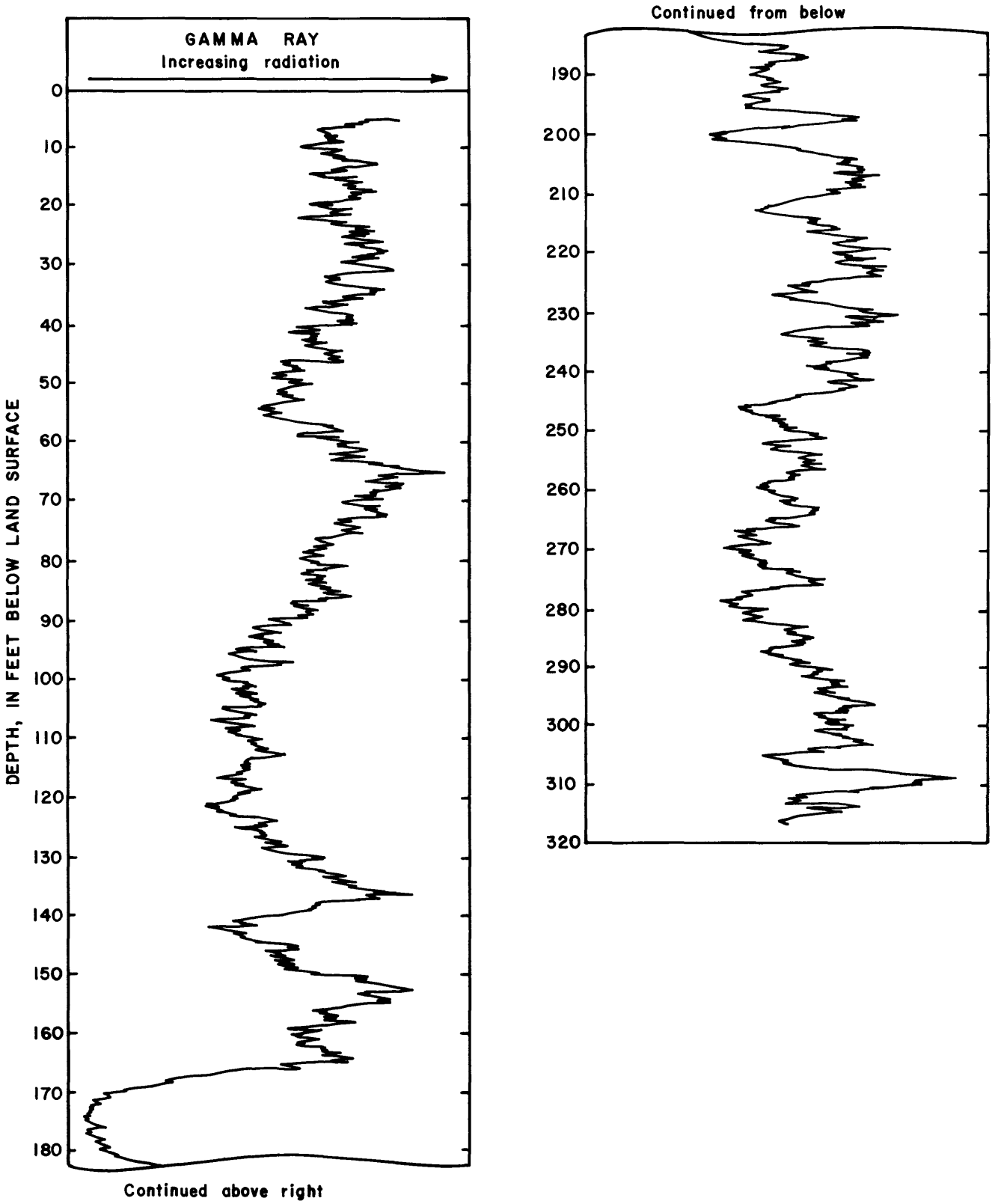


Figure 3.--Natural-gamma geophysical log for well 15N53E12ABAB01. Logged depth is 316 feet.

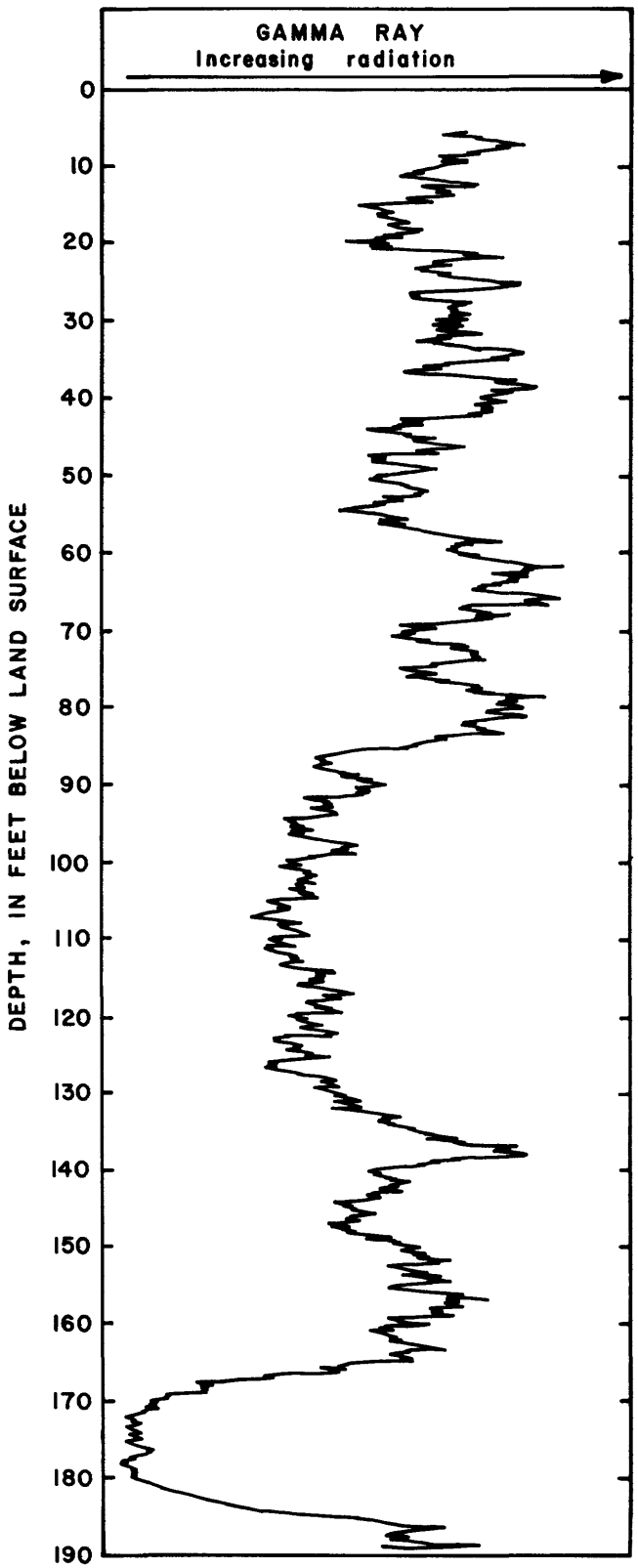


Figure 4.--Natural-gamma geophysical log for well 15N53E12ABAB02. Logged depth is 189 feet.

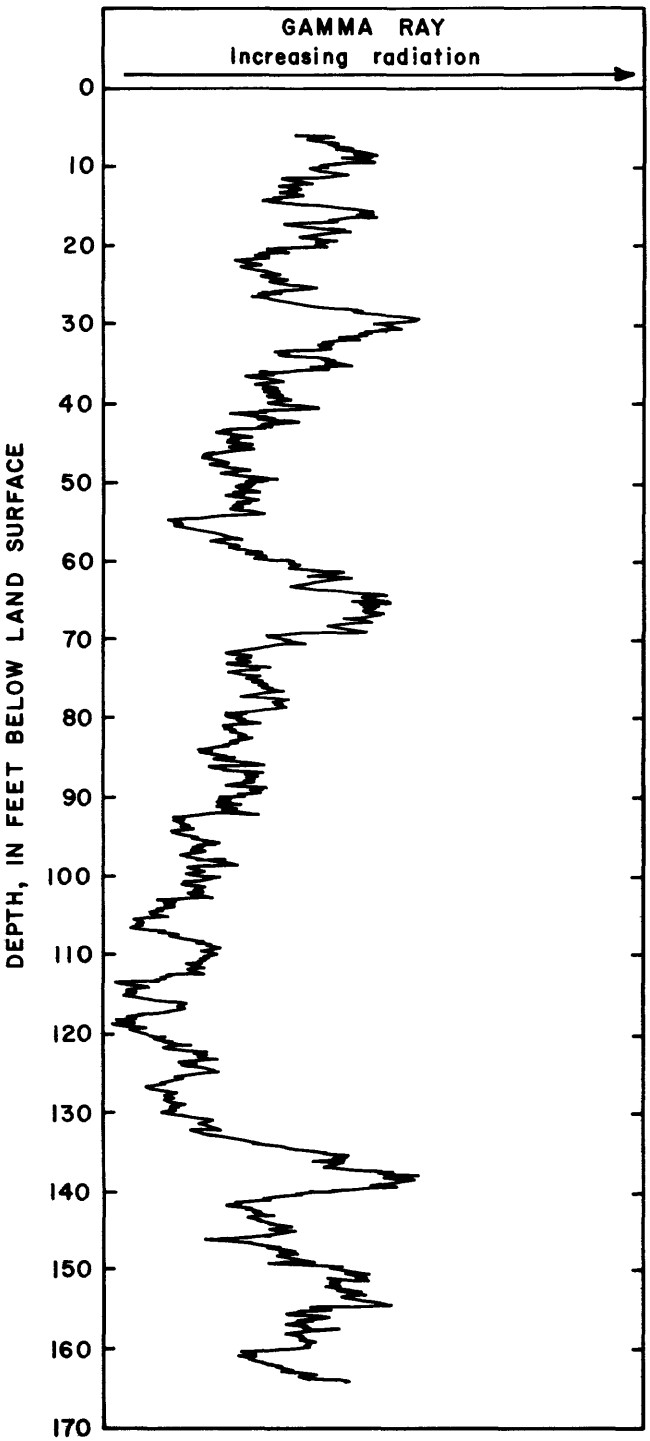


Figure 5.--Natural-gamma geophysical log for well 15N53E12ABAB03. Logged depth is 164 feet.

