HYDROLOGIC DATA FOR THE EAST POPLAR OIL FIELD, FORT PECK INDIAN RESERVATION, NORTHEASTERN MONTANA

By Joanna N. Thamke, Steven D. Craigg, and Thomas M. Mendes

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CONVERSION FACTORS, VERTICAL DATUM, AND ABBREVIATED WATER-QUALITY UNITS

Multiply	By	To obtain
acre	4,047	square meter
cubic foot per second (ft^3/s)	0.02832	cubic meter per second
foot (ft)	0.3048	meter
gallon (gal)	3.785	liter
gallon per minute (gal/min)	0.06309	liter per second
inch (in.)	25.4	millimeter
mile (mi)	1.609	kilometer
square foot (ft^2)	0.0929	square meter
square mile (mi^2)	2.59	square kilometer

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

$$C = 5/9\ (°F - 32)$$

$$F = 9/5\ (°C) + 32$$

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 Sea Level Datum of 1929.

Abbreviated water-quality units used in this report:

µg/L	microgram per liter
µS/cm	microsiemen per centimeter at 25 degrees Celsius
mg/L	milligram per liter
g/mL	gram per milliliter
per mil	part per thousand

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by Joanna N. Thamke[1], Steven D. Craigg[1], and Thomas M. Mendes[2]

Abstract

This report presents selected hydrologic data for the East Poplar oil field, located in the south-central part of the Fort Peck Indian Reservation in northeastern Montana. Data about the occurrence, quantity, and quality of ground and surface water are presented in tabular form. The tables contain records of privately owned wells (active and abandoned), monitoring wells installed by the U.S. Geological Survey and Montana Bureau of Mines and Geology, oil wells, and brine-injection wells; lithologic descriptions of drill cuttings and well-completion data from monitoring wells; data from two aquifer tests conducted in Quaternary alluvial and glacial deposits; chemical quality of ground water; and information on the quantity and chemical quality of surface water. Records of electromagnetic geophysical measurements collected throughout an area of about 20 square miles of the study area are compiled and included on a floppy disk.

Illustrations in this report contain information about study area location, site-numbering system, general physical and cultural features, and construction of monitoring wells installed by the U.S. Geological Survey. A plate-sized map presents additional information about privately owned wells, monitoring wells, oil wells, brine-injection wells, surface-water data-collection sites, and areas of electromagnetic data collection.

The data presented in this report provide a base with which to better define and interpret the occurrence, quantity, and quality of ground and surface water in the vicinity of the Poplar River Valley in the south-central part of the Fort Peck Indian Reservation. The data can be used to help delineate the occurrence of brine and saline water in Quaternary alluvial and glacial deposits in the East Poplar oil field.

INTRODUCTION

Oil production began in the East Poplar oil field in 1952 from the Mississippian Madison Group at depths between about 5,500 and 6,000 ft. Since then, large quantities of brine (water having a dissolved-solids concentration greater than 35,000 mg/L, classification of Swenson and Baldwin, 1965) have been produced with the oil. Most of this brine, which has a dissolved-solids concentration of as much as 160,000 mg/L, has been disposed of by injection into shallower formations (mainly the Upper Cretaceous Judith River Formation, and a deeper, Lower Cretaceous unit that historically has been referred to as the Dakota Sandstone by oil companies and by the Fort Peck Tribes). Some of the brine has been directed to storage and evaporation pits.

A reconnaissance investigation (Levings, 1984) determined the existence of saline-water contamination of shallow ground water in the alluvium along the Poplar River. In response to reported increased salinity of ground water used for domestic and stock supplies within and near the oil field, the U.S. Geological Survey (USGS), in cooperation with the Fort Peck Tribes, began an investigation in 1991 of shallow ground water in Quaternary alluvial and glacial deposits within the East Poplar oil field.

Purpose and Scope

This report presents hydrologic data that currently (1995) are available for the East Poplar oil field study area. Most of these data were collected onsite during summer 1991, 1992, and 1993. Some of the

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data contained herein were collected during previous investigations.

Data compiled for this report include both ground-water and surface-water. Ground-water data consist of records of privately owned wells, USGS and Montana Bureau of Mines and Geology (MBMG) installed monitoring wells, oil wells, and brine-injection wells; lithologic logs of the USGS-installed monitoring wells; water-quality data from privately owned, monitoring, and brine-injection wells; and data from two aquifer tests (one conducted in alluvial deposits and one conducted in glacial deposits). Electromagnetic geophysical data also are included for two areas. Surface-water data include measurements of streamflow quantity and quality.

A description of the geology and hydrogeology of the study area is beyond the scope of this report. However, the geology of the general area has been mapped by Colton (1963a,b); the geology of the study area has been discussed by Levings (1984) and Craigg and Thamke (1992). The hydrogeology of the study area has been discussed by Levings (1984), Craigg and Thamke (1992, 1993), Mendes and others (1992), Thamke and others (1992), Thamke and Craigg (1993), and Craigg and Thamke (1995).

Location and General Features of the Area

The East Poplar oil field study area encompasses about 70 square miles northeast of Poplar in northeastern Montana, in the Fort Peck Indian Reservation, Roosevelt County (fig. 1). The study area is located primarily in Townships 28 and 29 North, and Ranges 50 and 51 East (pl. 1), in and adjacent to the Poplar River Valley. Topography of the study area generally consists of a glacial bench of relatively low relief, dissected by the Poplar River and its tributaries (fig. 2).

Dryland farming is practiced on the glacial bench and in some parts of the Poplar River Valley. Livestock ranching also is practiced locally throughout the study area. Oil wells, storage tanks, evaporation pits, pipelines, and various structures associated with oil production are present on the landscape throughout the study area (fig. 3).

Site-Identification Systems

A site number is used as the primary identification for wells. This site number is based on the rectangular system for the subdivision of public lands (fig. 4); the number consists of as many as 14 characters and is assigned according to the location of a site within a given township, range, and section. The first three characters specify the township and its position north (N) of the Montana Base Line, while the next three characters specify the range and its position east (E) of the Montana Principal Meridian. The next two characters indicate the section; the next one to four characters indicate the position of the site within the section. The first letter denotes the quarter section (160-acre tract); the second letter denotes the quarter-quarter section (40-acre tract); the third letter denotes the quarter-quarter-quarter section (10-acre tract); and the fourth letter denotes the quarter-quarter-quarter-quarter section (2.5-acre tract). These lettered subdivisions of the section are indicated as 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 that a site was inventoried in that tract. For example, site number 29N51E09ABBA01 represents the first well inventoried in the NE 1/4 NW 1/4 NW 1/4 NE 1/4 sec. 9, T. 29 N., R. 51 E.

Wells also are identified by an alpha-numeric well name, allowing for ease of cross reference between wells plotted on plate 1 and wells listed in relevant tables. The well name consists of as many as three alpha characters and as many as four numeric characters. The alpha character denotes the well type: (FPB)--USGS monitoring well installed during this investigation; (W)--USGS monitoring well or miscellaneous inventoried domestic well from Levings (1984); and (M)--miscellaneous privately owned well or Montana Bureau of Mines and Geology (MBMG) observation well. The numeric characters for USGS-installed monitoring wells denote the sequence that wells were drilled; for example, well FPB93-3 is the third well drilled in 1993 during this investigation. The numeric part of wells identified by "M" numbers is assigned to allow for cross reference between plate 1 and relevant tables. Brine-injection wells and sampled oil wells are identified using the name assigned by the particular oil company; for example, Murphy 1-D is a brine-injection well, and Murphy 58 is an oil well.

Streamflow measurement sites along the Poplar River are identified by an alpha-numeric system and by latitude-longitude. The alpha-numeric part of the site number follows the system used by Levings (1984) and is based on downstream order, beginning with site PR-0 and ending with site PR-9. One measurement site (PR-8) was located at a long-term USGS streamflow-gaging station (06181000), and one measurement site (PR-1) was located at a USGS miscellaneous streamflow-measurement station (06180600).

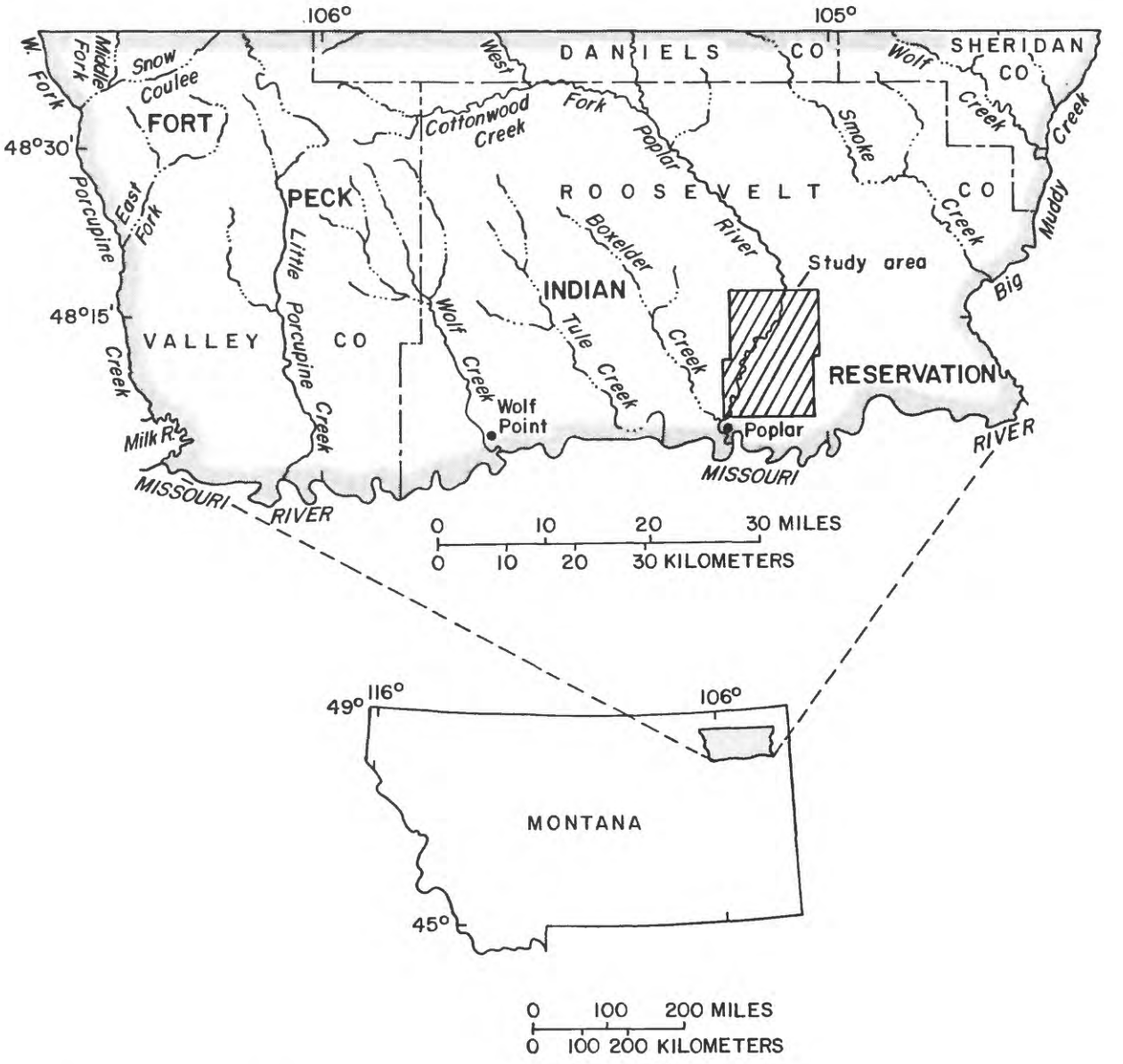

Figure 1. Location of the East Poplar oil field study area, Fort Peck Indian Reservation, northeastern Montana.

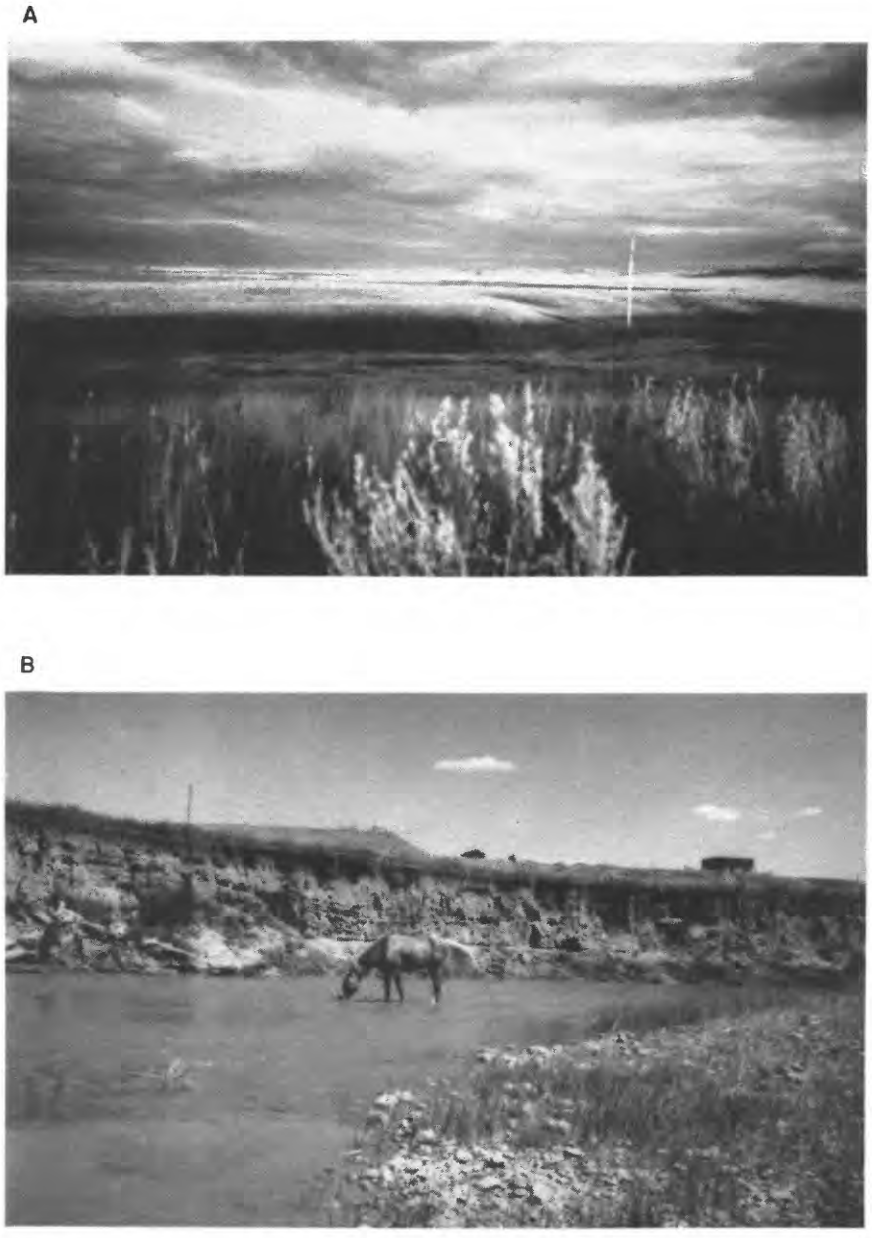

Figure 2. General physiographic features of the East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana. (A) View east across the alluvium-filled Poplar River Valley, toward the glacial bench. (B) View east along Poplar River showing typical deposits consisting of a gravel bar on the near side and a river bank formed of reworked glacial deposits on the other side.