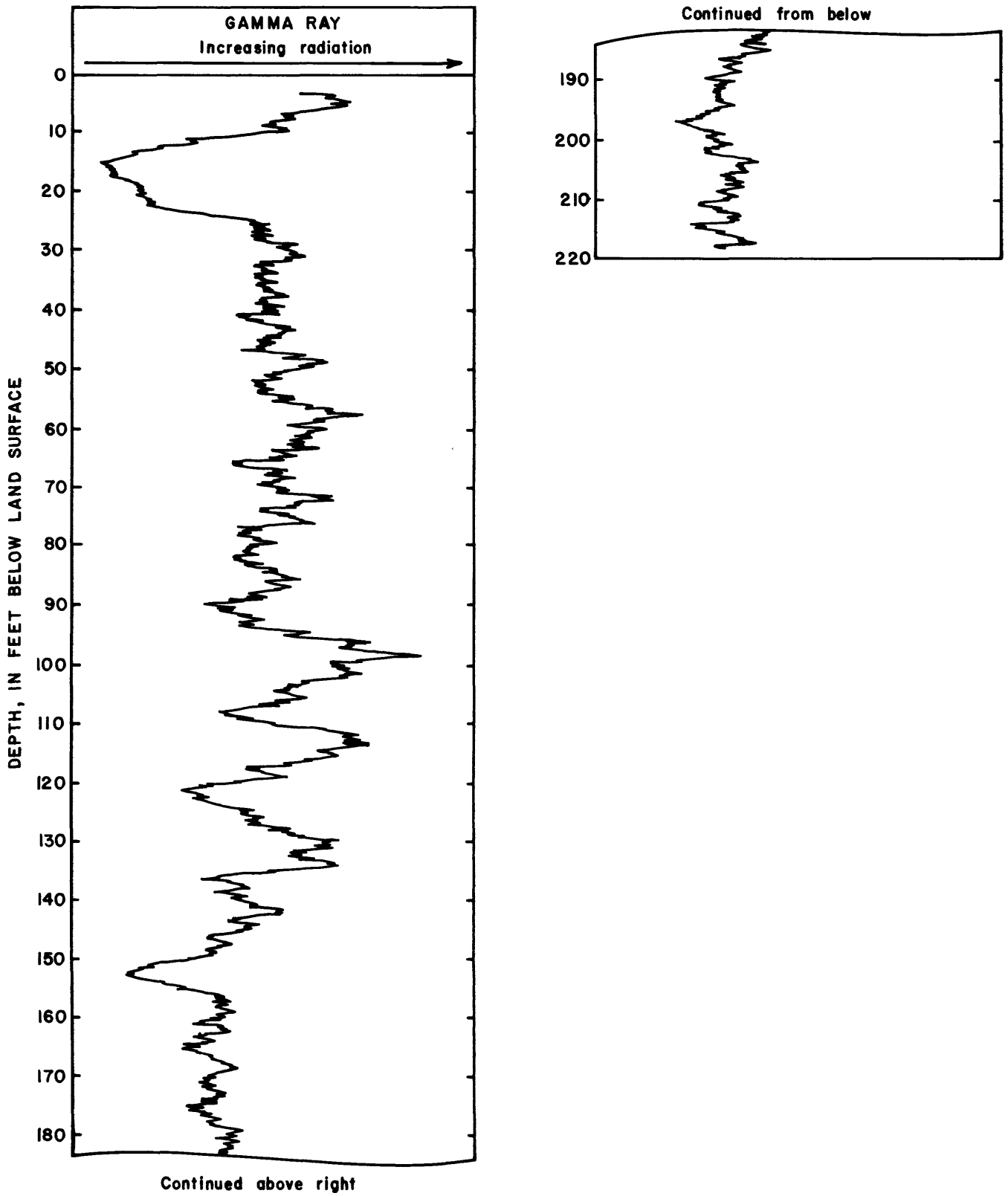


Figure 6.--Natural-gamma geophysical log for well 15N53E26CABC01. Logged depth is 218 feet.

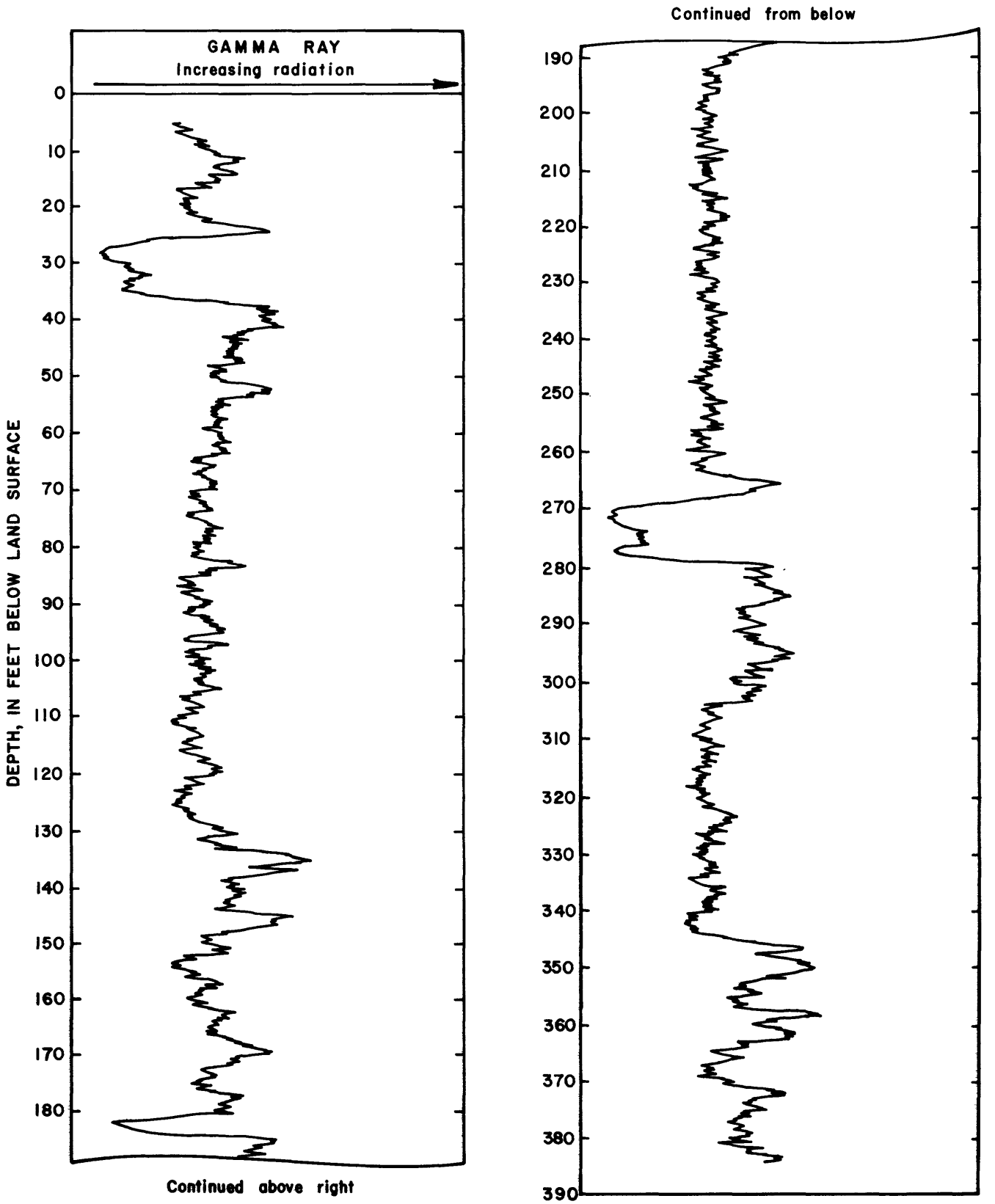


Figure. 7.--Natural-gamma geophysical log for well 15N53E26DABC01. Logged depth is 384 feet. Log was prepared by the Montana Bureau of Mines and Geology.

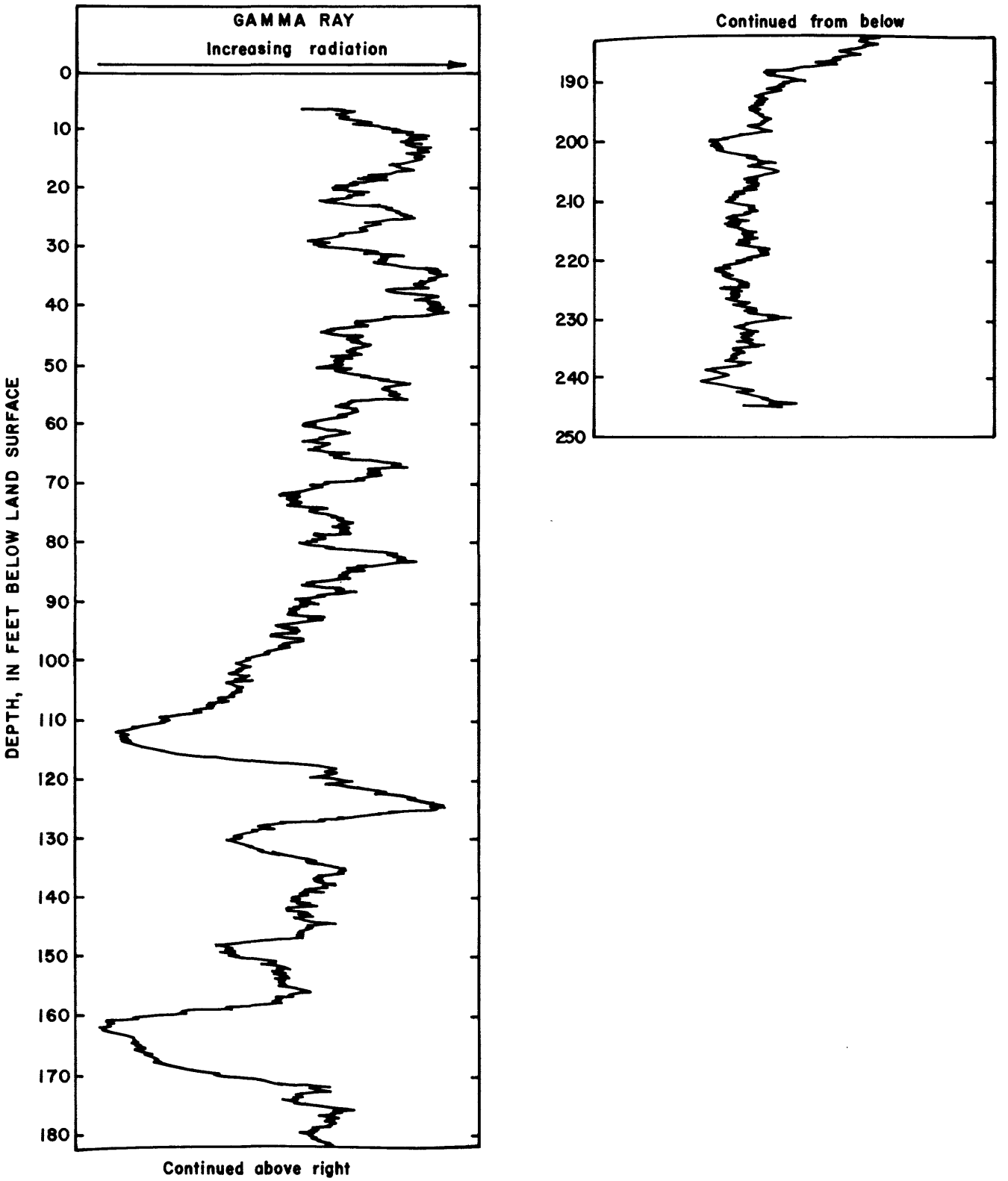


Figure 8.--Natural-gamma geophysical log for well 14N54E08CDDC01. Logged depth is 245 feet.

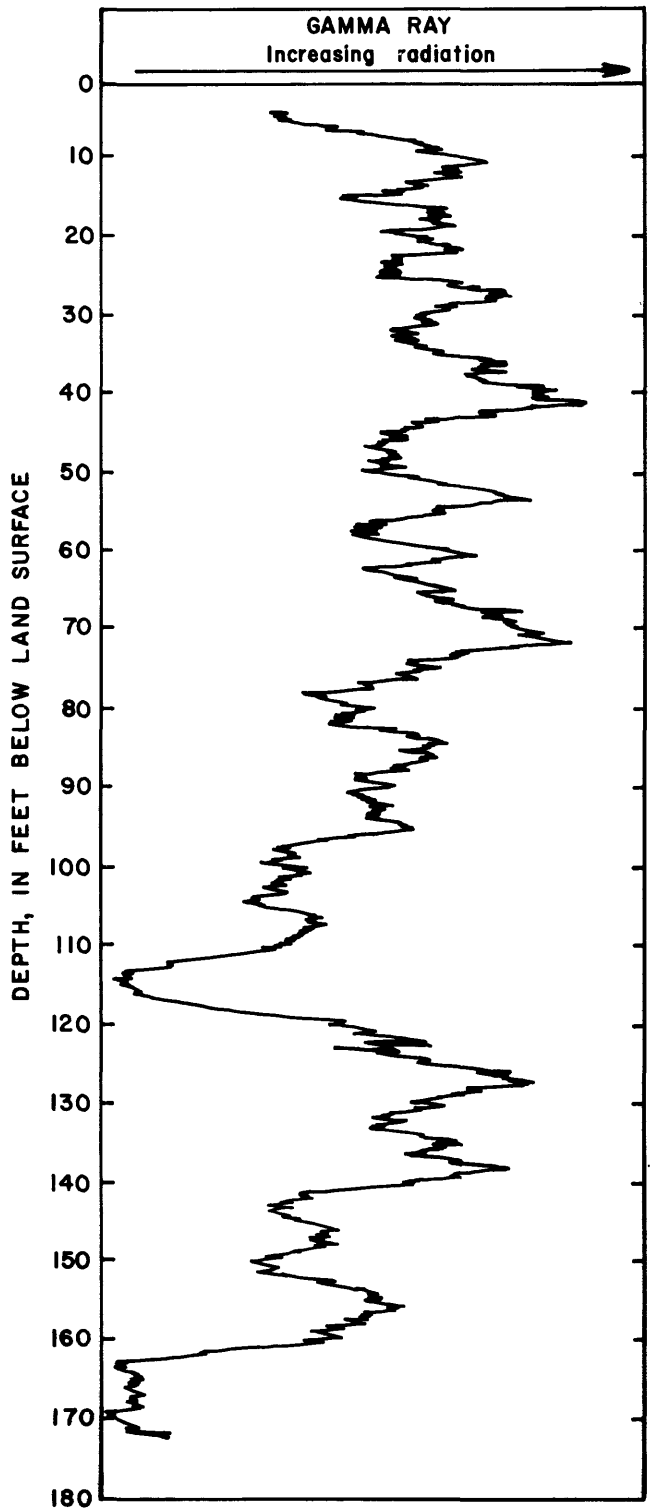


Figure 9.--Natural-gamma geophysical log for well 14N54E08CDDC02. Logged depth is 172 feet.

Geologic units identified for this report range in age from Late Cretaceous to Holocene (table 1). These geologic units supply most of the ground water used for various purposes in the study area.

Inventory data were obtained from 72 domestic, stock, irrigation, unused, and observation wells in and near the Southwest Glendive Preliminary Logical Mining Unit. Most data were collected from wells from 1977 through 1981. However, some data were collected as early as 1948. Records of inventoried wells are listed in table 2 and well locations are shown in figure 1.

Logs describing the lithology of stratigraphic units penetrated by a well were obtained from landowners or onsite inspection during drilling of the well. Lithologic logs for eight wells are given in table 3. The lithologic descriptions are as reported by geologists or well drillers, except for minor word changes that were made for consistent presentation.

Water-level measurements for three wells are listed in table 4. The period of record shown is short, owing to the limited length of the study. In 1984, these three wells became part of the statewide observation-well network, which is maintained by the Geological Survey in Montana in cooperation with the Montana Bureau of Mines and Geology. Water levels in wells in the network are measured systematically--usually once a year.

From 1948 to 1982, 26 water samples were collected from inventoried wells and analyzed for chemical-constituent concentrations and physical properties. Results of the analyses are given in table 5. The chemical analyses were performed by the Montana Bureau of Mines and Geology laboratory in Butte, Mont., or the Geological Survey national water-quality laboratory in Denver, Colo. All values have been rounded to current U.S. Geological Survey standards.

Table 1.--*Generalized section of geologic units*

Era-them	Sys-tem	Series	Geologic unit		Thickness (feet)	General description
Cenozoic	Quaternary	Pleistocene and Holocene	Alluvium		0-50	Mostly unconsolidated sand, silt, and clay with local lenses of gravel.
			Terrace deposits		0-100	Mostly gravel and sand with some silt and clay. May include the Crane Creek and Cartwright Gravels (Howard, 1960).
		Pliocene(?) or Miocene (?)	Flaxville Formation		0-100	Yellow to gray fluvial gravel, sand, and clay with local marl and beds of volcanic ash.
	Tertiary	Paleocene	Fort Union Formation	Tongue River Member	0-1,200	Light-gray to brownish-gray fine- to medium-grained thick-bedded to massive lenticular sandstone and siltstone. Contains lenses of shaly siltstone and shale and thick extensive coal beds. Burning of coal along outcrops has baked overlying sandstone and shale to form red to lavender clinker. Peuse coal bed is basal coal of this member (Banet, 1979).
				Lebo Shale Member	0-300	Predominantly dark shale interbedded with light-gray and brown to black carbonaceous shale, siltstone, and locally thin coal beds.
				Tullock Member	0-200	Interbedded medium-gray to light-gray shale, light-gray sandstone and siltstone, and thin coal beds.
Mesozoic	Cretaceous	Upper Cretaceous	Hell Creek Formation		0-400	Gray to yellowish-gray shale, siltstone, and thin coal beds compose the upper part of the unit. Sandstone, commonly crossbedded, occurs near the base of the unit.
			Fox Hills Sandstone		0-400	Two members of the unit are recognized: Colgate Member--very light gray fine- to medium-grained massive sandstone; unnamed lower member--gray to brownish-gray fine-grained thin-bedded sandstone, with interbedded sandy shale and siltstone. Fox Hills Sandstone and lower part of Hell Creek Formation are considered to be one aquifer.
			Bearpaw (Pierre) Shale		600-1,200	Gray to black marine shale and shaly claystone.

Modified from Slagle (1983)

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Banet, A.C., Jr., 1979, Preliminary geologic investigation of the West Glendive lignite deposits, Dawson County, Montana: U.S. Geological Survey Open-File Report 79-275, 11 p.

Howard, A.D., 1960 [1961], Cenozoic history of northeastern Montana and northwestern North Dakota with emphasis on the Pleistocene: U.S. Geological Survey Professional Paper 326, 107 p.