Acknowledgments

The authors would like to thank the Fort Peck Tribes for the full cooperation extended to the USGS throughout this investigation. Special appreciation is given to the Water Resources Office and the Office of Environmental Protection of the Fort Peck Tribes for supplying data about existing privately owned wells. Particular thanks for oil-well information and pipeline delineation are extended to Murphy Oil USA, Inc. We also wish to thank individual landowners in the reservation for their cooperation in allowing access to their lands during inventorying, sampling, or drilling monitoring wells, collecting electromagnetic geophysical data, and for their valuable contributions of historical information about the occurrence and use of water resources in the study area, as well as information about oil-field operations.

A

B

Figure 3. Various surface structures associated with oil production in the East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana. (A) View east (from SE 1/4 NE 1/4 NW 1/4 SE 1/4, sec. 10., T. 28 N., R. 51 E.) of a brine-injection well (Murphy 8-D; well 28N51E28DBAD01, table 2), storage tanks, and an evaporation pit. (B) View north (from SE 1/4 SE 1/4 SE 1/4, SE 1/4, sec. 30, T. 29 N., R. 51 E.) of wooden oil-storage tanks. In the background and to the right of the tanks is a brine-injection well (Murphy 1-D; well 29N51E30DDDD01, table 2).

PRESENTATION OF DATA

Ground-water data are presented for 60 privately owned wells, 34 USGS-installed monitoring wells (27 installed during this investigation and 7 from Levings, 1984), 5 MBMG-installed wells, 8 sampled oil wells (table 1) and 20 brine-injection wells (table 2). Locations of these wells are plotted on plate 1 (in pocket). Lithologic logs and completion data for the 27 monitoring wells installed during this investigation are given in table 3. Figure 5 illustrates the typical completion of a monitoring well. Data from two aquifer tests (one conducted in alluvial deposits along the Poplar River and one conducted in glacial deposits east of the river) are reported in tables 4 and 5, respectively. The location of the monitoring wells used for the aquifer tests are plotted on plate 1. Results of chemical analyses of samples from privately owned wells, monitoring wells, oil wells, and brine-injection wells are listed in tables 6 and 7. Tables 8 and 9 contain results of chemical anal-

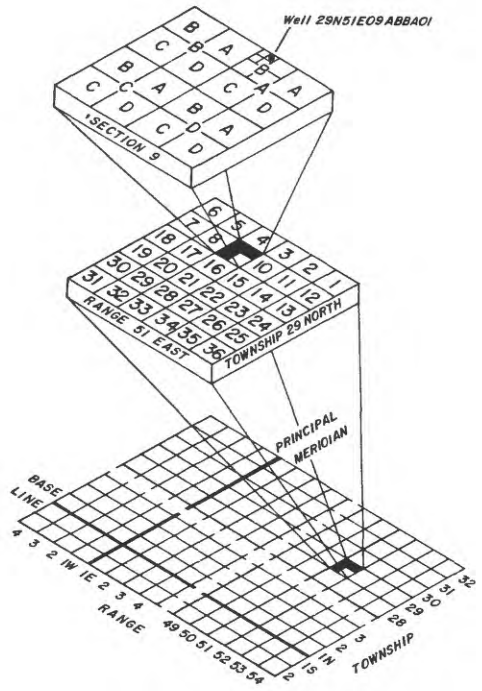

Figure 4. Site-numbering system.

yses of deionized-water field blanks processed through ground-water sampling equipment. Tables 1-9 are located at the back of the report.

Surface-water data are presented for 13 sites along the Poplar River (tables 10 and 11). Table 10 contains the site numbers and locations, along with physical descriptions of the sites; table 11 presents streamflow measurements, specific-conductance values, temperatures, and chloride concentrations of surface water at these sites. The locations of surface-water sites are plotted on plate 1. Results of water-quality analyses at two of the 13 sites (site PR-1, which was measured periodically during this investigation, and site PR-8, which is a long-term USGS gaging station) are presented in tables 12 and 13. Tables 10-13 are located at the back of the report.

Electromagnetic geophysical data were collected within two areas encompassing approximately 20 mi^2 of the East Poplar oil field; these areas are shown on plate 1. The electromagnetic data-collection site coordinates, values of apparent conductivity, and other information are compiled and included on a floppy disk located in the pocket of this report.

DATA-COLLECTION METHODS

Existing data for privately owned wells, monitoring wells, oil wells, brine-injection wells, and ground- and surface-water quality were obtained from various sources. Field activities conducted during this investigation included inventory of existing privately owned and monitoring wells, measurement of electromagnetic geophysical properties, measurements of streamflow along the Poplar River, installation of monitoring wells and description of lithologies, aquifer testing, and water-quality sampling. Methods used to collect these data are described below.

Existing Data

Existing data were obtained from various sources. These data sources and the general types of data obtained from them are listed below.

U.S. Geological Survey, Helena, Mont.--Selected ground-water-level and ground-water-quality data from Levings (1984) and Thamke (1991), selected streamflow and surface-water-quality data from Levings (1984), and geologic information from published geologic maps.

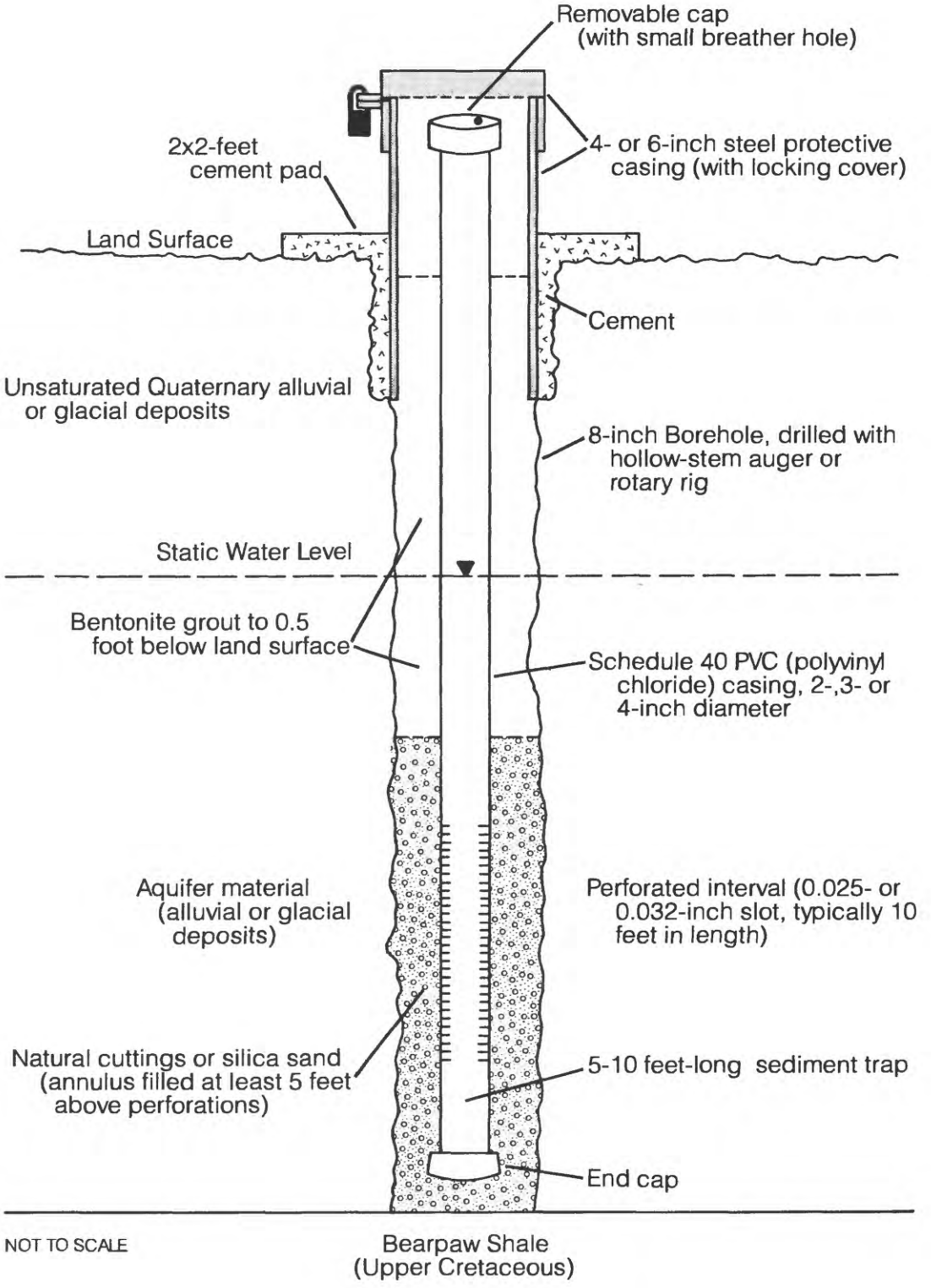

Figure 5. Typical completion of monitoring wells drilled in 1992-93 in Quaternary alluval or glacial deposits in the East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana (exact completion specifications vary somewhat, depending on site conditions).

Bureau of Land Management, Miles City, Mont.--Records of oil and gas wells, records of brine-injection wells, and locations of oil and gas and brine-injection wells.

U.S. Environmental Protection Agency, Helena, Mont.--Detailed information about brine-injection wells and water-quality analyses for water from selected brine-injection wells.

Bureau of Indian Affairs, Poplar, Mont.--Land-ownership maps.

Public Health Service/Indian Health Service-Fort Peck Service Unit, Wolf Point, Mont.--Drill logs of selected water wells and water-quality analyses for water from selected wells.

Fort Peck Tribes, Poplar, Mont.--Water Resources Office--Drill logs of selected water wells, well-ownership information, and water-quality analyses for water from selected wells.

Minerals Office--Information about location and status of selected brine-injection wells and subsurface geologic information from geologic maps.

Office of Environmental Protection--Water-quality analyses for water from selected wells and information about brine-injection rates and quantities.

Murphy Oil USA, Inc., Poplar, Mont.--Locations of oil, gas, and brine-injection wells.

Montana Bureau of Mines and Geology, Butte, Mont.--Drill logs of selected water wells and water-quality analyses for water from selected wells.

Well Inventory

All privately owned water wells were inventoried to acquire data in areas not covered by the existing data sources. The well inventory included determination of well location, land-surface altitude, geologic unit, and well depth, and measurements of water level and miscellaneous onsite water quality. Land-surface altitudes were determined from 7.5-minute topographic quadrangle maps, from oil-well records, or by surveying from the nearest benchmark. Geologic units were determined from geologic maps and lithologic logs. Well depths were obtained from well-completion records or by measuring with a graduated steel tape. Water levels were measured during June and July 1990 and September 1991 in existing privately owned and monitoring wells, during August and September 1992 in existing privately owned wells and selected monitoring wells, and during August and September 1993 in the 27 monitoring wells that were drilled for this investigation to determine the potentiometric surface in Quaternary deposits. Wells inventoried during previous investigations (Levings, 1984; Thamke, 1991; Donovan and Bergantino, 1987) were revisited, and information about these wells was updated.

Electromagnetic Geophysics

During summer 1991 and summer 1992, electromagnetic geophysical techniques were used to measure the electrical conductivity of subsurface materials in selected areas (pl. 1). A variable-depth ground-conductivity meter was used. Because water in the Quaternary deposits in the study area has a specific-conductance range of 658–127,000 µS/cm, electromagnetic geophysical techniques were used to help delineate conductive plumes.

The electromagnetic geophysical survey was conducted using either a 0.1-mi grid spacing or a 0.2-mi grid spacing; a grid spacing of 0.1 mi was selected for areas having possible saline-water plumes. Grids were developed for each square mile of the selected area; county roads, fence lines, telephone lines, or power lines were used to ensure north-south and east-west orientation. The base survey line was a north-south line on the edge of the square mile, and all other survey lines emanated from the base line in an east-west direction. The transit was on a north-south line and was oriented either east or west, depending on the position of the survey crew. Distances between survey stations were determined by pacing; generally, distances determined by pacing are accurate to 3 percent or less (Lahee, 1961, p. 550). Data values were

recorded on field maps; these maps are on file at the Montana District Office in Helena.

Electromagnetic geophysical measurements during the summer of 1991 were made at Area 1 (pl. 1) with 10-meter and 20-meter intercoil spacing and at Area 2 (pl. 1) with 20-meter and 40-meter intercoil spacing. Measurements during summer 1992 were made in both areas with 10-meter, 20-meter, and 40-meter intercoil spacing. At all intercoil spacings, measurements were made in both the vertical and horizontal dipole positions.

The variable-depth ground-conductivity meter was checked for gain and the receiver was compensated. The meter was nulled daily to remove any offsets in the output circuitry. Individual pacing was standardized at the beginning of each field trip and checked daily.

Streamflow Measurements

Instantaneous streamflow was measured periodically at 13 sites on the Poplar River during this investigation (table 11). In addition, more frequent measurements of instantaneous streamflow were obtained at sites PR-1 and PR-8 as a part of water-quality sampling procedures (table 12). Streamflow and/or miscellaneous water-quality measurements were made during stable streamflow conditions (discharge at site PR-8 varied 5 percent or less per day). All streamflow measurements in this report were collected using standard USGS methods (Rantz and others, 1982).