Levings, G.W., 1981, Selected hydrogeologic data from the northern Great Plains area of Montana: U.S. Geological Survey Open-File Report 81-534, 241 p.

Moulder, E.A., and Kohout, F.A., 1958, Ground-water factors affecting drainage in the First Division, Buffalo Rapids Irrigation Project, Prairie and Dawson Counties, Montana, *with a section on* Chemical quality of the water, by E.R. Jochens: U.S. Geological Survey Water-Supply Paper 1424, 198 p.

Moulder, E.A., Torrey, A.E., and Koopman, F.C., 1953, Ground-water factors affecting the drainage of Area IV, First Division, Buffalo Rapids Irrigation Project, Montana: U.S. Geological Survey Circular 198, 46 p.

Slagle, S.E., 1981, Hydrogeologic data for Dawson, McCone, Prairie, and Richland Counties, east-central Montana: U.S. Geological Survey Open-File Report 81-801, 101 p.

_____1983, Water resources of the Fort Union coal region, east-central Montana: U.S. Geological Survey Water-Resources Investigations Report 83-4151, 37 p.

Taylor, O.J., 1965, Ground-water resources along Cedar Creek anticline in eastern Montana: Montana Bureau of Mines and Geology Memoir 40, 99 p.

Torrey, A.E., and Swenson, F.A., 1951, Ground-water resources of the lower Yellowstone River valley between Miles City and Glendive, Montana, *with a section on* The chemical quality of the water, by F.A. Swenson: U.S. Geological Survey Circular 93, 72 p.

Wood, W.A., 1984, Hydrogeologic data for selected test wells drilled in the Fort Union coal region, eastern Montana: U.S. Geological Survey Open-File Report 84-464, 63 p.

DATA

Table 2.--*Records of wells*

Local number--well-numbering system described in text.
Altitude of land surface--in feet above sea level.
Depth drilled--in feet below land surface.
Depth of well--in feet below land surface.
Geologic unit--
    110ALVM, Alluvium;
    110TRRC, Terrace deposits;
    121FLXV, Flaxville Formation;
    125FRUN, Fort Union Formation;
    125TGRV, Tongue River Member of Fort Union Formation;
    125LEBO, Lebo Shale Member of Fort Union Formation;
    125TLCK, Tullock Member of Fort Union Formation;
    211HLCK, Hell Creek Formation;
    211FXHL, Fox Hills Sandstone;
    211FHHC, Fox Hills-lower Hell Creek aquifer.
Lithology code--GRVL, gravel; SNDS, sandstone.
Bottom of casing--in feet below land surface.
Casing material--C, concrete; G, galvanized iron, M, other metal; P, plastic (polyvinyl chloride); S, steel.
Water level--in feet below or above (+) land surface; F, flowing.
Discharge--in gallons per minute.
Primary use of site--O, observation; U, unused; W, withdrawal.
Primary use of water--H, domestic; I, irrigation; S, stock; U, unused.
Temperature--in degrees Celsius.
Specific conductance--in microsiemens per centimeter at 25 degrees Celsius.
Chemical analysis--C, analysis given in table 5.
Source of well records--
    A, onsite inspection, this study;
    B, office files of the U.S. Geological Survey, Helena, Mont.;
    C, Torrey and Swenson (1951);
    D, Moulder and others (1953);
    E, Moulder and Kohout (1958);
    F, Taylor (1965).
Symbol: --, no data.

Table 2.--*Records of wells*--Continued

Local number	Altitude of land surface (feet)	Date well completed	Depth drilled (feet)	Depth of well (feet)	Geologic unit	Lithology code	Bottom of casing (feet)	Diameter of casing (inches)	Casing material	Water level (feet)	Date water level measured
17N52E25DCA 01	2,700	1963	--	118	125FRUN	--	--	4.0	S	93.91	09-11-77
17N53E28CCAA01	2,670	1965	--	54	110ALVM	--	--	5.0	S	40.52	08-21-77
17N53E36BCAB01	2,760	--	--	121	125FRUN	--	--	6.0	S	45.56	08-18-77
16N53E03CBD 01	2,550	1977	165	165	125FRUN	--	165	4.0	P	29.86	08-21-77
16N53E10DABA01	2,470	1927	--	14	110ALVM	GRVL	14	36	G	10.10	08-16-77
16N53E13CCDB01	2,470	--	--	113	125FRUN	--	--	4.0	M	26.19	08-16-77
16N53E20ADD 01	2,750	1966	--	127	125FRUN	--	--	4.0	P	25.73	09-11-74
16N53E27CADD01	2,790	1957	--	106	125FRUN	--	--	4.0	S	65.00	09-08-77
16N53E28DCB 01	2,800	1915	--	123	125FRUN	--	--	5.0	S	104.66	08-24-77
16N53E34DADA01	2,750	1957	--	60	125FRUN	--	--	4.0	S	40.83	08-24-77
16N54E04DDCB01	2,580	--	--	--	121FLXV	--	--	--	--	12.60	08-18-77
16N54E06CDAA01	2,560	1957	--	106	125FRUN	--	85	7.0	S	72.47	08-22-77
16N54E12CBDB01	2,502	1946	--	--	125FRUN	--	--	4.0	S	53.01	08-17-77
16N54E14ADAD01	2,470	--	--	102	121FLXV	--	--	4.0	S	20.18	08-17-77
16N54E32CDDA01	2,540	1956	--	60	125FRUN	--	--	--	--	42.99	08-22-77
15N53E04ACB 01	2,800	--	--	40	125FRUN	--	--	--	--	--	--
15N53E07ACC 01	2,650	1967	--	50	110ALVM	--	--	4.0	S	31.74	09-10-77
15N53E10AAAB01	2,680	1952	--	--	110ALVM	GRVL	--	4.0	S	12.83	08-24-77
15N53E12ABAB01	2,610	1981	331	317	125LEBO	SNDS	317	4.0	P	130	09-05-81
15N53E12ABAB02	2,610	1981	195	193	125TGRV	COAL	193	4.0	P	87	09-05-81
15N53E12ABAB03	2,610	1981	172	172	125TGRV	SAND	172	4.0	P	82	09-05-81
15N53E12ACDA01	2,570	1956	--	75	125FRUN	--	(1)	(1)	S	64.52	09-08-77
15N53E20DBA 01	2,600	1964	--	57	125FRUN	--	--	4.0	S	49.98	09-10-77
15N53E26CABC01	2,510	1981	221	221	125LEBO	SNDS	221	4.0	P	77	09-05-81
15N53E26DABC01	2,540	1981	400	41	125TGRV	COAL	41	4.0	P	28.9	05-07-81
15N53E31BDC 01	2,850	1968	220	220	125FRUN	--	(2)	(2)	(2)	157.35	09-02-77
15N53E33CBC 01	2,650	1974	--	83	125FRUN	--	--	6.0	P	36.75	08-24-77
15N53E34AABA01	2,470	1976	78	78	125FRUN	--	--	6.0	S	30.13	08-23-77
15N53E34DBAD01	2,550	1972	58	58	121FLXV	GRVL	--	5.0	S	36.54	09-02-77
15N54E02DADB01	2,480	1975	--	150	125FRUN	--	--	5.0	S	81.66	08-22-77
15N54E07DAAB01	2,560	1957	--	65	125FRUN	--	--	4.0	S	62.64	08-22-77
15N54E20AACC01	2,510	1919	--	20	(3)	(3)	18	40	C	18.25	08-23-77
15N54E22CDBD01	2,490	1948	100	100	125FRUN	--	100	6.0	S	33.15	08-23-77
15N54E23DDCC01	2,410	1974	--	187	125FRUN	--	--	6.0	S	104.00	08-23-77
15N54E26CABD01	2,375	1952	1,220	1,220	211FHHC	--	1,220	5.5	S	--	--
15N54E34CAAB01	2,310	1920	--	18	110ALVM	--	(4)	(4)	(4)	13.92	08-23-77
15N54E34DDCA01	2,395	1960	1,200	1,200	211FHHC	--	1,200	3.0	S	--	--
15N54E36AA 01	2,175	--	--	60	125FRUN	--	--	4.0	G or S	--	--
15N54E36ACA 01	2,189	1951	--	31	--	--	--	.75	--	9.00	09-01-51
14N53E02CCBC01	2,560	1962	--	228	125FRUN	--	--	6.0	S	156.46	08-25-77
14N53E02CCCC01	2,540	1920	--	60	121FLXV	GRVL	--	4.0	S	46.84	08-25-77
14N53E04CACC01	2,640	--	--	143	125FRUN	--	--	4.0	S	98.35	08-24-77
14N53E04CBDD01	2,640	--	--	41	110ALVM	--	--	6.0	G	30.36	08-24-77
14N53E04CCCA01	2,640	1974	--	151	125FRUN	--	151	6.0	P	53.71	08-24-77
14N53E20DDAB01	2,580	1950	88	68	121FLXV	--	--	--	--	62.96	08-25-77
14N54E01AA 01	2,177	1942	--	202	--	--	--	4.0	G or S	20	09-27-48
14N54E01AD 01	2,166	--	--	50	125FRUN	--	--	4.0	G or S	18.51	09-27-48
14N54E01CCC 01	2,234	1951	--	65	--	--	--	4.0	--	64.00	05-01-51
14N54E01DAA 01	2,168	--	--	37	--	--	--	--	--	17.00	09-01-51
14N54E04ADBA01	2,410	1942	--	35	(5)	(5)	--	5.0	S	17.12	08-23-77
14N54E08CDDC01	2,400	1981	300	245	125TLCK	SAND	245	4.0	P	125.1	04-08-81
14N54E08CDDC02	2,400	1981	175	175	125TGRV	COAL	175	4.0	P	124.2	05-08-82
14N54E12BA 01	2,202	--	--	102	--	--	--	4.0	G or S	37.99	09-25-48
14N54E13BB 01	2,173	--	--	228	--	--	--	3.0	G or S	22	09-21-48
14N54E13BD 01	2,160	--	--	142	--	--	--	4.0	G or S	25	09-21-48
14N54E13CDD 01	2,155	1950	--	21	--	--	--	2.0	--	13.00	09-01-51
14N54E13DB 01	2,156	--	--	703	125FRUN, 211HLCK	--	--	2.0	G or S	--	--
14N54E13DBBA01	2,160	1942	710	710	211FHHC	--	--	--	--	+95.85	09-13-77
14N54E13DBBB01	2,160	1941	713	713	211FHHC	--	713	3.0	S	+138.42	12-31-63
14N54E13DCD 01	2,111	1951	--	24	--	--	--	3.0	--	4.00	08-01-51