Monitoring-Well Installation

During summer 1992 and summer 1993, 27 monitoring wells were drilled and completed either in Quaternary alluvial deposits along the Poplar River or in Quaternary glacial deposits east of the river (tables 1 and 3; pl. 1). Most drill holes penetrated a few feet of the Upper Cretaceous Bearpaw Shale, allowing for the perforated interval of the well to be completed in the lowest part of the saturated Quaternary deposits. Three wells (FPB92-2B, FPB93-2, FPB93-3A; table 3; pl. 1) were completed so that the perforated interval was in the shallowest part of the saturated Quaternary deposits; these three wells were located next to wells FPB92-2A, FPB92-1, and FPB93-3, respectively (table 3; pl. 1) that are perforated just above the contact of the Quaternary deposits and the Bearpaw Shale. These three shallow wells were completed to determine vertical differences in water quality and density. Wells completed during 1992 were drilled using hollow-stem augering techniques and wells completed during 1993 were drilled using rotary techniques. Except for wells completed specifically for aquifer testing, monitoring wells were installed in areas where high apparent ground conductivity values were recorded with electromagnetic geophysical equipment.

The monitoring wells were completed with polyvinylchloride (PVC) casing; machine-slotted casing was used in the perforated interval. Wells installed during 1992 were completed with 2-in. casing using a 0.032-in. slot size for the perforated interval (one 1992 well was completed with 3-in. casing and a 0.025-in. slot size); wells installed during 1993 were completed with 4-in. casing with a 0.025-in. slot size. For each well, a sediment trap (typically 5- to 10-ft long) was installed below the perforated interval. The annulus around the perforated interval of each well was packed either with silica sand or with natural cuttings material that caved around the well casing as the auger or drill rod was withdrawn. The annulus above the pack was sealed with bentonite slurry; a cement pad was used as a surface seal. A steel protective casing with locking cover was set into the cement surface pad surrounding each well. Monitoring wells were developed by surging with compressed air until the discharge remained clear and specific conductance remained constant. General details of monitoring-well construction are shown in figure 5; additional data for each well are given in table 1; lithologic logs and completion details for each well are reported in table 3.

Aquifer Testing

Two constant-discharge aquifer tests were conducted during summer 1993, using wells installed during this investigation (tables 1, 4, 5; pl. 1). One test was conducted in alluvial deposits along the Poplar River in the NW 1/4 NE 1/4 sec. 09, T. 29 N., R. 51 E. Drawdown in three observation wells (located at distances of about 8 to 72 ft from the pumped well) was measured while discharge from the pumped well was held constant at 40 gal/min for 180 minutes. After 180 minutes, drawdown in the observation wells ranged from 0.64 to 1.41 ft. Aquifer-test data are presented in table 4.

The other test was conducted in glacial deposits east of the Poplar River in the SE 1/4 SE 1/4 sec. 33, T. 28 N., R. 51 E. Drawdown in two observation wells (located at distances of about 7 to 30 ft from the pumped well) was measured while discharge from the pumped well was held constant at 12.5 gal/min for 110 minutes. After 110 minutes, drawdown in the observation wells ranged from 0.29 to 0.48 ft. Aquifer-test data are presented in table 5.

Water-Quality Sampling

Ground-water samples were collected using a variety of samplers. Samples from privately owned wells with pumps were obtained using the existing submersible pump. Samples from monitoring wells that yielded sufficient water and privately owned wells without pumps or power were obtained using either a 2-in. or 4-in. diameter, portable stainless-steel submersible pump. Samples from monitoring wells that yielded insufficient amounts of water to pump were obtained with a PVC bailer. All wells were purged until at least three well volumes of water were removed and parameters measured onsite (pH, water temperature, and specific conductance) had stabilized. Onsite parameters were measured in a flow-through chamber for pumped wells and a clean sample container for bailed wells. Onsite values for alkalinity were determined by incremental titration of the sample with sulfuric acid.

Ground-water samples for chemical analysis were collected from a flow-through chamber for pumped wells or from a sample container for bailed wells. A peristaltic pump was used to pass sample water through a 0.45-micron pore-diameter filter for analysis of dissolved constituents. Water samples for dissolved-organic carbon analysis were collected directly into glass sample containers from a discharge point as close to the well as possible and then filtered. Sample processing, filtration, and preservation were performed in the field using methods described by Knapton (1985).

Ground-water samples (tables 6 and 7) were analyzed for dissolved major ions, trace elements, and organic carbon by the USGS's National Water Quality Laboratory (NWQL) in Arvada, Colo., using methods described by Fishman and Friedman (1989) and Fishman (1993). Ground-water samples were analyzed for oxygen-18/oxygen-16 (O-18/O-16) and deuterium/hydrogen (D/H) isotopic ratios by USGS laboratories in Reston, Va. The O-18/O-16 and D/H results are reported relative to Standard Mean Ocean Water in per mil notation which indicates enrichment (positive value) or depletion (negative value) of the heavy isotope in the sample compared to the standard.

Surface-water samples (tables 11-13) were collected using either the equal-width increment, equal-discharge increment, or dip method described in Knapton (1985). Samples collected during October 22-25, 1990 were analyzed for chloride (with a specific-ion meter) and specific conductance by the USGS District Office in Helena, Mont. Specific conductance and temperature were measured onsite during all other samplings as described by Knapton (1985). All other surface-water samples were collected using methods of Ward and Harr (1990) and were analyzed by the NWQL. Analytical methods are described by Fishman and Friedman (1989) and Fishman (1993).

Data-collection and analytical procedures used during this investigation incorporated practices designed to control, verify, and assess the quality of sample data. Methods and associated quality control for collection and processing of water samples are described by Ward and Harr (1990), Knapton (1985), and Knapton and Nimick (1991). Standard quality-assurance analytical procedures used by the NWQL are described by Friedman and Erdmann (1982) and Jones (1987).

Because of the large concentration of dissolved constituents in many of the ground-water samples, additional steps were taken after sample collection at each site to minimize possible cross-contamination between sites from sampling equipment. The plate-filter and flow-through chamber were disassembled and scrubbed using a low-phosphate detergent and then thoroughly rinsed with deionized water. Portable stainless-steel submersible pumps were placed in either a 4-in. PVC casing (for the 2-in. pump) or a 30-gallon plastic container (for the 4-in. pump) which were filled with tap water. The pump then was operated to flush water through the pump and hoses. A low-phosphate detergent was added to the tap water and passed through the pump and hoses. This was followed by rinsing the equipment with tap water until the detergent was no longer visually detected. The PVC bailer and sampling container were scrubbed using a low-phosphate detergent and then thoroughly rinsed with deionized water.

Quality-control data to document the reproducibility of analytical results and any sample contamination were provided by test samples that consisted of either a replicate sample (table 8) or a field-blank sample (table 9) incorporated in the sampling set. Quality-control samples comprised about 10 percent of the total number of ground-water samples submitted by the USGS for analysis.

A replicate sample is a volume of sampled water split into subsamples in such a manner that the physical and chemical characteristics of each subsample are considered to be essentially identical in composition. The percent difference of constituent concentrations between replicate ground-water samples did not exceed 10 percent.

A field-blank sample for this investigation was a volume of deionized water that was passed through either all or parts of the sampling equipment to test the adequacy of cleaning procedures to prevent cross-contamination between sites. Four field-blank samples

were collected during this investigation. The field-blank sample collected after the described cleaning procedures at site 28N51E27BBBB01 on August 29, 1990 was a volume of deionized water passed through sampling hoses and the plate filter. The field-blank sample collected after the described cleaning procedures at site 28N51E16DBCB01 on July 21, 1991 was deionized water passed through the 2-in. stainless steel pump, hoses, flow-through chamber, and plate-filter. About 5 gal of deionized water passed through the system before the field-blank sample was collected in the same manner as the other environmental samples. The field-blank samples collected after the described cleaning procedures at sites 28N51E22CBCB01 on July 21, 1993 and 29N51E32ABAC01 on August 13, 1993 was deionized water passed through the 4-in. and 2-in. stainless-steel pumps, respectively, hoses, flow-through chamber, and plate filter. For both samples, about 20 gal of deionized water passed through the system before the field-blank sample was collected in the same manner as the other environmental samples.

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DATA

Table 1. Records of privately owned wells, monitoring wells, and sampled oil wells in the East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana

Site number--numbering system described in text.

Well name--naming system described in text (used for cross reference to wells plotted on plate 1).

Altitude of land surface--in feet above sea level (determined from U.S. Geological Survey 7.5-minute topographic maps and reported to whole number; from individual oil-well or brine-injection-well records; or by surveying levels from the nearest benchmark and reported in tenths for selected privately owned wells and for observation wells drilled as part of this study).

Geologic unit (in which well is completed)--

- Qal - Alluvium (Quaternary)
- Qt - Glacial till (Pleistocene)
- Qgo - Glacial outwash (Pleistocene)
- Qw - Wiota Gravel (Pleistocene)
- Tf - Flaxville Formation (Pliocene and Miocene)
- Khf - Hell Creek Formation and Fox Hills Sandstone (Upper Cretaceous)
- Kb - Bearpaw Shale (Upper Cretaceous)
- Kjr - Judith River Formation (Upper Cretaceous)
- Mh - Heath Formation (Upper Mississippian)
- Mk - Kibbey Formation (Upper Mississippian)
- Mm - Madison Group (Mississippian)
  - Mc - Charles Formation of Madison Group
  - Mmc - Mission Canyon Limestone of Madison Group

Depth of well--in feet below land surface.

Primary use of site--Ab, abandoned; O, observation; P, oil or gas production; U, unused; W, withdrawal; Z, destroyed. Sites with two uses listed indicate that the primary use initially was the first use, but subsequently became the second use.

Primary use of water--H, domestic; S, livestock; U, unused; Z, other. Sites with two uses listed indicate that the primary use initially was the first use, but subsequently became the second use.

Water level--Depth, in feet below land surface. Altitude, in feet above sea level (determined as the difference between altitude of land surface and depth to water) reported to whole number or tenths, depending on accuracy of altitude of land surface.

Specific conductance--reported in microsiemens per centimeter at 25 degrees Celsius.

Symbol: --, no data.

Table 1. Records of privately owned wells, monitoring wells, and sampled oil wells in the East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana (Continued)

Site number and well name (plate 1)	Altitude of land surface (feet)	Geologic unit	Depth of well (feet)	Primary use of site	Primary use of water	Water level			Specific conductance, onsite (µS/cm)	Date specific conductance measured
						Depth to water (feet)	Date of measurement	Altitude (feet)		
28N51E01BBBB01 M-1	2,190	Qt	153	W	H	48.50 -- --	07-19-82 -- --	2,142 -- --	2,820 4,000 3,930	07-21-82 08-22-90 07-20-91
28N51E04CCCD01 M-2	2,015	Qt	50	W	H	-- --	-- --	-- --	2,650 2,650	06-29-90 08-25-90
28N51E08ADDA01 M-3	1,985.9	Qal	52	W	H	13.50 13.35	08-23-90 09-12-91	1,972.4 1,972.6	2,150 [1]2,050	06-28-90 08-23-90
28N51E08BACC01 M-4	1,990	Qal	15	W	H	13.20	06-29-90	1,977	--	--
28N51E08BACC02 M-5	1,984.1	Qal	25	U	U	14.40	06-29-90	1,969.7	--	--
28N51E08BBDA01 M-6	1,990	Qal	19	U	U	13.06	06-29-90	1,977	--	--
28N51E08BBDB01 M-7	1,992.0	Qal	14	W	S	6.75 11.04 9.62	06-10-89 10-25-89 06-29-90	1,985.2 1,981.0 1,982.4	2,120 2,900 --	06-10-89 10-25-89 --
28N51E08BDBA01 M-8	1,986.1	Qal	39	U	U	14.00	06-29-90	1,972.1	--	--
28N51E08BDBA02 M-9	1,986.1	Qal	24	U	U	14.40	06-29-90	1,971.7	--	--
28N51E08CCBB01 M-10	1,976.4	Qal	22	W	H	8.67	07-01-90	1,967.7	[1]1,500	11-08-88
28N51E08CCBC01 M-11	1,980	Qal	22	W	H	14.30	07-01-90	1,966	1,460	07-01-90
28N51E08CCBC02 M-12	1,980	Qal	20	W,Z	U	13	08-05-82	1,967	--	--
28N51E08DDDB01 M-13	2,026.9	Qt	102	W	H	57.1 57.25 54.31	06-28-90 08-25-90 09-12-91	1,969.8 1,969.6 1,972.6	9,500 8,120 --	06-28-90 08-25-90 --
28N51E09BCBB01 M-14	2,043.7	Qt	90	U	U	71.30 70.59 71.29	06-29-90 07-17-91 09-12-91	1,972.4 1,973.1 1,972.4	2,610 -- --	07-17-91 -- --
28N51E09CCDD01 M-15	2,041.2	Qt	117	W	U	71.66 70.80 70.46 --	06-27-90 07-19-91 09-12-91 --	1,969.5 1,970.4 1,970.7 --	[1]2,910 [1]3,220 3,750 [1]3,180	04-07-89 08-16-89 06-27-90 07-19-91
28N51E09CDBB01 FPB93-5	2,026.4	Qt	104	O	U	51.03 52.77	07-24-93 08-12-93	1,975.4 1,973.6	18,300 --	08-12-93 --

Table 1. Records of privately owned wells, monitoring wells, and sampled oil wells in the East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana (Continued)