Discharge (gal/min)	Date discharge measured	Primary use of site	Primary use of water	Temperature, onsite (°C)	Specific conductance, onsite (µS/cm)	Date quality parameters measured	Chemical analysis	Source of well records	Local number
4.1	09-11-77	W	S	10.0	3,640	09-11-77	--	B	17N52E25DCA 01
--	--	W	S	10.0	2,330	08-21-77	--	B	17N53E28CCAA01
--	--	W	S	11.5	910	08-18-77	C	B	17N53E36BCAB01
25	06-29-77	W	H	18.5	3,300	08-21-77	C	B	16N53E03CBD 01
7.8	08-16-77	W	H	16.0	1,060	08-16-77	C	B	16N53E10DABA01
--	--	U	U	--	--	--	--	B	16N53E13CCDB01
--	--	W	S	10.0	473	09-11-77	--	B	16N53E20ADD 01
3.0	09-08-77	W	S	9.5	455	09-08-77	C	B	16N53E27CADD01
--	--	W	S	10.0	520	08-24-77	--	B	16N53E28DCB 01
--	--	W	S	9.5	488	08-24-77	--	B	16N53E34DADA01
--	--	W	S	10.0	710	08-18-77	--	B	16N54E04DDCB01
--	--	W	S	10.0	610	08-22-77	--	B	16N54E06CDAA01
--	--	W	S	11.5	1,650	08-17-77	--	B	16N54E12CBDB01
--	--	W	S	10.0	670	08-17-77	C	B	16N54E14ADAD01
--	--	W	H	14.5	445	08-22-77	C	B	16N54E32CDDA01
--	--	W	S	10.0	502	08-24-77	--	B	15N53E04ACB 01
2.8	09-10-77	W	S	10.0	595	09-10-77	C	B	15N53E07ACC 01
--	--	W	H	15.5	560	08-24-77	--	B	15N53E10AAAB01
2.0	10-13-82	O	U	12.0	1,410	10-13-82	C	A	15N53E12ABAB01
1.8	10-15-82	O	U	11.0	840	10-15-82	C	A	15N53E12ABAB02
17	10-15-82	O	U	10.5	540	10-15-82	C	A	15N53E12ABAB03
--	--	W	S	10.0	722	09-08-77	--	B	15N53E12ACDA01
--	--	W	S	10.5	1,110	09-10-77	--	B	15N53E20DBA 01
17	10-14-82	O	U	12.5	1,560	10-14-82	C	A	15N53E26CABC01
.02	10-15-82	O	U	11.5	595	10-15-82	C	A	15N53E26DABC01
--	--	W	S	10.0	810	09-02-77	--	B	15N53E31BDC 01
7.0	05-11-74	W	S	--	--	--	--	B	15N53E33CBC 01
5.3	08-23-77	W	H	10.5	1,500	08-23-77	C	B	15N53E34AABA01
9.0	09-02-77	W	S	10.5	1,130	09-02-77	C	B	15N53E34DBAD01
6.2	08-22-77	W	I	11.5	795	08-22-77	C	B	15N54E02DADB01
--	--	W	H	15.0	578	08-22-77	--	B	15N54E07DAAB01
--	--	W	H	16.0	690	08-23-77	C	B	15N54E20AACC01
--	--	W	S	11.5	552	08-23-77	--	B	15N54E22CDBD01
--	--	W	H	14.0	428	08-23-77	--	B	15N54E23DDCC01
--	--	U	--	--	--	--	--	B	15N54E26CABD01
18	08-23-77	W	H	18.5	835	08-23-77	C	B	15N54E34CAAB01
--	--	U	--	--	--	--	--	B	15N54E34DDCA01
--	--	W	S	--	--	--	--	C	15N54E36AA 01
--	--	--	--	--	--	--	--	E	15N54E36ACA 01
--	--	W	H	17.0	1,500	08-25-77	--	B	14N53E02CCBC01
--	--	W	H	13.5	550	08-25-77	--	B	14N53E02CCCC01
--	--	W	S	11.5	600	08-24-77	--	B	14N53E04CACC01
--	--	U	U	19.0	570	08-24-77	--	B	14N53E04CBDD01
18	04-23-74	W	H	14.5	460	08-24-77	C	B	14N53E04CCCA01
--	--	W	H	11.5	810	08-25-77	--	B	14N53E20DDAB01
--	--	W	H,S	--	--	--	--	C	14N54E01AA 01
--	--	W	H,S	--	--	--	--	C	14N54E01AD 01
--	--	--	--	--	--	--	--	E	14N54E01CCC 01
--	--	--	--	--	--	--	--	E	14N54E01DAA 01
--	--	W	H	14.5	958	08-23-77	--	B	14N54E04ADBA01
13	05-05-81	O	U	11.5	1,460	05-05-81	C	A	14N54E08CDDC01
.2	10-16-82	O	U	10.0	1,400	10-16-82	C	A	14N54E08CDDC02
--	--	W	H,S	--	--	--	--	C	14N54E12BA 01
--	--	W	H,S	--	--	--	--	C	14N54E13BB 01
--	--	W	H,S	--	--	--	--	C	14N54E13BD 01
--	--	--	--	--	--	--	--	E	14N54E13CDD 01
--	--	W	H,S	--	--	--	C	C,E	14N54E13DB 01
6.5	09-13-77	W	H	13.5	1,400	09-13-77	C	B	14N54E13DBBA01
--	--	W	H	12.0	1,370	09-08-79	--	B	14N54E13DBBB01
--	--	--	--	--	--	--	--	E	14N54E13DCD 01

Table 2.--*Records of wells*--Continued

Local number	Altitude of land surface (feet)	Date well completed	Depth drilled (feet)	Depth of well (feet)	Geologic unit	Lithology code	Bottom of casing (feet)	Diameter of casing (inches)	Casing material	Water level (feet)	Date water level measured
14N54E14BA 01	2,190	--	--	68	--	--	--	4.0	G or S	15	09-21-48
14N54E14DA 01	2,171	--	--	265	125FRUN	--	--	--	--	9.00	--
14N54E18BCCA01	2,500	--	--	51	121FLXV	--	(6)	(6)	(6)	41.87	08-26-77
14N54E22BDDD01	2,190	1963	1,100	1,100	211FHHC	--	(7)	(7)	S	+126.89	11-01-63
14N54E22CCBB01	2,230	1959	--	140	125FRUN	--	100	4.0	S	62.55	09-12-77
14N54E23BC 01	2,170	--	--	373	125FRUN	--	--	--	--	--	--
14N54E23BDC 01	2,162	1951	--	9	110TRRC	--	--	.75	--	1.05	09-05-51
14N54E24AAB 01	2,110	1951	--	12	--	--	--	3.0	--	8.00	08-01-51
14N54E25BB 01	2,118	1960	--	816	211HLCK, 211FXHL	--	--	2.0	--	+182	08-11-63
14N54E28DD 01	2,108	1950	--	16	110ALVM	--	--	.75	G	12.85	09-05-50
14N54E29AC 01	2,290	--	--	1,020	--	--	--	4.0	S	F	09-21-48
14N54E29ACCA01	2,265	1969	1,050	1,050	211FHHC	--	(8)	(8)	S	F	08-23-79

1 Well contains 6-inch casing to depth of 30 feet and 4-inch casing to unknown depth.
2 Well contains 5-inch steel casing to depth of 60 feet and 4-inch plastic casing to depth of 220 feet.
3 Well completed in GRVL of 121FLXV and COAL of 125FRUN.
4 Well contains 6-inch concrete casing to depth of 10 feet and 3-inch steel casing to depth of 17.7 feet.
5 Well completed in GRVL of 110ALVM and COAL of 125FRUN.
6 Well contains 6-inch steel casing to depth of 25 feet and 4-inch plastic casing to depth of 51 feet.
7 Well contains 4-inch casing to depth of 36 feet and 2-inch casing to depth of 1,100 feet.
8 Well contains 6-inch casing to depth of 42 feet and 2-inch casing to depth of 1,050 feet.