Site number and well name (plate 1)	Altitude of land surface (feet)	Geologic unit	Depth of well (feet)	Primary use of site	Primary use of water	Water level			Specific conductance, onsite (µS/cm)	Date specific conductance measured
						Depth to water (feet)	Date of measurement	Altitude (feet)		
28N51E09DCCC01 FPB92-18	2,039.4	Qt	93	O	U	69.70 67.00 66.63 67.08	10-21-92 05-25-93 08-12-93 09-08-93	1,969.7 1,972.4 1,972.8 1,972.3	1,400 -- -- --	08-13-93 -- -- --
28N51E12CCBD01 Murphy 24	2,169	Mm	[2]5,910-5,920	P	Z	--	--	--	--	--
28N51E13CCCA01 M-16	2,075	Qt	33	U	U	14.81 14.06 15.03	07-01-90 08-22-90 09-16-91	2,060 2,061 2,060	3,600 -- --	08-22-90 -- --
28N51E13CCCC01 M-17	2,180	Qw	150	W	H	132.74 129.14 131.46 129.13	05-16-89 07-01-90 08-22-90 09-16-91	2,047 2,051 2,049 2,051	2,990 3,150 3,000 --	05-16-89 07-01-90 08-22-90 --
28N51E16DBCB01 M-18	2,046.2	Qt	104	W,U	H,U	79.72 79.60 79.62 78.91 79.65 81.78	07-23-89 10-25-89 06-30-90 07-21-91 09-12-91 08-23-92	1,966.5 1,966.6 1,966.6 1,967.3 1,966.6 1,964.4	10,000 12,700 -- -- -- --	07-23-89 07-21-91 -- -- -- --
28N51E17AABA01 M-19	1,990	Qt	37	U	U	25.59	06-29-90	1,964	--	--
28N51E17ABDC01 M-20	1,978.6	Qal	36	U	U	11.79 11.84 11.78	06-27-90 08-26-90 09-16-91	1,966.8 1,966.8 1,966.8	7,000 -- --	08-26-90 -- --
28N51E17ABDC02 M-21	1,975.9	Qal	36	U	U	9.36	08-23-92	1,966.5	--	--
28N51E17ABDD01 M-22	1,990.6	Qt	40	W	H	24.07 24.10 24.02 24.15	06-27-90 08-26-90 09-16-91 08-23-92	1,966.5 1,966.5 1,966.6 1,966.4	10,000 8,600 -- --	06-27-90 08-26-90 -- --
28N51E17ABDD02 M-23	1,992.7	Qal	68	U	U	25.37 25.45	09-16-91 08-23-92	1,967.3 1,967.2	-- --	-- --
28N51E17ADAD01 M-24	2,031.1	Qt	130	W	H	63.60 62.80 63.60 63.77	08-28-90 07-16-91 09-12-91 08-23-92	1,967.5 1,968.3 1,967.5 1,967.3	4,550 5,380 -- --	08-28-90 07-16-91 -- --
28N51E17DADA01 M-25	2,030.9	Qt	102	W	H	75.99 66.09 65.86 66.06	06-30-90 08-25-90 09-12-91 08-23-92	1,954.9 1,964.8 1,965.0 1,964.8	[1]1,080 5,200 4,600 4,400	02-10-75 07-22-89 06-30-90 08-25-90

Table 1. Records of privately owned wells, monitoring wells, and sampled oil wells in the East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana (Continued)

Site number and well name (plate 1)	Altitude of land surface (feet)	Geologic unit	Depth of well (feet)	Primary use of site	Primary use of water	Water level			Specific conductance, onsite (µS/cm)	Date specific conductance measured
						Depth to water (feet)	Date of measurement	Altitude (feet)		
28N51E18ABDC01 M-26	2,000	Qgo	--	W	H	--	--	--	790	07-01-90
28N51E21BDBC01 M-27	2,029.1	Qt	91	W,U	H,U	66.74	08-26-90	1,962.4	6,500	07-20-89
						66.40	09-12-91	1,962.7	5,820	08-26-90
						66.74	08-23-92	1,962.4	--	--
28N51E22BBBB01 FPB92-12	2,061.6	Qt	68	O	U	18.66	10-21-92	2,042.9	3,050	07-24-93
						16.92	05-26-93	2,044.7	--	--
						15.10	07-21-93	2,046.5	--	--
28N51E22BDCA01 Buckles A-1	2,085	Mc	5,872	P,Ab	U	--	--	--	[1]120,000	04-30-81
28N51E22CBCB01 FPB93-3	2,080.0	Qt	81	O	U	36.79	07-21-93	2,043.2	98,600	07-21-93
						35.76	09-08-93	2,044.2	--	--
28N51E22CBCB02 FPB93-3A	2,080.0	Qt	49	O	U	36.49	07-20-93	2,043.5	97,200	07-20-93
						35.34	09-08-93	2,044.7	--	--
28N51E22CDCC01 M-28	2,102.8	Qt	85	W,U	H,U	57.87	07-14-83	2,044.9	4,000	07-14-83
						59.26	07-01-90	2,043.5	[1]4,010	07-09-85
						59.25	06-23-91	2,043.6	13,000	07-20-89
						59.25	07-20-91	2,043.6	11,400	10-26-89
						59.06	09-12-91	2,043.7	26,500	07-20-91
						58.83	08-23-92	2,044.0	--	--
28N51E22CDCC02 M-29	2,102.7	Qt	85	W,U	H,U	60.20	07-20-89	2,042.5	--	--
						59.99	10-26-89	2,042.7	--	--
28N51E25ACBC01 Tenneco 1	2,178	Mk	[2]5,350-5,380	P,Ab	Z	--	--	--	73,200	01-09-67
		Mc	[2]5,640-5,680			--	--	--	160,000	01-09-67
28N51E27ABAA01 M-30	2,161.1	Qt	135	W	H	118.26	07-01-90	2,042.8	[1]1,310	10-11-89
						120.27	08-24-90	2,040.8	[1]1,550	11-10-89
						118.27	06-07-91	2,042.8	[1]1,760	12-15-89
						118.15	06-11-91	2,043.0	1,750	07-01-90
						118.15	09-12-91	2,043.0	1,120	08-24-90
						117.88	08-23-92	2,043.2	2,100	09-12-91
						--	--	--	1,550	04-15-92
						--	--	--	1,500	07-23-93
28N51E27ACDB01 Murphy 63	2,167	Mh	[2]4,960-4,970	P,Ab	Z	--	--	--	--	--

Table 1. Records of privately owned wells, monitoring wells, and sampled oil wells in the East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana (Continued)

Site number and well name (plate 1)	Altitude of land surface (feet)	Geologic unit	Depth of well (feet)	Primary use of site	Primary use of water	Water level			Specific conductance, onsite (µS/cm)	Date specific conductance measured
						Depth to water (feet)	Date of measurement	Altitude (feet)		
28N51E27BBBB01 M-31	2,085.0	Qt	68	W,U	H,U	32.50	07-24-89	2,052.5	[1]3,470	05-23-85
						42.43	10-25-89	2,042.6	[1]15,400	11-21-88
						42.41	07-01-90	2,042.6	25,000	07-24-89
						42.43	08-27-90	2,042.6	22,500	10-25-89
						42.42	01-31-91	2,042.6	48,000	08-27-90
						42.32	04-05-91	2,042.7	[1]52,700	01-31-91
						42.30	05-08-91	2,042.7	51,400	05-08-91
						42.70	06-20-91	2,042.3	63,000	07-22-91
						41.53	07-22-91	2,043.5	50,000	04-15-92
						42.23	09-12-91	2,042.8	81,500	07-23-93
						42.20	04-15-92	2,042.8	--	--
						42.10	08-23-92	2,042.9	--	--
						41.52	07-23-93	2,043.5	--	--
28N51E29BACA01 M-32	1,974.6	Qal	50	W	H	18.49	08-15-93	1,956.1	2,090	08-17-93
28N51E29CACB01 M-33	1,974.9	Qal	32	W	H	27.88	06-29-90	1,947.0	670	06-29-90
						27.89	08-23-90	1,947.0	690	08-23-90
28N51E32CCCB01 M-34	2,020	Qt	120	W	H	--	--	--	1,200	06-30-90
28N51E32DCCC01 M-35	2,030	Qt	104	U	U	80.35	06-27-90	1,950	--	--
						81.10	09-16-91	1,949	--	--
28N51E33BBBB01 M-36	2,041.4	Qt	120	W	H	89.96	06-27-90	1,951.4	[1]2,630	03-17-89
						90.05	08-24-90	1,951.4	2,900	06-27-90
						89.70	09-12-91	1,951.7	2,670	08-24-90
28N51E33BBBC01 M-37	2,045	Qt	107	U	U	91.17	06-27-90	1,954	--	--
						91.95	09-12-91	1,953	--	--
28N51E33BBBC02 M-38	2,045	Qt	120	W	H	92.01	08-24-90	1,953	[1]2,480	03-16-89
						91.68	09-12-91	1,953	2,700	08-24-90
28N51E33CBAA01 M-39	2,050	Qt	130	U	U	100.78	06-27-90	1,949	--	--
28N51E33DDCC01 M-40	2,075	Qw	60	U	U	43.76	06-29-90	2,031	--	--
						43.09	09-16-91	2,032	--	--
28N51E33DDCC02 M-41	2,075	Qw	66	W,U	H,U	42.58	06-29-90	2,032	3,400	06-29-90
						41.44	09-16-91	2,034	--	--
						40.39	08-17-93	2,035	--	--
28N51E33DDCC03 FPB93-4A	2,070.8	Qw	65	O	U	41.46	08-16-93	2,029.3	3,820	08-17-93
						41.55	08-17-93	2,029.2	--	--
						41.09	09-08-93	2,029.7	--	--
28N51E33DDCC04 FPB93-4B	2,070.8	Qw	65	O	U	41.64	08-16-93	2,029.2	--	--
						41.71	08-17-93	2,029.1	--	--
						41.27	09-08-93	2,029.5	--	--

Table 1. Records of privately owned wells, monitoring wells, and sampled oil wells in the East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana (Continued)

Site number and well name (plate 1)	Altitude of land surface (feet)	Geologic unit	Depth of well (feet)	Primary use of site	Primary use of water	Water level			Specific conductance, onsite (µS/cm)	Date specific conductance measured
						Depth to water (feet)	Date of measurement	Altitude (feet)		
28N51E33DDCC05 FPB93-4C	2,070.8	Qw	66	O	U	41.81	08-16-93	2,029.0	--	--
						41.90	08-17-93	2,028.9	--	--
						41.45	09-08-93	2,029.4	--	--
28N52E18ACCA01 Murphy 2	2,135	Mmc	[2]6,020-6,080	P,Ab	Z	--	--	--	60,000	05-17-52
28N52E20BBBB01 M-42	2,125	Qw	100	O	U	[3]72.60	10-06-85	2,052	[3]1,780	10-06-85
						[3]72.18	08-15-85	2,053	--	--
						[3]72.31	10-06-85	2,053	--	--
						[3]72.16	11-04-85	2,053	--	--
						[3]73.03	12-10-85	2,052	--	--
						[3]72.38	01-14-86	2,053	--	--
						[3]74.85	02-11-86	2,050	--	--
						[3]72.53	04-04-86	2,052	--	--
						[3]72.50	05-07-86	2,052	--	--
						[3]72.43	06-10-86	2,053	--	--
						[3]72.45	07-08-86	2,053	--	--
						[3]72.20	08-06-86	2,053	--	--
						[3]72.10	09-11-86	2,053	--	--
						[3]72.58	10-08-86	2,052	--	--
						[3]71.91	11-20-86	2,053	--	--
						[3]72.27	01-09-87	2,053	--	--
						[3]72.08	02-11-87	2,053	--	--
						[3]72.22	03-10-87	2,053	--	--
						[3]71.74	04-09-87	2,053	--	--
						[3]71.63	05-12-87	2,053	--	--
						[3]71.72	06-05-87	2,053	--	--
						[3]71.78	06-30-87	2,053	--	--
						[3]71.75	07-31-87	2,053	--	--
						[3]72.35	10-09-87	2,053	--	--
						[3]70.99	03-27-88	2,054	--	--
						[3]71.49	07-15-88	2,054	--	--
						[3]70.75	12-18-88	2,054	--	--

Table 1. Records of privately owned wells, monitoring wells, and sampled oil wells in the East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana (Continued)

Site number and well name (plate 1)	Altitude of land surface (feet)	Geologic unit	Depth of well (feet)	Primary use of site	Primary use of water	Water level			Specific conductance, onsite (µS/cm)	Date specific conductance measured
						Depth to water (feet)	Date of measurement	Altitude (feet)		
28N52E20CCCC01 M-43	2,143	Qw	128	O	U	[3]96.4	07-24-85	2,047	2,240	08-21-90
						[3]96.10	08-15-85	2,047	--	--
						[3]96.38	10-05-85	2,047	--	--
						[3]96.04	11-04-85	2,047	--	--
						[3]96.90	12-10-85	2,046	--	--
						[3]96.25	01-14-86	2,047	--	--
						[3]98.70	02-11-86	2,044	--	--
						[3]96.62	03-06-86	2,046	--	--
						[3]96.32	04-04-86	2,047	--	--
						[3]96.29	05-07-86	2,047	--	--
						[3]96.24	06-10-86	2,047	--	--
						[3]96.24	07-08-86	2,047	--	--
						[3]96.03	08-06-86	2,047	--	--
						[3]95.93	09-11-86	2,047	--	--
						[3]96.40	10-08-86	2,047	--	--
						[3]95.75	11-20-86	2,047	--	--
						[3]96.16	01-09-87	2,047	--	--
						[3]95.93	02-11-87	2,047	--	--
						[3]96.07	03-10-87	2,047	--	--
						[3]95.61	04-09-87	2,047	--	--
						[3]95.52	05-12-87	2,047	--	--
						[3]95.58	06-05-87	2,047	--	--
						[3]95.65	06-30-87	2,047	--	--
						[3]95.61	07-31-87	2,047	--	--
						[3]96.25	10-09-87	2,047	--	--
						[3]94.97	03-27-88	2,048	--	--
						[3]95.47	07-15-88	2,048	--	--
						[3]94.80	12-18-88	2,048	--	--
						94.80	07-01-90	2,048	--	--
						95.06	08-21-90	2,048	--	--
28N52E30DDDD01 M-44	2,173	Qw	170	O	U	[3]140.58	08-15-85	2,032	[3]2,950	10-05-85
						[3]140.65	10-05-85	2,032	--	--
						[3]137.30	11-04-85	2,036	--	--
						[3]79.09	12-10-85	2,094	--	--
						[3]78.29	01-14-86	2,095	--	--
						[3]77.16	03-06-86	2,096	--	--
						[3]113.07	05-07-86	2,060	--	--
						[3]76.54	06-10-86	2,096	--	--
29N50E14CDAD01 M-45	2,380	Tf	44	U	U	37.80	06-29-90	2,342	--	--
29N50E14CDDD01 M-46	2,380	Tf	48	U	U	41.50	06-29-90	2,338	--	--
29N50E23BAAA01 M-47	2,380	Tf	--	U	U	8.66	06-29-90	2,371	--	--
29N51E08CCCA01 Murphy 58	2,100	Mc	5,970	P	Z	--	--	--	62,200	01-24-56

Table 1. Records of privately owned wells, monitoring wells, and sampled oil wells in the East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana (Continued)