Discharge (gal/min)	Date discharge measured	Primary use of site	Primary use of water	Temperature, onsite (°C)	Specific conductance onsite (µS/cm)	Date quality parameters measured	Chemical analysis	Source of well records	Local number
--	--	W	H,S	--	--	--	--	C	14N54E14BA 01
--	--	--	--	--	--	--	--	C	14N54E14DA 01
--	--	W	H	11.5	1,000	08-26-77	C	B	14N54E18BCCA01
3.1	08-23-79	W	S	17.0	1,320	08-23-79	--	B	14N54E22BDDD01
2.4	09-11-77	W	H	15.0	1,060	09-12-77	--	B	14N54E22CCBB01
--	--	--	--	--	--	--	--	C	14N54E23BC 01
--	--	--	--	--	--	--	C	E	14N54E23BDC 01
--	--	--	--	--	--	--	--	E	14N54E24AAB 01
26	--	W	S	--	--	--	--	F	14N54E25BB 01
--	--	--	--	--	--	--	C	D	14N54E28DD 01
--	--	--	--	--	--	--	--	D	14N54E29AC 01
6.0	02-20-69	W	H	14.5	1,060	08-23-79	C	B	14N54E29ACCA01

Table 3.--*Lithologic logs of wells*

[Thickness--in feet; depth--in feet below land surface]

16N53E03CBD01	Thickness	Depth
Clay, yellow	45	45
Sand, blue	5	50
Clay, blue	18	68
Coal	10	78
Clay, blue	4	82
Sand, gray; 4 gallons of water per minute	13	95
Clay, blue	27	122
Sand, gray; 30 gallons of water per minute	40	162
Clay, blue	3	165
15N53E12ABAB01		
Topsoil	.5	.5
Silt, muddy	1.5	2
Sand and gravel, muddy; few clayey mud layers	21	23
Shale, silty; alternating sandy and clayey layers	17	40
Sand, shaly	4	44
Shale	2	46
Sandstone, shaly	11	57
Shale; sandy from 58 to 63 feet; clayey from 64 to 73 feet	19	76
Shale, silty, to shaly siltstone	15	91
Sandstone; shaly from 91-99 feet; 1-foot shale beds at 97, 104, 112, and 123 feet	38	129
Shale; sandy from 129 to 135 feet; clayey from 135 to 137.5 feet	11	140
Sandstone and little shale	10	150
Shale, clayey	6	156
Shale, silty	9	165
Shale, carbonaceous	4	169
Coal bed	16	185
Shale	3	188
Sandstone; few thin shale layers	8	196
Shale, probably carbonaceous	4	200
Sandstone	2	202
Shale	9	211
Sandstone	4	215
Shale	10	225
Sandstone	4	229
Shale	3	232
Sandstone; shaly in lower half	4	236
Shale; sandy bed at 238 to 240 feet	9	245
Sandstone	5	250
Shale	1.5	251.5
Sandstone	2.5	254
Shale	4.5	258.5
Sandstone, shaly	4.5	263

Table 3.--*Lithologic logs of wells*--Continued

15N53E12ABAB01--Continued	Thickness	Depth
Shale	1.5	264.5
Sandstone; few thin shale layers	8.5	273
Shale	4	277
Sandstone; shaly in lower half	6	283
Shale	3.5	286.5
Sandstone	1.5	288
Shale, partly sandy; clayey from 302 to 304 feet	17	305
Coal or sandstone	3	308
Shale, clayey or carbonaceous	3	311
Sandstone; clayey shale at 314 to 315 feet	6	317

15N53E12ABAB02		
Topsoil	.5	.5
Silt, muddy	1.5	2
Sand and gravel, muddy; few clayey layers, light-brown	19	21
Shale, silty; alternating sandy and clayey layers	21.5	42.5
Sand, shaly	2.5	45
Shale	2	47
Sandstone; few shale layers	10	57
Shale; alternating sandy and clayey layers, brown to gray	28	85
Sandstone	4	89
Shale, gray	2.5	91.5
Sandstone; shaly from 97 to 99 and 114 to 122 feet	41	132.5
Shale; sandy in upper half; clayey from 137 to 139 feet	7.5	140
Sandstone; little shale, gray	9	149
Shale; clayey from 156 to 159 feet	16	165
Shale, probably carbonaceous	4	169
Coal bed	16.5	185.5
Shale	3.5	189
Sand, silty	6	195

15N53E12ABAB03	Thickness	Depth
Topsoil	.5	.5
Silt, muddy	1.5	2
Sand and gravel, muddy	14	16
Clay, sandy; few gravel stringers	4	20
Sand and gravel, brown	8	28
Shale; clayey in upper half; sandy in lower half	8	36
Sandstone; shaly from 49 to 54 feet, yellow and gray	23.5	59.5
Shale; clayey from 64 to 69 feet, yellowish-brown and yellowish-green	11.5	71
Sandstone, shaly, to sandy shale, light-gray to bluish-green	21.5	92.5
Sandstone; shaly stringers, light-gray	42.5	135
Shale; clayey from 137 to 140 feet, light-gray	6	141
Sandstone; shaly from 144 to 146 feet	9	150
Shale; clayey in upper half; sandy in lower half, gray	10	160

Table 3.--*Lithologic logs of wells*--Continued

15N53E12ABAB03--Continued	Thickness	Depth
Sandstone	3	163
Shale, probably carbonaceous	6	169
Coal bed	3	172
15N53E26CABC01		
Topsoil and talus	1	1
Silt, sandy, very light grayish yellow	2.5	3.5
Shale, clayey, light-grayish-yellow	3	6.5
Silt and silty sandstone, very light grayish yellow	7.5	14
Coal bed, partly weathered near top, lignite to sub-bituminous below	10	24
Shale, clayey, carbonaceous near top, moderate-grayish brown	7.5	31.5
Silt, shaly, very light gray; few shale layers	15.5	47
Shale, clayey	2	49
Silt, shaly, light-gray to very light gray	7	56
Shale, silty and clayey, light-gray	15	71
Shale, clayey, very light grayish brown	2	73
Shale, silty and clayey, light-gray	2	75
Shale, clayey, very light grayish brown	1.5	76.5
Silt, shaly	7	83.5
Shale	5.5	89
Sandstone, shaly, very light gray	5	94
Shale, clayey, light-gray	9	103
Shale	4	107
Sandstone, shaly	4	111
Shale, clayey	6	117
Sandstone, shaly	2.5	119.5
Sandstone	4.5	124
Shale	5	129
Shale, clayey	6	135
Shale, silty, light-greenish-gray	17	152
Coal bed	3.5	155.5
Shale, silty	5.5	161
Sandstone, shaly	6	167
Shale, sandy; few sandstone layers	19.5	186.5
Sandstone, very fine, light-gray; few shale layers	34.5	221
15N53E26DABC01		
Topsoil	.5	.5
Sand and sandy clay	4.5	5
Sand and sandy clay; some pebble- and cobble-sized gravel	11	16
Sand and cobble-sized gravel, well rounded	9	25
Clay, sandy, yellow	2	27
Coal bed	9	36
Shale, carbonaceous, brownish-black	6	42

Table 3.--*Lithologic logs of wells*--Continued

15N53E26DABC01--Continued	Thickness	Depth
Sandstone, very light gray	9	51
Shale, gray	3	54
Sandstone	14	68
Sandstone, partly shaly; few shale layers; very light gray	65	133
Shale, light-gray	5	138
Sandstone, shaly	6	144
Shale	3	147
Sandstone, light-greenish gray	15	162
Shale; carbonaceous in lower part	19	181
Coal bed	3	184
Shale, carbonaceous, dark-brownish-gray	4	188
Sandstone; some shale layers; light-greenish-gray	77	265
Shale, carbonaceous	5	270
Coal bed; shaly coal from 274 to 277 feet	10	280
Shale, carbonaceous	7	287
Shale, sandy, light-brownish-gray	7	294
Shale, clayey	3	297
Shale, sandy, pale-green	7	304
Sandstone; few shale layers; light-gray	42	346
Shale, clayey, light-brownish-gray	6	352
Sandstone, light-gray	6	358
Shale, clayey, light-brownish-gray	5	363
Sandstone, shaly, light-gray	8	371
Shale, sandy, light-brownish-gray	12	383
Shale, clayey, brownish-gray	4	387
Shale, light-brownish-gray	13	400
14N54E22BDDD01		
Topsoil	4	4
Gravel	27	31
Shale, gray	59	90
Sandstone, gray	30	120
Shale, gray	35	155
Coal	10	165
Shale, gray	120	285
Shale, white	10	295
Coal	3	298
Shale, dark	120	418
Rock	3	421
Shale, gray	29	450
Shale, dark	45	495
Rock	10	505
Shale, dark	235	740
Rock	3	743
Shale, light	157	900
Shale, sandy	60	960
Sandstone, gray	140	1,100

Table 3.--*Lithologic logs of wells*--Continued

14N54E29ACCA01	Thickness	Depth
Topsoil, yellow, sandy	12	12
Gravel	26	38
Gumbo; streaks of coal	42	80
Sandstone; streaks of sand rock	110	190
Gumbo, blue	30	220
Coal	35	255
Gumbo	40	295
Rock	4	299
Gumbo	13	312
Rock	2	314
Gumbo; streaks of coal	181	495
Sandstone	40	535
Gumbo	95	630
Rock, hard	5	635
Gumbo, blue	145	780
Sandstone	40	820
Gumbo	170	990
Sandstone	55	1,045
Shale	5	1,050

Table 4.--*Measurements of water levels in wells*

[Measurements made with steel tape during static conditions, except as indicated. Water level--in feet below land surface]

Well	Date	Water level	Remarks
15N53E12ABAB01	09-03-81	--	Date well completed
	09-05-81	[1]130	
	09-26-84	132.90	
	10-06-85	131.87	
	10-19-86	132.66	
15N53E12ABAB02	09-04-81	--	Date well completed
	09-05-81	[1]87	
	09-26-84	81.34	
	10-06-85	81.73	
	10-19-86	81.57	
15N53E12ABAB03	09-05-81	--	Date well completed
	09-05-81	[1]82	
	09-26-84	79.00	
	10-06-85	79.02	
	10-19-86	79.05	

[1]Measured with electric tape to nearest foot; water level may still be recovering from development.

Table 5.--*Chemical-constituent concentrations and physical properties of water from selected wells*

Local number--well-numbering system described in text.
Depth of well--in feet below land surface.
Sampling depth--in feet below land surface.
Geologic unit--
- 110ALVM, Alluvium;
- 110TRRC, Terrace deposits;
- 121FLXV, Flaxville Formation;
- 125FRUN, Fort Union Formation;
- 125TGRV, Tongue River Member of Fort Union Formation;
- 125LEBO, Lebo Shale Member of Fort Union Formation;
- 125TLCK, Tullock Member of Fort Union Formation;
- 211HLCK, Hell Creek Formation;
- 211FHHC, Fox Hills-lower Hell Creek aquifer.