Site number and well name (plate 1)	Altitude of land surface (feet)	Geologic unit	Depth of well (feet)	Primary use of site	Primary use of water	Water level			Specific conductance, onsite (µS/cm)	Date specific conductance measured
						Depth to water (feet)	Date of measurement	Altitude (feet)		
29N51E09ABBA01 FPB92-15	2,038.6	Qal	42	O	U	8.98 8.52 7.57 7.76	09-22-92 05-25-93 08-16-93 09-09-93	2,029.6 2,030.1 2,031.0 2,030.8	1,240 -- -- --	09-22-92 -- -- --
29N51E09ABBA02 FPB92-16	2,038.5	Qal	38	O	U	8.95 8.52 7.55	09-24-92 05-25-93 08-16-93	2,029.6 2,030.0 2,031.0	1,240 -- --	09-24-92 -- --
29N51E09ABBA03 FPB92-17	2,038.4	Qal	42	O	U	8.79 8.38 7.26	09-22-92 05-25-93 08-16-93	2,029.6 2,030.0 2,031.1	1,240 -- --	09-22-92 -- --
29N51E09ABBA04 FPB93-1	2,038.5	Qal	36	O	U	7.42	08-16-93	2,031.1	1,260	08-16-93
29N51E10CDAA01 M-48	2,070	Qt	57	W	H	49.84 49.35	06-29-90 09-11-91	2,020 2,021	2,550 --	06-29-90 --
29N51E10CDAB01 M-49	2,070	Qt	60	W	S	44.70 44.34	06-29-90 09-11-91	2,025 2,026	[1]1,940 --	05-14-85 --
29N51E10CDBA01 M-50	2,065	Qal	90	W,U	S,U	44.44 --	05-05-82 --	2,021 --	1,390 1,360	05-05-82 07-21-82
29N51E14BDDA01 M-51	2,190	Khf	160	U	U	--	--	--	1,550	06-28-90
29N51E15CACA01 M-52	2,055	Qal	62	W	H	-- --	-- --	-- --	1,850 1,710	06-28-90 07-19-91
29N51E15CCBD01 M-53	2,041.7	Qal	65	W	H	29.23	06-28-90	2,012.5	--	--
29N51E16BDAA01 W-1	2,030.6	Qal	53	U	U	9.14 10.32 9.98 10.79 11.22 10.49 10.80 11.22	07-20-82 11-03-82 04-07-83 11-18-83 06-30-90 07-18-91 09-11-91 08-23-92	2,021.5 2,020.3 2,020.6 2,019.8 2,019.4 2,020.1 2,019.8 2,019.4	1,550 -- -- -- -- -- -- --	07-20-91 -- -- -- -- -- -- --
29N51E16CBCC01 W-2	2,030.2	Qal	25	U	U	13.48 13.52 15.22 15.52	05-04-82 07-20-82 07-22-89 06-30-90	2,016.7 2,016.7 2,015.0 2,014.7	[1]1,610 900 -- --	07-23-79 07-26-82 -- --
29N51E16CCAA01 W-3	2,027.0	Qal	23	W	Z	9.31 11.90 12.13 10.51	05-04-82 06-11-89 06-30-90 07-18-91	2,017.7 2,015.1 2,014.9 2,016.5	1,140 1,140 1,200 1,220	05-04-82 07-20-82 06-11-89 07-18-91

Table 1. Records of privately owned wells, monitoring wells, and sampled oil wells in the East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana (Continued)

Site number and well name (plate 1)	Altitude of land surface (feet)	Geologic unit	Depth of well (feet)	Primary use of site	Primary use of water	Water level			Specific conductance, onsite (µS/cm)	Date specific conductance measured
						Depth to water (feet)	Date of measurement	Altitude (feet)		
29N51E16DACA01 M-54	2,018.2	Qal	25	W	H	4.83	06-29-90	2,013.4	[1]1,220	03-08-90
						6.25	08-23-90	2,012.0	1,650	06-29-90
						6.00	09-11-91	2,012.2	1,520	08-23-90
29N51E17CCCC01 W-4	2,064.8	Qal or Kb	87	U	U	55.66	05-04-82	2,009.1	[1]1,070	07-23-79
						55.31	07-20-82	2,009.5	[1]11,500	07-27-82
						55.47	11-03-82	2,009.3	9,500	07-22-89
						55.48	04-07-83	2,009.3	--	--
						55.59	07-13-83	2,009.2	--	--
						55.73	11-18-83	2,009.1	--	--
						56.90	07-22-89	2,007.9	--	--
						57.08	06-30-90	2,007.7	--	--
						56.65	09-11-91	2,008.2	--	--
						56.94	08-23-92	2,007.9	--	--
29N51E19DCAC01 M-55	2,060	Kjr	740	W,U	Z,U	--	--	--	17,000	07-22-82
29N51E20ABBA02 W-6	2,037	Qal	44	U	U	24.67	07-27-82	2,012	[1]7,300	07-23-79
						25.70	06-30-90	2,011	[1]7,430	07-26-82
29N51E20BCDB01 Murphy 84	2,049	Mm	5,773	P	Z	--	--	--	[1]62,500	03-01-76
29N51E20CCDB01 Murphy 21	2,027	Mm	5,750	P	Z	--	--	--	[1]62,500	03-01-76
29N51E20DABB01 FPB92-13	2,013.7	Qal	56	O	U	16.89	09-22-92	1,996.8	12,800	09-22-92
						20.39	05-25-93	1,993.3	14,200	08-15-93
						15.76	08-15-93	1,997.9	--	--
29N51E21ABCB01 W-7	2,016	Qal	197	U	U	11.37	05-04-82	2,005	--	--
						11.20	07-20-82	2,005	--	--
						11.20	11-03-82	2,005	--	--
29N51E21ABCC01 W-8	2,025.1	Qal	12	W	H	9.51	05-04-82	2,015.6	[1]1,240	07-23-79
						11.51	06-11-89	2,013.6	1,250	05-04-82
						11.32	07-18-91	2,013.8	1,200	07-20-82
						--	--	--	1,500	06-11-89
						--	--	--	1,520	07-18-91
29N51E21ABDA01 FPB92-14	2,027.9	Qal	33	O	U	12.39	09-22-92	2,015.5	1,580	09-22-92
						11.95	05-25-93	2,016.0	1,500	08-15-93
						11.42	08-15-93	2,016.5	--	--

Table 1. Records of privately owned wells, monitoring wells, and sampled oil wells in the East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana (Continued)

Site number and well name (plate 1)	Altitude of land surface (feet)	Geologic unit	Depth of well (feet)	Primary use of site	Primary use of water	Water level			Specific conductance, onsite (µS/cm)	Date specific conductance measured
						Depth to water (feet)	Date of measurement	Altitude (feet)		
29N51E21BBAA01 W-9	2,025.4	Qal	17	U	U	9.40	05-04-82	2,016.0	[1]3,070	07-23-79
						9.82	07-20-82	2,015.6	3,100	07-26-82
						10.60	11-03-82	2,014.8	4,600	07-22-89
						10.53	04-07-83	2,014.9	--	--
						10.97	07-13-83	2,014.4	--	--
						11.04	11-18-83	2,014.4	--	--
						11.67	04-19-89	2,013.7	--	--
						11.85	07-22-89	2,013.6	--	--
						12.01	06-30-90	2,013.4	--	--
						11.08	09-11-91	2,014.3	--	--
						11.88	08-23-92	2,013.5	--	--
29N51E29CBBB01 W-10	2,007	Qal	45	O,Z	U	11.23	08-31-82	1,996	10,000	11-03-82
						11.51	11-02-82	1,995	--	--
						11.53	04-07-83	1,995	--	--
						11.97	07-13-83	1,995	--	--
						12.39	11-18-83	1,995	--	--
29N51E31AABB01 W-11	2,013.1	Qal	54	O	U	19.55	08-31-82	1,993.6	17,000	11-03-82
						19.87	11-02-82	1,993.2	12,000	04-19-89
						19.69	04-07-83	1,993.4	13,500	07-23-89
						20.12	07-13-83	1,993.0	--	--
						20.48	11-18-83	1,992.6	--	--
						20.48	04-19-89	1,992.6	--	--
						20.75	07-23-89	1,992.4	--	--
						21.06	08-27-90	1,992.0	--	--
						20.57	09-11-91	1,992.5	--	--
						19.64	09-09-93	1,993.5	--	--
29N51E31ABDD01 FPB92-6	2,006.1	Qal	43	O	U	15.59	09-23-92	1,990.5	15,100	09-23-92
						15.26	05-26-93	1,990.8	15,100	08-10-93
						14.46	08-10-93	1,991.6	--	--
						14.68	09-09-93	1,991.4	--	--
29N51E31BDBA01 FPB92-10	2,006.2	Qal	40	O	U	17.62	09-23-92	1,988.6	8,380	09-23-92
						17.31	05-26-93	1,988.9	8,900	08-10-93
						16.39	08-09-93	1,989.8	--	--
						16.82	09-09-93	1,989.4	--	--
29N51E31CABB01 FPB92-9	1,994.3	Qal	33	O	U	8.57	09-23-92	1,985.7	24,500	09-23-92
						8.27	05-26-93	1,986.0	24,500	08-11-93
						7.10	08-11-93	1,987.2	--	--
						7.90	09-10-93	1,986.4	--	--
29N51E31DBAD01 FPB92-7	1,998.5	Qal	37	O	U	10.54	09-23-92	1,988.0	31,000	09-23-92
						10.40	05-26-93	1,988.1	[1]26,300	08-11-93
						9.22	08-11-93	1,989.3	--	--
						9.65	09-10-93	1,988.8	--	--

Table 1. Records of privately owned wells, monitoring wells, and sampled oil wells in the East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana (Continued)

Site number and well name (plate 1)	Altitude of land surface (feet)	Geologic unit	Depth of well (feet)	Primary use of site	Primary use of water	Water level			Specific conductance, onsite (µS/cm)	Date specific conductance measured
						Depth to water (feet)	Date of measurement	Altitude (feet)		
29N51E31DBDD01 FPB92-8	1,993.9	Qal	33	O	U	8.30	09-23-92	1,985.6	35,000	09-23-92
						7.81	05-26-93	1,986.1	31,500	08-12-93
						6.42	08-11-93	1,987.5	--	--
						6.79	09-10-93	1,987.1	--	--
29N51E32ABAC01 FPB92-4	2,018.7	Qal	41	O	U	29.34	10-21-92	1,989.4	75,100	10-21-92
						24.34	05-25-93	1,994.4	25,600	08-13-93
						21.88	07-26-93	1,996.8	--	--
						22.89	08-13-93	1,995.8	--	--
29N51E32ACCA01 FPB92-5	2,019.2	Qal	30	O	U	22.67	10-21-92	1,996.5	19,600	10-21-92
						22.50	05-25-93	1,996.7	18,600	08-14-93
						22.87	07-26-93	1,996.3	--	--
						22.85	08-14-93	1,996.4	--	--
29N51E32BAAD01 FPB92-3	2,002.1	Qal	39	O	U	8.95	10-20-92	1,993.2	57,100	10-20-92
						8.49	05-25-93	1,993.6	35,400	08-14-93
						7.20	08-13-93	1,994.9	--	--
						7.71	09-10-93	1,994.4	--	--
29N51E32BABB01 FPB92-2A	2,001.4	Qal	46	O	U	8.45	09-24-92	1,993.0	90,000	09-24-92
						7.97	05-25-93	1,993.4	102,000	07-26-93
						5.14	07-26-93	1,996.3	--	--
29N51E32BABB02 FPB92-2B	2,001.6	Qal	27	O,Z	U	7.74	09-24-92	1,993.9	17,600	09-24-92
						7.36	05-25-93	1,994.2	--	--
						4.46	07-26-93	1,997.1	--	--
29N51E32BBAA01 W-12	1,999	Qal	42	O,Z	U	8.37	08-31-82	1,991	70,000	11-02-82
						8.12	11-02-82	1,991	--	--
						7.67	04-07-83	1,991	--	--
						8.29	07-13-83	1,991	--	--
29N51E32BBBA01 W-13	2,003.6	Qal	31	O,Z	U	9.50	08-31-82	1,994.1	--	--
						9.88	11-02-82	1,993.7	--	--
						9.16	04-07-83	1,994.4	--	--
						9.67	07-13-83	1,993.9	--	--
						8.81	05-02-89	1,994.8	--	--
						8.83	07-21-91	1,994.8	--	--
						8.15	09-11-91	1,995.4	--	--
29N51E32BBBA02 W-14	2,000	Qal	47	O,Z	U	9.48	08-31-82	1,991	58,000	11-02-82
						9.69	11-02-82	1,990	--	--
						9.06	04-07-83	1,991	--	--
						9.77	07-13-83	1,990	--	--
						10.04	11-18-83	1,990	--	--
29N51E32BBBA03 FPB92-1	2,004.2	Qal	53	O	U	11.14	09-24-92	1,993.1	123,000	09-24-92
						12.23	05-25-93	1,992.0	127,000	07-25-93
						10.78	07-25-93	1,993.4	--	--
						10.80	09-09-93	1,993.4	--	--
29N51E32BBBA04 FPB93-2	2,004.2	Qal	27	O	U	8.59	07-25-93	1,995.6	12,300	07-25-93

Table 1. Records of privately owned wells, monitoring wells, and sampled oil wells in the East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana (Continued)

Site number and well name (plate 1)	Altitude of land surface (feet)	Geologic unit	Depth of well (feet)	Primary use of site	Primary use of water	Water level			Specific conductance, onsite (µS/cm)	Date specific conductance measured
						Depth to water (feet)	Date of measurement	Altitude (feet)		
29N51E32BBBB01 W-15	2,004.2	Qal	49	O	U	10.21	08-31-82	1,994.0	120,000	11-03-82
						10.20	11-02-82	1,994.0	30,000	04-19-89
						9.78	04-07-83	1,994.4	65,000	07-23-89
						10.24	07-13-83	1,994.0	--	--
						10.50	11-18-83	1,993.7	--	--
						10.20	04-19-89	1,994.0	--	--
						9.60	07-23-89	1,994.6	--	--
						11.94	08-27-90	1,992.3	--	--
29N51E32BCCA01 W-16	1,996	Qal	40	O,Z	U	8.84	08-31-82	1,987	70,000	11-02-82
						8.81	11-02-82	1,987	--	--
						8.16	04-07-83	1,988	--	--
						8.87	07-13-83	1,987	--	--
						8.97	11-18-83	1,987	--	--
29N51E32BCCA02 FPB92-11	2,001.1	Qal	45	O	U	10.19	09-24-92	1,990.9	36,600	09-24-92
						9.93	05-26-93	1,991.2	41,700	08-11-93
						8.76	08-10-93	1,992.3	--	--
29N51E36CBBB01 M-56	2,080	Qgo	42	O	U	[3]24.71	08-25-85	2,055	--	--
						[3]24.75	10-05-85	2,055	--	--
						[3]24.68	11-04-85	2,055	--	--
						[3]24.83	12-10-85	2,055	--	--
						[3]24.67	04-04-86	2,055	--	--
						[3]24.42	05-06-86	2,056	--	--
						[3]24.10	06-10-86	2,056	--	--
						[3]24.15	07-08-86	2,056	--	--
						[3]24.19	08-06-86	2,056	--	--
						[3]24.20	09-11-86	2,056	--	--
						[3]23.96	10-08-86	2,056	--	--
						[3]23.80	11-20-86	2,056	--	--
						[3]24.02	01-09-87	2,056	--	--
						[3]24.15	02-11-87	2,056	--	--
						[3]24.18	03-16-87	2,056	--	--
						[3]24.02	04-09-87	2,056	--	--
						[3]23.89	05-12-87	2,056	--	--
						[3]23.79	06-05-87	2,056	--	--
						[3]23.89	06-30-87	2,056	--	--
						[3]23.96	07-31-87	2,056	--	--
						[3]23.77	10-09-87	2,056	--	--
						[3]23.32	03-27-88	2,057	--	--
						[3]24.52	07-15-88	2,055	--	--
						[3]24.91	12-18-88	2,055	--	--
						25.02	07-01-90	2,055	--	--
29N51E36CCCC01 M-57	2,065	Qgo	30	O	U	[3]6.85	10-05-85	2,058	[3]658	10-05-85
						7.22	07-01-90	2,058	--	--

[1]Laboratory measurement; specific laboratory listed in table 6.
[2]Sampling depth.
[3]Montana Bureau of Mines and Geology, Butte, Mont.