Agency collecting sample--USGS, U.S. Geological Survey.
Agency analyzing sample--MBMG, Montana Bureau of Mines and Geology;
USGS, U.S. Geological Survey.
Source of data--
- A, onsite collection, this study;
- B, office files of the U.S. Geological Survey, Helena, Mont.;
- C, Torrey and Swensen (1951);
- D, Moulder and others (1953);
- E, Moulder and Kohout (1958).

Abbreviations and symbols--
- µS/cm, microsiemens per centimeter at 25 degrees Celsius;
- lab, laboratory;
- °C, degrees Celsius;
- mg/L, milligrams per liter;
- fet, fixed endpoint titration;
- ac-ft, acre-feet;
- µg/L, micrograms per liter;
- <, less than;
- --, no data.

The five-digit number in parentheses on the last line of selected column headings is the parameter code, which is used by the Geological Survey to uniquely identify a specific constituent.

Table 5.--*Chemical-constituent concentrations and physical properties of water from selected wells*--Continued

Local number	Date sample collected	Depth of well (feet)	Sampling depth (feet)	Geologic unit	Specific conductance, onsite (µS/cm) (00095)	Specific conductance, lab (µS/cm) (90095)	pH, onsite (standard units) (00400)
17N53E36BCAB01	09-06-77	121	--	125FRUN	865	834	--
16N53E03CBD 01	08-31-77	165	--	125FRUN	3,300	--	--
16N53E10DABA01	08-31-77	14	--	110ALVM	1,040	1,020	--
16N53E27CADD01	09-08-77	106	--	125FRUN	455	275	--
16N54E14ADAD01	09-04-77	102	--	121FLXV	670	630	--
16N54E32CDDA01	09-04-77	60	--	125FRUN	450	435	--
15N53E07ACC 01	09-10-77	50	--	110ALVM	595	579	--
15N53E12ABAB01	10-13-82	317	295	125LEBO	1,410	1,460	8.6
15N53E12ABAB02	10-15-82	193	190	125TGRV	840	872	8.3
15N53E12ABAB03	10-15-82	172	170	125TGRV	540	548	7.7
15N53E26CABC01	10-14-82	221	220	125LEBO	1,560	1,600	8.7
15N53E26DABC01	10-15-82	41	37	125TGRV	595	604	6.7
15N53E34AABA01	09-02-77	78	--	125FRUN	1,460	1,430	--
15N53E34DBAD01	09-02-77	58	--	121FLXV	1,130	1,080	--
15N54E02DADB01	09-04-77	150	--	125FRUN	852	810	--
15N54E20AACC01	09-02-77	20	--	121FLXV, 125FRUN	692	672	--
15N54E34CAAB01	09-01-77	18	--	110ALVM	835	775	--
14N53E04CCCA01	09-02-77	151	--	125FRUN	452	--	--
14N54E08CDDC01	05-05-81	245	--	125TLCK	1,460	1,450	8.6
14N54E08CDDC02	10-16-82	175	172	125TGRV	1,400	1,350	8.3
14N54E13DB 01[1]	10-01-48	703	--	125FRUN, 211HLCK	--	1,460	--
14N54E13DBBA01	09-13-77	710	--	211FHHC	1,400	1,360	--
14N54E18BCCA01	09-02-77	51	51	121FLXV	1,040	986	--
14N54E23BDC 01	10-18-51	9	--	110TRRC	--	2,530	--
14N54E28DD 01	10-11-50	16	--	110ALVM	--	4,550	--
14N54E29ACCA01	09-19-79	1,050	--	211FHHC	1,440	1,290	8.6

Table 5.--*Chemical-constituent concentrations and physical properties of water from selected wells*--Continued

Local number	pH, lab (standard units) (00403)	Temperature, onsite (°C) (00010)	Hardness (mg/L as $CaCO_3$) (00900)	Hardness, noncarbonate (mg/L as $CaCO_3$) (00902)	Calcium, dissolved (mg/L as Ca) (00915)	Magnesium, dissolved (mg/L as Mg) (00925)	Sodium, dissolved (mg/L as Na) (00930)	Percent sodium (00932)
17N53E36BCAB01	--	11.5	280	0	40	44	78	37
16N53E03CBD 01	--	18.5	580	0	84	90	580	68
16N53E10DABA01	--	16.0	460	120	84	61	66	24
16N53E27CADD01	--	9.5	140	0	30	15	3.1	5
16N54E14ADAD01	--	10.0	68	0	12	9.3	130	80
16N54E32CDDA01	--	11.0	220	9	43	27	14	12
15N53E07ACC 01	--	10.0	260	0	43	38	30	20
15N53E12ABAB01	8.4	12.5	18	0	4.3	1.8	360	98
15N53E12ABAB02	8.5	11.0	32	0	6.3	3.9	200	93
15N53E12ABAB03	7.9	10.0	230	0	39	31	37	26
15N53E26CABC01	8.6	12.0	19	0	5.5	1.2	390	98
15N53E26DABC01	7.2	11.5	270	0	57	30	30	19
15N53E34AABA01	--	11.0	34	0	5.9	4.6	350	95
15N53E34DBAD01	--	10.5	170	0	33	22	200	71
15N54E02DADB01	--	11.0	20	0	4.1	2.4	190	95
15N54E20AACC01	--	15.0	320	79	57	43	23	13
15N54E34CAAB01	--	18.5	370	3	77	44	35	17
14N53E04CCCA01	--	11.5	200	0	34	29	21	18
14N54E08CDDC01	8.4	12.0	41	0	8.6	4.6	320	94
14N54E08CDDC02	8.4	10.0	33	0	6.8	3.9	340	95
14N54E13DB 01[1]	9.0	--	17	0	6.0	.5	360	98
14N54E13DBBA01	--	13.5	4	0	1.6	.1	370	99
14N54E18BCCA01	--	12.5	460	180	70	70	28	11
14N54E23BDC 01	7.7	11.5	510	0	74	78	430	64
14N54E28DD 01	7.3	9.5	920	43	200	100	910	68
14N54E29ACCA01	8.8	13.5	2	0	.6	.2	320	--

Table 5.--*Chemical-constituent concentrations and physical properties of water from selected wells*--Continued

Local number	Sodium adsorption ratio (00931)	Potassium, dissolved (mg/L as K) (00935)	Bicarbonate, total onsite (mg/L as HCO_3) (00440)	Bicarbonate, fet, lab (mg/L as HCO_3) (95440)	Carbonate, fet, lab (mg/L as CO_3) (95445)	Alkalinity, total onsite (mg/L as $CaCO_3$) (00410)	Alkalinity, lab (mg/L as $CaCO_3$) (90410)
17N53E36BCAB01	2	2.3	420	--	--	340	--
16N53E03CBD 01	11	7.7	960	--	--	790	--
16N53E10DABA01	1	4.5	420	--	--	340	--
16N53E27CADD01	.1	1.8	--	170	--	--	140
16N54E14ADAD01	7	2.3	--	320	--	--	260
16N54E32CDDA01	.4	2.4	260	--	--	210	--
15N53E07ACC 01	.8	2.3	360	--	--	300	--
15N53E12ABAB01	38	1.5	--	--	--	--	591
15N53E12ABAB02	16	2.1	--	--	--	--	395
15N53E12ABAB03	1	2.2	--	--	--	--	262
15N53E26CABC01	41	1.4	--	--	--	--	654
15N53E26DABC01	.8	4.9	--	--	--	--	311
15N53E34AABA01	27	1.8	630	--	--	520	--
15N53E34DBAD01	7	2.9	440	--	--	360	--
15N54E02DADB01	19	1.9	450	--	--	370	--
15N54E20AACC01	.6	3.7	290	--	--	240	--
15N54E34CAAB01	.8	4.8	--	450	--	--	370
14N53E04CCCA01	.7	1.9	270	--	--	220	--
14N54E08CDDC01	23	.6	--	730	5	--	608
14N54E08CDDC02	26	2.7	--	--	--	--	731
14N54E13DB 01[1]	--	2.0	--	730	65	--	--
14N54E13DBBA01	80	1.1	840	--	--	690	--
14N54E18BCCA01	.6	4.8	340	--	--	280	--
14N54E23BDC 01	--	9.8	--	740	0	--	--
14N54E28DD 01	--	9.2	--	1,070	0	--	--
14N54E29ACCA01	93	.9	720	--	26	--	638

Table 5.--*Chemical-constituent concentrations and physical properties of water from selected wells*--Continued

Local number	Carbon dioxide, dissolved (mg/L as CO_2) (00405)	Sulfide, total (mg/L as S) (00745)	Sulfate, dissolved (mg/L as SO_4) (00945)	Chloride, dissolved (mg/L as Cl) (00940)	Fluoride, dissolved (mg/L as F) (00950)	Silica, dissolved (mg/L as SiO_2) (00955)	Solids, sum of constituents, dissolved (mg/L) (70301)
17N53E36BCAB01	--	--	86	24	1.1	15	500
16N53E03CBD 01	--	--	980	13	.5	11	2,200
16N53E10DABA01	--	--	240	7.4	.3	15	680
16N53E27CADD01	--	--	6.7	.7	.2	18	160
16N54E14ADAD01	--	--	76	4.3	.4	13	400
16N54E32CDDA01	--	--	18	4.7	.4	20	260
15N53E07ACC 01	--	--	33	2.3	.4	14	340
15N53E12ABAB01	2.8	--	160	10	5.3	7.3	900
15N53E12ABAB02	3.8	--	69	4.8	.6	8.7	530
15N53E12ABAB03	10	--	34	4.2	.4	13	320
15N53E26CABC01	2.5	--	180	10	5.8	8.0	990
15N53E26DABC01	120	--	29	3.9	.2	27	370
15N53E34AABA01	--	--	250	12	2.5	6.9	950
15N53E34DBAD01	--	--	210	7.4	.4	15	710
15N54E02DADB01	--	--	70	6.6	1.4	9.3	510
15N54E20AACC01	--	--	120	17	.4	22	430
15N54E34CAAB01	--	--	88	5.0	.3	20	500
14N53E04CCCA01	--	--	18	3.7	.4	18	260
14N54E08CDDC01	2.9	--	120	8.0	2.6	8.1	840
14N54E08CDDC02	7.0	--	24	8.7	1.5	8.4	830
14N54E13DB 01[1]	--	--	38	27	2.8	15	[2]880
14N54E13DBBA01	--	--	38	26	3.0	12	860
14N54E18BCCA01	--	--	35	65	.3	22	460
14N54E23BDC 01	--	--	750	18	.6	27	[2]1,800
14N54E28DD 01	--	--	2,000	35	.8	20	[2]3,800
14N54E29ACCA01	--	0.3	46	24	2.1	12	800