Table 2. Records of known brine-injection wells in the East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana

Site number--numbering system described in text.

Well name--oil company name for specified well. Sites are plotted on plate 1.

Altitude of land surface--in feet above sea level, determined from USGS 7.5-minute topographic maps, or from individual brine-injection well records.

Geologic unit (unit either into which brine is injected or that is the source of the brine)--

- Kjr - Judith River Formation (Upper Cretaceous)
- Kd - Dakota Sandstone (Lower Cretaceous)
- Mh - Heath Formation (Upper Mississippian)
- Mm - Madison Group (Mississippian)
  - Mc - Charles Formation of Madison Group
  - Mmc - Mission Canyon Limestone of Madison Group
- Dn - Nisku Formation (Upper Devonian)

Drilled depth and well depth--in feet below land surface.

Site status--Ac, Active; Ab, abandoned.

Abbreviations used in remarks --

BWPD- Injection rate in barrels of water per day; PSI, injection pressure in pounds per square inch; µS/cm, specific conductance in microsiemens per centimeter at 25 degrees Celsius.

Symbol: --, no data; (?), uncertain.

Table 2. Records of known brine-injection wells in the East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana (Continued)

Site number and well name (plate 1)	Altitude of land surface (feet)	Geologic unit into which brine is injected	Geologic unit that is source of the brine	Drilled depth (feet)	Well depth (feet)	Site status	Remarks
28N51E02ACDB01 Murphy 2-D	2,124	Kjr	Mm	834	834	Ab	Completed as water well December 1951. Converted to brine-injection well January 1962. Injection test of 2,880 BWPD into Judith River Formation November 1961. Abandonment date not known. Water-quality analysis available (table 6).
28N51E03BCAC01 Murphy 80-D	2,059	Kd	Mm,Mh	5,832	3,575	Ac	Producing oil well July 1956-April 1960. Temporarily abandoned May 1960. Converted to brine-injection well January 1964. Injection rates: average = 2,700 BWPD; maximum = 4,500 BWPD. Injection pressures: average = 400 PSI; maximum = 650 PSI. Water-quality analysis available (table 6).
28N51E04BCAC01 Murphy 59-D	1,990	Kd	Mm	5,760	3,365	Ab	Dry oil well drilled June 1955. Converted to brine-injection well June 1961. Abandoned June 1986. Injection rates: average = 4,500 BWPD; maximum = 6,500 BWPD. Injection pressures: average = 650 PSI; maximum = 800 PSI.
28N51E10ABAC01 Huber 4	2,085	Mm	Mc	6,063	6,063	Ab	Producing oil well September 1952-August 1969. Temporarily abandoned August 1969. Converted to brine-injection well October 1970. Abandonment date not known.
28N51E10ABAD01 Huber 1-W	2,090	Kjr	Mm	881	881	Ab	Completion as brine-injection well October 1961. Reported injection rate 696 BWPD. Abandonment date not known.
28N51E10DADC01 Grace 110X-D	2,094	Mmc	Mc,Dn	7,360	7,000	Ab	Producing oil well September 1969-September 1973. Converted to brine-injection well October 1973. Injection rates: average = 1,827 BWPD; maximum = 3,000 BWPD. Injection pressures: average = 430 PSI; maximum = 900 PSI. Abandoned May 1985. Water-quality analysis available (table 6).
28N51E10DBAD01 Murphy 8-D	2,087	Kjr	Mm	5,788	780(?)	Ac	Producing oil well September 1952-September 1965. Temporarily abandoned October 1965. Converted to brine-injection well in Dakota Sandstone January 1973. Recompleted as brine-injection well in Judith River Formation January 1978. Injection rates: average = 7,100 BWPD; maximum = 8,400 BWPD. Injection pressures: average = 650 PSI: maximum = 700 PSI. Water-quality analysis available (table 6).

Table 2. Records of known brine-injection wells in the East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana (Continued)

Site number and well name (plate 1)	Altitude of land surface (feet)	Geologic unit into which brine is injected	Geologic unit that is source of the brine	Drilled depth (feet)	Well depth (feet)	Site status	Remarks
28N51E22BDBD01 TXO SWD-1	2,085	Kjr	Mm	960	850	Ab	Completed as brine-injection well May 1981. Abandoned June 1984.
28N51E22CBCB03 Mesa 1-W (Biere 1)	2,075	Kjr	Mm	998	998	Ab	Completed as brine-injection well July 1970. Abandoned September 1984.
29N50E11CDCA01 Grace SWD-1	2,246	Kd	Mm	6,124	3,825(?)	Ab	Producing oil well November 1953-November 1974. Converted to brine-injection well March 1977. Injection rate not known. Abandoned August 1990.
29N50E25DCDB01 Murphy 46	2,106	Mm	Mm	5,864	5,864	Ab	Drilled as oil-test well September 1954 and abandoned as a dry hole. Converted to brine-injection well April 1956. Reported injection rate 2,302 BWPD. Abandonment date uncertain, but possibly August 1959.
29N51E07BCDB01 Buck Elk 2	2,220	Kjr	Mc	5,964	5,933	Ab	Apparently first drilled as oil well and later converted to brine-injection well. Brine injected sporadically since December 1967. Injection rates: average = 525 BWPD; maximum = 1,500 BWPD. Injection pressures: average = 225 PSI; maximum = 400 PSI. Abandoned January 1986. Water-quality analysis available (table 6).
29N51E07BDBD01 Buck Elk 1-W	2,200	Kjr	Mm	1,207	1,207	Ab	Completed as brine-injection well February 1961. Abandoned May 1968. Reported injection rate 600 BWPD at 400 PSI. Water-quality analysis available (table 6).
29N51E08DCCA01 Murphy (Empire State) Smith 1	2,045	Mm	Mm	5,982	5,982	Ab (see remarks)	Producing oil well June 1953-November 1956. Temporarily abandoned December 1956. Converted to dual completion as brine-injection well and oil well August 1960. Well does not appear to have been plugged as of 1995. Appears not to have been used for long period of time.
29N51E16BACA01 Murphy (Empire State) Rehder 7	2,028	Mm	Mm	5,770	5,750	Ab	Producing oil well January 1955-August 1960. Converted to brine-injection well September 1960. Abandonment date not known.
29N51E16DDDB01 Murphy (Owens-Simons 1)	2,015	Mm	Mm	5,850	5,780	Ab	Producing oil well June 1955-October 1959. Shut-in November 1959. Converted to brine-injection well October 1960. Abandonment date not known.

Table 2. Records of known brine-injection wells in the East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana (Continued)

Site number and well name (plate 1)	Altitude of land surface (feet)	Geologic unit into which brine is injected	Geologic unit that is source of the brine	Drilled depth (feet)	Well depth (feet)	Site status	Remarks
29N51E19DDBA01 Murphy 5-D	2,039	Kd	Mm	3,583	3,583	Ac	Completed as brine-injection well February 1976. Injection rates: average = 3,000 BWPD; maximum = 5,000 BWPD. Injection pressures: average = 300 PSI; maximum = 650 PSI. Water-quality analysis available (tables 6 and 7).
29N51E28CCAC01 Murphy 29-D	2,105	Kjr	Mm	5,875	--	Ab	Apparently first drilled as oil well September 1953. Later (possibly April 1981) converted to brine-injection well. Abandoned October 1987. Injection rates: average 3,225 BWPD; maximum = 4,725 BWPD. Injection pressures: average = 600 PSI; maximum = 650 PSI.
29N51E30DDDD01 Murphy 1-D	2,005	Kd	Mm	3,465	3,431	Ac	Completed as brine-injection well September 1957. Injection rates: average = 4,500 BWPD; maximum = 7,500 BWPD. Injection pressures: average = 650 PSI; maximum = 1,600 PSI. Water-quality analysis available (tables 6 and 7).
29N51E33BBAB01 Murphy 6-D	2,110	--	--	--	--	Ab (see remarks)	Abandonment date not known. Various surface structures still at site. Not known if well is plugged.

Table 3. Lithologic logs and completion details for monitoring wells drilled in 1992-93 in Quaternary alluvial and glacial deposits in the East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana

[Well name, a field-identification system used for cross reference to wells plotted on plate 1; site number, numbering system described in text; casing, in feet below land surface, except where + indicates feet above land surface. Abbreviations: ft, feet; in., inches; PVC, polyvinylchloride]

Description	Depth (feet)
Well name: FPB92-1	
Location number: 29N51E32BBBA03	
Geologic unit: Alluvial deposits	
Lithology:	
Silt, clayey, medium-gray	0-1
Clay, silty, medium-brownish gray	1-8
Gravel of various sizes with some cobbles, all of crystalline origin. Becomes somewhat finer and better sorted at 17 ft. Becomes more sandy and moist at 18 ft	8-18
Sand with fine gravel, water	18-30
Sand with much more gravel than in above interval	30-40
Coarse gravel, with some cobbles, sandy	40-51
Clay, light-gray (Bearpaw Shale)	51-53
Completion details:	
Well completion:	
2-in. PVC casing, with breather cap	+2.7-38
2-in. PVC factory-slotted casing (0.032-in. slot size)	38-48
2-in. PVC casing, with end cap for sediment trap	48-53
Finish:	
Bentonite grout	0.5-31
Natural cuttings and silica sand pack	31-53
Surface completion:	
6-in. steel protective casing	+2.7-1.3
2x2-ft cement pad	0-0.5
Remarks: Well drilled using auger method; completed on August 24, 1992. Site geologist, S.D. Craigg. Drilled as replacement well for older, abandoned USGS well W-13 (Levings, 1984) to obtain follow-up water-level and water-quality data.	

Table 3. Lithologic logs and completion details for monitoring wells drilled in 1992-93 in Quaternary alluvial and glacial deposits in the East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana (Continued)

Description	Depth (feet)
Well name: FPB92-2A	
Location number: 29N51E32BABB01	
Geologic unit: Alluvial deposits	
Lithology:	
Sand, light-brown	0-2
Gravel of various sizes, with some moist sand	2-10
Gravel, overall coarser than in above interval, with some cobbles and moist sand	10-20
Sand, wet	20-25
Sand, with various-sized gravels, becoming coarser toward bottom of interval	25-42
Clay, light-gray (Bearpaw Shale)	42-46
Completion details:	
Well completion:	
2-in. PVC casing, with breather cap	+1.7-31
2-in. PVC factory-slotted casing (0.032-in. slot size)	31-41
2-in. PVC casing, with end cap for sediment trap	41-46
Finish:	
Bentonite grout	0.5-6
Natural cuttings	6-46
Surface completion:	
6-in. steel protective casing, with locking cover	+1.7-2.3
2x2-ft cement pad	0-0.5

Remarks: Well drilled using auger method; completed on August 25, 1992. Site geologist, S.D. Craigg. The purpose of this site is to provide a deep well and a shallow well in alluvial deposits to measure vertical differences in water quality and density. This is the deeper of two wells at this site; well FPB92-2B is the shallow well.

Table 3. Lithologic logs and completion details for monitoring wells drilled in 1992-93 in Quaternary alluvial and glacial deposits in the East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana (Continued)

Description	Depth (feet)
Well name: FPB92-2B	
Location number: 29N51E32BABB02	
Geologic unit: Alluvial deposits	
Lithology:	
No samples described. See description of well FPB92-2A for lithology of this hole.	
Completion details:	
Well completion:	
2-in. PVC casing, with breather cap	+2.0-12
2-in. PVC factory-slotted casing (0.032-in. slot size)	12-22
2-in. PVC casing, with end cap for sediment trap	22-27
Finish:	
Bentonite grout	0.5-5
Natural cuttings	5-27
Surface completion:	
6-in. steel protective casing, with locking cover	+2.0-2.0
2x2-ft cement pad	0-0.5

Remarks: Well drilled using auger method; completed on September 23, 1992. Site geologist, S.D. Craigg. Well FPB92-2B drilled 10 ft north of well FPB92-2A to determine vertical differences in water quality and density. Well had to be abandoned on August 8, 1993 because of extensive bulldozing for gravel deposits to within about 20 ft of the site, and also because "surge block" and extension rods (for developing monitoring wells) was stuck in the well and was impossible to remove.

Table 3. Lithologic logs and completion details for monitoring wells drilled in 1992-93 in Quaternary alluvial and glacial deposits in the East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana (Continued)

Description	Depth (feet)
Well name: FPB92-3	
Location number: 29N51E32BAAD01	
Geologic unit: Alluvial deposits	
Lithology:	
Silt and sand, brown	0-4
Gravel of various sizes	4-8
Gravel with some sand	8-14
Sand, wet, with possibly some fine gravel	14-32
Probably same as above interval, but change in drilling character	32-35
Clay, light-gray (Bearpaw Shale)	35-39
Completion details:	
Well completion:	
2-in. PVC casing, with breather cap	+1.7-24
2-in. PVC factory-slotted casing (0.032-in. slot size)	24-34
2-in. PVC casing, with end cap for sediment trap	34-39
Finish:	
Bentonite grout	0.5-7
Natural cuttings	7-39
Surface completion:	
6-in. steel protective casing	+1.7-2.3
2x2-ft cement pad	0-0.5

Remarks: Well drilled using auger method; completed on August 26, 1992. Site geologist, S.D. Craigg.

Table 3. Lithologic logs and completion details for monitoring wells drilled in 1992-93 in Quaternary alluvial and glacial deposits in the East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana (Continued)

Description	Depth (feet)
Well name: FPB92-4	
Location number: 29N51E32ABAC01	
Geologic unit: Alluvial deposits	
Lithology:	
Silt and sand, medium-brown	0-3
Fine sand, light-brown	3-7
Fine sand, light-brown, with minor gravel	7-13
Gravel of various sizes, with some sand	13-20
Same as above, but with some cobbles, moist	20-25
Clay, silty, gray, moist, with some sand and fine gravel	25-30
Clay galls, dark-gray, moist, with some sand and fine gravel	30-35
Clay, sandy and silty, drilling very difficult (uncertain whether material is clay-rich alluvial or glacial deposits, or Bearpaw Shale)	35-45
Completion details:	
Well completion:	
2-in. PVC casing, with breather cap	+2.0-16
2-in. PVC factory-slotted casing (0.032-in. slot size)	16-26
2-in. PVC casing, with end cap for sediment traps	26-41
Finish:	
Bentonite grout	0.5-11
Natural cuttings and silica sand pack	11-41
Surface completion:	
6-in. steel protective casing, with locking cover	+2.0-2.0
2x2-ft cement pad	0-0.5

Remarks: Well drilled using auger method; completed on August 26, 1992. Site geologist, S.D. Craigg. Hole caved 4 ft at bottom.

Table 3. Lithologic logs and completion details for monitoring wells drilled in 1992-93 in Quaternary alluvial and glacial deposits in the East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana (Continued)

Description	Depth (feet)
Well name: FPB92-5	
Location number: 29N51E32ACCA01	
Geologic unit: Alluvial deposits	
Lithology:	
Silt and sand, medium-dark brown	0-1
Sand, fine, light-brown	1-7
Gravel of various sizes	7-8
Sand, brown, wet	8-15
Gravel with some minor cobbles and sand	15-18
Sand	18-26
Clay, light-gray (uncertain whether material is clay-rich alluvial or glacial deposits, or Bearpaw Shale)	26-30
Completion details:	
Well completion:	
2-in. PVC casing, with breather cap	+1.7-15
2-in. PVC factory-slotted casing (0.032-in. slot size)	15-25
2-in. PVC casing, with end cap for sediment trap	25-30
Finish:	
Bentonite grout	0.5-11
Silica sand pack	11-25
Natural cuttings	25-30
Surface completion:	
6-in. steel protective casing, with locking cover	+1.7-2.3
2x2-ft cement pad	0-0.5

Remarks: Well drilled using auger method; completed on August 26, 1992. Site geologist, S.D. Craigg.

Table 3. Lithologic logs and completion details for monitoring wells drilled in 1992-93 in Quaternary alluvial and glacial deposits in the East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana (Continued)

Description	Depth (feet)
Well name: FPB92-6	
Location number: 29N51E31ABDD01	
Geologic unit: Alluvial deposits	
Lithology:	
Silt, clayey, light- to dark-brown	0-5
Clay galls, silty, medium-brown, slightly moist	5-10
Clay with very minor silt, medium-brown, barely moist	10-11
Gravels of various sizes, sandy cobbles at base of interval	11-30
Same as above interval, but no cobbles present	30-35
Sand, fine, silty	35-44
Clay, light-gray (Bearpaw Shale)	44-48
Completion details:	
Well completion:	
2-in. PVC casing, with breather cap	+2.5-28
2-in. PVC factory-slotted casing (0.032-in. slot size)	28-38
2-in. PVC casing, with end cap for sediment trap	38-43
Finish:	
Bentonite grout	0.5-15
Silica sand pack	15-28
Natural cuttings	28-43
Surface completion:	
6-in. steel protective casing	+2.5-1.5
2x2-ft cement pad	0-0.5

Remarks: Well drilled using auger method; completed on August 27, 1992. Site geologist, S.D. Craigg.

Table 3. Lithologic logs and completion details for monitoring wells drilled in 1992-93 in Quaternary alluvial and glacial deposits in the East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana (Continued)

Description	Depth (feet)
Well name: FPB92-7	
Location number: 29N51E31DBAD01	
Geologic unit: Alluvial deposits	
Lithology:	
Sand, fine, silty, light-brown	0-6
Gravel of various sizes, with minor cobbles	6-20
Sand, fine-medium, very wet (like "quicksand")	20-33
Clay, light-gray (Bearpaw Shale)	33-38
Completion details:	
Well completion:	
2-in. PVC casing, with breather cap	+1.9-23
2-in. PVC factory-slotted casing (0.032-in. slot size)	23-33
2-in. PVC casing, with end cap for sediment trap	33-37
Finish:	
Bentonite grout	0.5-7
Silica sand pack	7-8
Natural cuttings	8-37
Surface completion:	
6-in. steel protective casing	+1.9-2.1
2x2-ft cement pad	0-0.5

Remarks: Well drilled using auger method; completed on August 28, 1992. Site geologist, S.D. Craigg.

Table 3. Lithologic logs and completion details for monitoring wells drilled in 1992-93 in Quaternary alluvial and glacial deposits in the East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana (Continued)

Description	Depth (feet)
Well name: FPB92-8	
Location number: 29N51E31DBDD01	
Geologic unit: Alluvial deposits	
Lithology:	
Silt, light-brown	0-2
Gravel of various sizes, but mostly in the finer range	2-8
Sand, with possibly minor gravel toward base of interval	8-18
Gravel, very well sorted	18-32
Clay, light-gray (Bearpaw Shale)	32-33
Completion details:	
Well completion:	
2-in. PVC casing, with breather cap	+2.1-19
2-in. PVC factory-slotted casing (0.032-in. slot size)	19-29
2-in. PVC casing, with end cap for sediment trap	29-33
Finish:	
Bentonite grout	0.5-12
Silica sand pack	12-13
Natural cuttings	13-33
Surface completion:	
6-in. steel protective casing, with locking cover	+2.1-1.9
2x2-ft cement pad	0-0.5

Remarks: Well drilled using auger method; completed on August 28, 1992. Site geologist, S.D. Craigg.

Table 3. Lithologic logs and completion details for monitoring wells drilled in 1992-93 in Quaternary alluvial and glacial deposits in the East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana (Continued)

Description	Depth (feet)
Well name: FPB92-9	
Location number: 29N51E31CABB01	
Geologic unit: Alluvial deposits	
Lithology:	
Silt, light-brown	0-0.5
Gravel of various sizes, with minor cobbles	0.5-1
Sand, medium-brown	1-3
Sand with finer gravel, moist at approximately 8 ft	3-8
Sand, very wet (like "quicksand")	8-28
Clay, light-gray (Bearpaw Shale)	28-33
Completion details:	
Well completion:	
2-in. PVC casing, with breather cap	+2.1-18
2-in. PVC factory-slotted casing (0.032-in. slot size)	18-28
2-in. PVC casing, with end cap for sediment trap	28-33
Finish:	
Bentonite grout	0.5-7
Silica sand pack	7-8
Natural cuttings	8-33
Surface completion:	
6-in. steel protective casing, with locking cover	+2.1-1.9
2x2-ft cement pad	0-0.5

Remarks: Well drilled using auger method; completed on August 29, 1992. Site geologist, S.D. Craigg

Table 3. Lithologic logs and completion details for monitoring wells drilled in 1992-93 in Quaternary alluvial and glacial deposits in the East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana (Continued)

Description	Depth (feet)
Well name: FPB92-10	
Location number: 29N51E31BDBA01	
Geologic unit: Alluvial deposits	
Lithology:	
Clay, dark-gray (bedded, clayey alluvium from upland erosion of Bearpaw Shale outcrop about 0.5 mi west of site)	0-5
Clay, brown, silty	5-8
Clay, dark-gray to brown, slightly silty; slightly moist at approximately 11 ft	8-15
Gravel of various sizes	15-21
Sand, very silty and clayey, medium- to dark-brown; very wet and sticky	21-30
Sand, fine, clayey, dark-gray, very moist	30-33
Clay, dark-gray (Bearpaw Shale)	33-40
Completion details:	
Well completion:	
2-in. PVC casing, with breather cap	+2.2-20
2-in. PVC factory-slotted casing (0.032-in. slot size)	20-30
2-in. PVC casing, with end cap for sediment trap	30-40
Finish:	
Bentonite grout	0.5-10
Silica sand pack	10-28
Natural cuttings	28-40
Surface completion:	
6-in. steel protective casing, with locking cover	+2.2-1.8
2x2-ft cement pad	0-0.5

Remarks: Well drilled using auger method; completed on August 30, 1992. Site geologist, S.D. Craigg.

Table 3. Lithologic logs and completion details for monitoring wells drilled in 1992-93 in Quaternary alluvial and glacial deposits in the East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana (Continued)

Description	Depth (feet)
Well name: FPB92-11	
Location number: 29N51E32BCCA02	
Geologic unit: Alluvial deposits	
Lithology:	
Silt, light-brown	0-5
Gravel of various sizes, fairly well sorted; minor cobbles	5-25
Sand, with minor finer gravel	25-41
Bearpaw Shale	41-45
Completion details:	
Well completion:	
2-in. PVC casing, with breather cap	+2.2-30
2-in. PVC factory-slotted casing (0.032-in. slot size)	30-40
2-in. PVC casing, with end cap for sediment trap	40-45
Finish:	
Bentonite grout	0.5-4
Silica sand pack	4-10
Natural cuttings	10-45
Surface completion:	
6-in. steel protective casing, with locking cover	+2.2-1.8
2x2-ft cement pad	0-0.5

Remarks: Well drilled using auger method; completed on August 30, 1992. Site geologist, S.D. Craigg.

Table 3. Lithologic logs and completion details for monitoring wells drilled in 1992-93 in Quaternary alluvial and glacial deposits in the East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana (Continued)

Description	Depth (feet)
Well name: FPB92-12	
Location number: 28N51E22BBBB01	
Geologic unit: Glacial deposits	
Lithology:	
Silt, sandy, medium-brown	0-5
Clay, silty, medium-brown; encountered a large boulder at 33 ft; from 34-48 ft, becomes more moist; from 48-62 ft, becomes very tight and difficult to drill	5-62
Sand(?); drilling much easier and bit cuts like it is moving through sand, presumably water bearing	62-65
Drilling very difficult; decided to complete well; brought up bit for sample (sample was a gray clay); could not continue augering	65-68
Completion details:	
Well completion:	
2-in. PVC casing, with breather cap	+2.5-33
2-in. PVC factory-slotted casing (0.032-in. slot size)	33-63
2-in. PVC casing, with end cap for sediment trap	63-68
Finish:	
Bentonite grout	0.5-12
Silica sand pack	12-68
Surface completion:	
6-in. steel protective casing, with locking cover	+2.5-1.5
2x2-ft cement pad	0-0.5

Remarks: Well drilled using auger method; completed September 1, 1992. Site geologist, S.D. Craigg. Originally called the interval beginning at 65 ft Bearpaw Shale but later decided (after coring the same material in well FPB92-18) that the material probably is tight glacial clay or, possibly, the Sprole Silt of Pleistocene age.

Table 3. Lithologic logs and completion details for monitoring wells drilled in 1992-93 in Quaternary alluvial and glacial deposits in the East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana (Continued)

Description	Depth (feet)
Well name: FPB92-13	
Location number: 29N51E20DABB01	
Geologic unit: Alluvial deposits	
Lithology:	
Clay, brown, silty, compact	0-4
Clay, light-brown in upper part, dark-brown in lower part, wet	4-12
Gravel of various sizes, with some cobbles	12-20
Sand, fine, saturated. Tried coring, no return	20-37
Sand and gravel, interbedded, with some clay layers; sand fine- to medium-grained, dark-gray. Cored from 44-47 ft with excellent return; also cored interval from 47-52 ft	37-47
Sand, well sorted, medium-grained, gray	47-51
Gravel and clay, sandy	51-52
Clay (Bearpaw Shale)	52-56
Completion details:	
Well completion:	
2-in. PVC casing, with breather cap	+2.1-42
2-in. PVC factory-slotted casing (0.032-in. slot size)	42-52
2-in. PVC casing, with end cap for sediment trap	52-56
Finish:	
No data	
Surface completion:	
6-in. steel protective casing, with locking cover	+2.1-1.9
2x2-ft cement pad	0-0.5

Remarks: Well drilled using auger method; completed on September 18, 1992. Site geologist, M.R. Cannon.

Table 3. Lithologic logs and completion details for monitoring wells drilled in 1992-93 in Quaternary alluvial and glacial deposits in the East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana (Continued)

Description	Depth (feet)
Well name: FPB92-14	
Location number: 29N51E21ABDA01	
Geologic unit: Alluvial deposits	
Lithology:	
Silt, light-brown, dry	0-3
Clay and silt, brown	3-10
Gravel of various sizes, clayey, wet cobbles at 16-17 ft	10-20
Sand and gravel, clayey, gray, saturated	20-22
Clay (Bearpaw Shale), highly fractured. Cored from 28-33 ft, with full return; bentonite layer at 32 ft; a few small fossil shells in core; calcite filling in some of the larger fractures.	22-33
Completion details:	
Well completion:	
2-in. PVC casing, with breather cap	+2.0-15
2 in. PVC factory-slotted casing (0.032-in. slot size)	15-25
2-in. PVC casing, with end cap for sediment trap	25-33
Finish:	
Bentonite grout	0.5-3
Natural cuttings and silica sand pack	3-33
Surface completion:	
6-in. steel protective casing	+2.0-2.0
2x2-ft cement pad	0-0.5

Remarks: Well drilled using auger method; completed on September 19, 1992. Site geologist, M.R. Cannon. The shallow depth of the Bearpaw Shale at this site evidently represents an anomalous high of some type, the reason for which is uncertain.

Table 3. Lithologic logs and completion details for monitoring wells drilled in 1992-93 in Quaternary alluvial and glacial deposits in the East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana (Continued)

Description	Depth (feet)
Well name: FPB92-15	
Location number: 29N51E09ABBA01	
Geologic unit: Alluvial deposits	
Lithology:	
Sand, very fine-grained, silty, light-brown	0-2
Gravel of various sizes, sandy, light-brown, moist below 7 ft	2-12
Gravel of various sizes, sandy, some cobbles up to 3.5 in. in diameter	12-16
Sand, fine- to medium-grained, gravelly, saturated, poor return from auger	16-38
Clay (Bearpaw Shale)	38-42
Completion details:	
Well completion:	
2-in. PVC casing, with breather cap	+2.0-20
2-in. PVC factory-slotted casing (0.032-in. slot size)	20-35
2-in. PVC casing, with end cap for sediment trap	35-42
Finish:	
Bentonite grout	0.5-4
Natural cuttings	4-42
Surface completion:	
6-in. steel protective casing, with locking cover	+2.0-2.0
2x2-ft cement pad	0-0.5

Remarks: Well drilled using auger method; completed on September 20, 1992. Site geologist, M.R. Cannon.