Table 5.--*Chemical-constituent concentrations and physical properties of water from selected wells*--Continued

Local number	Solids, dissolved (tons per ac-ft) (70303)	Nitrogen, nitrate total (mg/L as N) (00620)	Nitrogen, nitrate dissolved (mg/L as N) (00618)	Nitrogen, NO_2+NO_3 dissolved (mg/L as N) (00631)	Nitrogen, ammonia total (mg/L as N) (00610)	Aluminum, dissolved (µg/L as Al) (01106)	Barium, dissolved (µg/L as Ba) (01005)
17N53E36BCAB01	0.68	--	--	--	--	--	--
16N53E03CBD 01	3.0	--	--	--	--	--	--
16N53E10DABA01	.93	--	--	--	--	--	--
16N53E27CADD01	.22	--	--	--	--	--	--
16N54E14ADAD01	.55	--	--	--	--	--	--
16N54E32CDDA01	.35	--	--	--	--	--	--
15N53E07ACC 01	.46	--	--	--	--	--	--
15N53E12ABAB01	1.2	--	--	0.46	--	--	--
15N53E12ABAB02	.72	--	--	.63	--	--	--
15N53E12ABAB03	.43	--	--	.30	--	--	--
15N53E26CABC01	1.4	--	--	.50	--	--	--
15N53E26DABC01	.5	--	--	<.10	--	--	--
15N53E34AABA01	1.3	--	--	--	--	--	--
15N53E34DBAD01	.96	--	--	--	--	--	--
15N54E02DADB01	.69	--	--	--	--	--	--
15N54E20AACC01	.58	--	--	--	--	--	--
15N54E34CAAB01	.67	--	--	--	--	--	--
14N53E04CCCA01	.35	--	--	--	--	--	--
14N54E08CDDC01	1.1	<0.01	--	--	--	<30	--
14N54E08CDDC02	1.1	--	--	.59	--	--	--
14N54E13DB 01[1]	--	--	[3]0.57	--	--	--	--
14N54E13DBBA01	1.2	--	--	--	--	--	--
14N54E18BCCA01	.63	--	--	--	--	--	--
14N54E23BDC 01	--	--	[3].27	--	--	--	--
14N54E28DD 01	--	--	[3].66	--	--	--	--
14N54E29ACCA01	1.1	--	.02	--	0.42	--	100

Table 5.--*Chemical-constituent concentrations and physical properties of water from selected wells*--Continued

Local number	Boron, dissolved (µg/L as B) (01020)	Cadmium, dissolved (µg/L as Cd) (01025)	Chromium, dissolved (µg/L as Cr) (01030)	Copper, dissolved (µg/L as Cu) (01040)	Iron, dissolved (µg/L as Fe) (01046)	Lead, dissolved (µg/L as Pb) (01049)	Lithium, dissolved (µg/L as Li) (01130)
17N53E36BCAB01	--	--	--	--	30	--	--
16N53E03CBD 01	--	--	--	--	570	--	--
16N53E10DABA01	--	--	--	--	60	--	--
16N53E27CADD01	--	--	--	--	20	--	--
16N54E14ADAD01	--	--	--	--	80	--	--
16N54E32CDDA01	--	--	--	--	20	--	--
15N53E07ACC 01	--	--	--	--	20	--	--
15N53E12ABAB01	--	--	--	--	56	--	--
15N53E12ABAB02	--	--	--	--	26	--	--
15N53E12ABAB03	--	--	--	--	150	--	--
15N53E26CABC01	--	--	--	--	38	--	--
15N53E26DABC01	--	--	--	--	140	--	--
15N53E34AABA01	--	--	--	--	30	--	--
15N53E34DBAD01	--	--	--	--	20	--	--
15N54E02DADB01	--	--	--	--	130	--	--
15N54E20AACC01	--	--	--	--	50	--	--
15N54E34CAAB01	--	--	--	--	20	--	--
14N53E04CCCA01	--	--	--	--	20	--	--
14N54E08CDDC01	<20	<2	<2	<2	<2	<40	<2
14N54E08CDDC02	--	--	--	--	130	--	--
14N54E13DB 01[1]	780	--	--	--	[4]140	--	--
14N54E13DBBA01	--	--	--	--	120	--	--
14N54E18BCCA01	--	--	--	--	<10	--	--
14N54E23BDC 01	390	--	--	--	--	--	--
14N54E28DD 01	200	--	--	--	[4]6,200	--	--
14N54E29ACCA01	450	--	--	--	80	--	27

Table 5.--*Chemical-constituent concentrations and physical properties of water from selected wells*--Continued

Local number	Manganese, dissolved (µg/L as Mn) (01056)	Molybdenum, dissolved (µg/L as Mo) (01060)	Nickel, dissolved (µg/L as Ni) (01065)	Silver, dissolved (µg/L as Ag) (01075)	Strontium, dissolved (µg/L as Sr) (01080)	Titanium, dissolved (µg/L as Ti) (01150)
17N53E36BCAB01	<10	--	--	--	--	--
16N53E03CBD 01	80	--	--	--	--	--
16N53E10DABA01	<10	--	--	--	--	--
16N53E27CADD01	10	--	--	--	--	--
16N54E14ADAD01	<10	--	--	--	--	--
16N54E32CDDA01	<10	--	--	--	--	--
15N53E07ACC 01	40	--	--	--	--	--
15N53E12ABAB01	--	--	--	--	--	--
15N53E12ABAB02	--	--	--	--	--	--
15N53E12ABAB03	--	--	--	--	--	--
15N53E26CABC01	--	--	--	--	--	--
15N53E26DABC01	--	--	--	--	--	--
15N53E34AABA01	<10	--	--	--	--	--
15N53E34DBAD01	<10	--	--	--	--	--
15N54E02DADB01	<10	--	--	--	--	--
15N54E20AACC01	80	--	--	--	--	--
15N54E34CAAB01	40	--	--	--	--	--
14N53E04CCCA01	<10	--	--	--	--	--
14N54E08CDDC01	1	<20	<10	<2	270	<1
14N54E08CDDC02	--	--	--	--	--	--
14N54E13DB 01[1]	--	--	--	--	--	--
14N54E13DBBA01	<10	--	--	--	--	--
14N54E18BCCA01	<10	--	--	--	--	--
14N54E23BDC 01	--	--	--	--	--	--
14N54E28DD 01	--	--	--	--	--	--
14N54E29ACCA01	.0	--	--	--	30	--

Table 5.--*Chemical-constituent concentrations and physical properties of water from selected wells*--Continued

Local number	Vanadium, dissolved (µg/L as V) (01085)	Zinc, dissolved (µg/L as Zn) (01090)	Zirconium, dissolved (µg/L as Zr) (01160)	Carbon, organic dissolved (mg/L as C) (00681)	Agency collecting sample	Agency analyzing sample	Source of data
17N53E36BCAB01	--	--	--	--	USGS	USGS	B
16N53E03CBD 01	--	--	--	--	USGS	--	--
16N53E10DABA01	--	--	--	--	USGS	USGS	B
16N53E27CADD01	--	--	--	--	USGS	USGS	B
16N54E14ADAD01	--	--	--	--	USGS	USGS	B
16N54E32CDDA01	--	--	--	--	USGS	USGS	B
15N53E07ACC 01	--	--	--	--	USGS	USGS	B
15N53E12ABAB01	--	--	--	--	USGS	USGS	A
15N53E12ABAB02	--	--	--	--	USGS	USGS	A
15N53E12ABAB03	--	--	--	--	USGS	USGS	A
15N53E26CABC01	--	--	--	--	USGS	USGS	A
15N53E26DABC01	--	--	--	--	USGS	USGS	A
15N53E34AABA01	--	--	--	--	USGS	USGS	B
15N53E34DBAD01	--	--	--	--	USGS	USGS	B
15N54E02DADB01	--	--	--	--	USGS	USGS	B
15N54E20AACC01	--	--	--	--	USGS	USGS	B
15N54E34CAAB01	--	--	--	--	USGS	USGS	B
14N53E04CCCA01	--	--	--	--	--	--	--
14N54E08CDDC01	<1	<4	<4	--	USGS	MBMG	A
14N54E08CDDC02	--	--	--	--	USGS	USGS	A
14N54E13DB 01[1]	--	--	--	--	USGS	USGS	C,E
14N54E13DBBA01	--	--	--	--	USGS	USGS	B
14N54E18BCCA01	--	--	--	--	USGS	USGS	B
14N54E23BDC 01	--	--	--	--	USGS	USGS	E
14N54E28DD 01	--	--	--	--	USGS	USGS	D,E
14N54E29ACCA01	--	--	--	[5]9.1	USGS	MBMG	B

[1] Reported as 14N54E13DBB in table 4 of Moulder and Kohout (1958).
[2] Residue on evaporation at 180 °Celsius.
[3] Original value reported as NO_3 has been converted to value as N by multiplying by 0.227.
[4] Reported as total iron.
[5] Analysis by U.S. Geological Survey.