Table 3. Lithologic logs and completion details for monitoring wells drilled in 1992-93 in Quaternary alluvial and glacial deposits in the East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana (Continued)

Description	Depth (feet)
Well name: FPB92-16	
Location number: 29N51E09ABBA02	
Geologic unit: Alluvial deposits	
Lithology:	
Sand, very fine-grained, silty, light-brown	0-2
Gravel, sandy, coarsens downward (refer to log of well FPB92-15)	2-16
Sand, fine- to medium-grained, gravelly	16-37
Clay (Bearpaw Shale)	37-38
Completion details:	
Well completion:	
3-in. PVC casing, with breather cap	+2.2-18
3-in. PVC factory-slotted casing (0.025-in. slot size)	18-33
3-in. PVC casing, with end cap for sediment trap	33-38
Finish:	
No data	
Surface completion:	
6-in. steel protective casing, with locking cover	+2.2-1.8
2x2-ft cement pad	0-0.5

Remarks: Well drilled using auger method; completed on September 20, 1992. Site geologist, M.R. Cannon.

Table 3. Lithologic logs and completion details for monitoring wells drilled in 1992-93 in Quaternary alluvial and glacial deposits in the East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana (Continued)

Description	Depth (feet)
Well name: FPB92-17	
Location number: 29N51E09ABBA03	
Geologic unit: Alluvial deposits	
Lithology:	
Sand, very fine-grained, silty, light-brown	0-2
Gravel of various sizes, sandy, coarsens downward, some cobbles up to 3.5 in. in diameter	2-20
Sand, fine- to medium-grained, gray, gravelly	20-28
Clay, silty, gray; cored entire interval, full return	28-42
Completion details:	
Well completion:	
2-in. PVC casing, with breather cap	+1.9-18
2-in. PVC factory-slotted casing (0.032-in. slot size)	18-28
2-in. PVC casing, with end cap for sediment trap	28-42
Finish:	
No data	
Surface completion:	
6-in. steel casing, with locking cover	+1.9-2.1
2x2-ft cement pad	0-0.5

Remarks: Well drilled using auger method; completed on September 21, 1992. Site geologist, M.R. Cannon. The clay from 28-42 ft is derived from the Bearpaw Shale, but is silty and has no structure; possibly deposited by water and ice reworking of the Bearpaw Shale.

Table 3. Lithologic logs and completion details for monitoring wells drilled in 1992-93 in Quaternary alluvial and glacial deposits in the East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana (Continued)

Description	Depth (feet)
Well name: FPB92-18	
Location number: 28N51E09DCCC01	
Geologic unit: Glacial deposits	
Lithology:	
Sandy loam, brown	0-7
Glacial till (clay loam), mottled yellowish-brown from 7-8 ft, light brown below 8 ft, gray below about 36 ft. Some small pebbles and cobbles, moist. Cored from 38-41.5 ft, with full return; gray till with numerous pebbles. Drilled 58 ft on 09-21-92; harder drilling from 57-58 ft	7-58
Cored interval; excellent return. Till (dark-gray silty clay) with locally interspersed gravel particles of various sizes. Lower 6 in. of core water-yielding, very fine-grained gray	58-63
Sand, very fine-grained, gray, saturated; minor particles of transported coal fragments present	63-68
Same as interval above, only a few gravels present	68-80
Drilling characteristics indicate probable gravel bed	80-95
Gravel of various sizes coming up stuck onto sticky clay on auger sections. Drilling reached maximum limit of auger rig at 98 ft; still apparently in glacial till	95-98
Completion details	
Well completion:	
2-in. PVC casing, with breather cap	+1.9-68
2-in. PVC factory-slotted casing (0.032-in. slot size)	68-88
2-in. PVC casing, with end cap for sediment trap	88-93
Finish:	
Bentonite grout	0.5-10
Silica sand pack (natural cuttings at bottom)	10-93
Surface completion:	
6-in. steel protective casing, with locking cover	+1.9-2.1
2x2 ft-cement pad	0-0.5
Remarks: Well drilled using auger method; completed on September 22, 1992. S.D. Craigg replaced M.R. Cannon as site geologist 09-22-92. Had planned to try to get to 115 ft with this hole, but the limit of the auger rig was reached at 98 ft. Did not reach the Bearpaw Shale.	

Table 3. Lithologic logs and completion details for monitoring wells drilled in 1992-93 in Quaternary alluvial and glacial deposits in the East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana (Continued)

Description	Depth (feet)
Well name: FPB93-1	
Location number: 29N51E09ABBA04	
Geologic unit: Alluvial deposits	
Lithology:	
Sand, silty, very fine-grained, light-brown	0-2
Gravel and cobbles, coarsens downwards	2-18
Sand and gravel, interbedded	18-38
Clay/shale, gray, soft, smooth, sticky (Bearpaw Shale)	38-40
Completion details:	
Well completion:	
4-in. PVC casing, with breather cap	+2.2-8
4-in. PVC factory-slotted casing (0.025-in. slot size)	8-33
4-in. PVC casing, with end cap for sediment trap	33-36
Finish:	
Bentonite grout	0.5-6
Natural gravel and silica sand pack	6-40
Surface completion:	
6-in. steel protective casing, with locking cover	+2.2-1.8
2x2-ft cement pad	0-0.5

Remarks: Well drilled using mud rotary method; completed on June 22, 1993. Site geologist, M.R. Cannon. Drilled as pumped well for aquifer test in alluvial deposits (observation wells were FPB92-15, 16, and 17).

Table 3. Lithologic logs and completion details for monitoring wells drilled in 1992-93 in Quaternary alluvial and glacial deposits in the East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana (Continued)

Description	Depth (feet)
Well name: FPB93-2	
Location number: 29N51E32BBBA04	
Geologic unit: Alluvial deposits	
Lithology:	
Sand, brown	0-8
Gravel	8-10
Gravel, sandy	10-18
Gravel	18-23
Sand, dark-gray	23-30
Completion details:	
Well completion:	
2-in. PVC casing, with breather cap	+2.5-18
2-in. PVC factory-slotted casing (0.032-in. slot size; no sediment trap)	18-27
Finish:	
Natural cuttings	0.5-11
Bentonite grout	11-12
Natural cuttings	12-19
Silica sand pack	19-27
Surface completion:	
6-in. steel protective casing, with locking cover	+2.5-1.5
2x2-ft cement pad	0-0.5

Remarks: Well drilled using mud rotary method; completed on June 23, 1993. Site geologist, R.E. Davis.

Table 3. *Lithologic logs and completion details for monitoring wells drilled in 1992-93 in Quaternary alluvial and glacial deposits in the East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana (Continued)*

Description	Depth (feet)
Well name: FPB93-3	
Location number: 28N51E22CBCB01	
Geologic unit: Glacial deposits	
Lithology:	
Clay loam and gravel, caramel-brown	0-25
Clay and gravel, mostly coarse to very coarse pebble gravel, caramel-brown	25-33
Sand, fine-grained, caramel-brown	33-40
Gravel and sand, mostly fine pebble gravel, caramel-brown	40-46
Sand and cobbles	46-50
Sand and large cobbles	50-56
Shale, dark-gray, smooth, small pink calcareous pieces (Bearpaw Shale)	56-81
Completion details:	
Well completion:	
4-in. PVC casing, with breather cap	+1.6-52
4-in. PVC factory-slotted casing (0.025-in. slot size)	52-57
4-in. PVC casing, with end cap for sediment trap	57-81
Finish:	
Bentonite grout	0.5-44
Natural cuttings	44-81
Surface completion:	
6-in. steel protective casing, with locking cover	+1.6-2.4
2x2-ft cement pad	0-0.5

Remarks: Well drilled using mud rotary method; completed on June 24, 1993. Site geologist, J.N. Thamke. The purpose of this site is to provide a deep well and a shallow well in glacial deposits to measure vertical differences in water quality and density. This well is the deeper of two wells at the site; well FPB93-3A is the shallow well.

Table 3. Lithologic logs and completion details for monitoring wells drilled in 1992-93 in Quaternary alluvial and glacial deposits in the East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana (Continued)

Description	Depth (feet)
Well name: FPB93-3A	
Location number: 28N51E22CBCB02	
Geologic unit: Glacial deposits	
Lithology:	
Clay and gravel, medium-sized pebbles, some sand	0-12
Clay and gravel, minor amounts of iron staining on clay; gravel more abundant than in interval above	12-20
Clay and gravel, mostly fine pebble gravel	20-26
Gravel, clay, and sand, black and brown; mostly coarse pebble gravel and fine sand	26-31
Sand and gravel, caramel-brown; mostly coarse pebble gravel	31-36
Gravel, very coarse pebble gravel	36-46
Gravel and sand, mostly very coarse pebble gravel	46-51
Completion details:	
Well completion:	
4-in. PVC casing, with breather cap	+1.8-41
4-in. PVC factory-slotted casing (0.025-in. slot size)	41-46
4-in. PVC casing, with end cap for sediment trap	46-49
Finish:	
Bentonite grout	0.5-37
Silica sand pack	37-51
Surface completion:	
6-in. steel protective casing, with locking cover	+1.8-2.2
2x2-ft cement pad	0-0.5

Remarks: Well drilled using mud rotary method; completed on June 25, 1993. Site geologist, J. N. Thamke. The purpose of this site is to provide a deep well and a shallow well in glacial deposits to measure vertical differences in water quality and density. This well is the shallower of two wells at the site; well FPB93-3 is the deep well.

Table 3. Lithologic logs and completion details for monitoring wells drilled in 1992-93 in Quaternary alluvial and glacial deposits in the East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana (Continued)

Description	Depth (feet)
Well name: FPB93-4A	
Location number: 28N51E33DDCC03	
Geologic unit: Wiota Gravel	
Lithology:	
Topsoil	0-2
Gravel, medium-pebble size; some thin, sandy seams	2-4
Clay and gravel, silty, dark-brown; mostly fine to medium pebble gravel	4-29
Gravel and clay	29-35
Clay, plastic; some granular iron concretions	35-39
Sand and clay, dark-brown	39-41
Gravel and sand, dark-brown, mostly fine pebble gravel, well rounded (Wiota Gravel)	41-61
Shale, steel-blue, hard, consolidated (Bearpaw Shale)	61-70
Completion details:	
Well completion:	
4-in. PVC casing, with breather cap	+1.7-40
4-in. PVC factory-slotted casing (0.025-in. slot size)	40-60
4-in. PVC casing, with end cap for sediment trap	60-65
Finish:	
Bentonite grout	0.5-31
Silica sand pack	31-54
Natural cuttings, gravel	54-70
Surface completion:	
6-in. steel protective casing, with locking cover	+1.7-2.3
2x2-ft cement pad	0-0.5

Remarks: Well completed using mud rotary method; completed on June 26, 1993. Site geologist, J.N. Thamke. Well drilled as an observation well for aquifer test in glacial deposits (the other observation well was FPB93-4C; the pumped well was FPB93-4B).

Table 3. Lithologic logs and completion details for monitoring wells drilled in 1992-93 in Quaternary alluvial and glacial deposits in the East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana (Continued)

Description	Depth (feet)
Well name: FPB93-4B	
Location number: 28N51E33DDCC04	
Geologic unit: Wiota Gravel	
Lithology:	
Topsoil	0-2
Gravel	2-6
Clay, moist; small iron concretions	6-10
Clay and gravel, gray, hard; mostly fine pebble gravel	10-20
Clay and gravel, silty; some small iron concretions	20-40
Silt, sandy	40-42
Gravel, mostly fine pebble gravel, well rounded (Wiota Gravel)	42-62
Bearpaw Shale	62-70
Completion details:	
Well completion:	
4-in. PVC casing, with breather cap	+1.9-40
4-in. PVC factory-slotted casing (0.025-in. slot size; no sediment trap)	40-65
Finish:	
Bentonite grout	0.5-33
Silica sand pack	33-70
Surface completion:	
6-in. steel protective casing, with locking cover	+1.9-2.1
2x2-ft cement pad	0-0.5

Remarks: Well drilled using mud rotary method; completed on June 27, 1993. Site geologist, J.N. Thamke. Well drilled as the pumped well for aquifer test in glacial deposits (the observation wells were FPB93-4A and 4C).

Table 3. Lithologic logs and completion details for monitoring wells drilled in 1992-93 in Quaternary alluvial and glacial deposits in the East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana (Continued)

Description	Depth (feet)
Well name: FPB93-4C	
Location number: 28N51E33DDCC05	
Geologic unit: Wiota Gravel	
Lithology:	
Clay and gravel, gray, hard; mostly fine pebble gravel	0-37
Clay and gravel, some iron concretions	37-39
Silt, sandy, brown; some iron color; thin, interbedded gravel layer at 43 ft	39-47
Gravel; thin, interbedded sand seams	47-48
Wiota Gravel	48-61
Bearpaw Shale	61-67
Completion details:	
Well completion:	
4-in. PVC casing, with breather cap	+1.7-41
4-in. PVC factory-slotted casing (0.025-in. slot size)	41-61
4-in. PVC casing, with end cap for sediment trap	61-66
Finish:	
Bentonite grout	0.5-37
Silica sand pack	37-67
Surface completion:	
6-in. steel protective casing, with locking cover	+1.7-2.3
2x2-ft cement pad	0-0.5

Remarks: Well drilled using mud rotary method; completed on June 27, 1993. Site geologist, J.N. Thamke. Well drilled as an observation well for aquifer test in glacial deposits (the other observation well was FPB93-4A; the pumped well was FPB93-4B).

Table 3. Lithologic logs and completion details for monitoring wells drilled in 1992-93 in Quaternary alluvial and glacial deposits in the East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana (Continued)

Description	Depth (feet)
Well name: FPB93-5	
Location number: 28N51E09CDBB01	
Geologic unit: Glacial deposits	
Lithology:	
Clay and sand, light-brown	0-5
Clay and sand, light-brown; small rock fragments	5-12
Cobble, black, large; granitic origin; contains garnet crystals	12-13
Clay and sand; minor amounts of fine pebble gravel	13-20
Clay, brown, sticky; minor amounts of well-rounded, fine pebble gravel	20-35
Clay, gray, hard, plastic; minor amounts of gravel with occasional cobbles	35-61
Gravel, dark-red and brown, well-rounded, coarse pebble gravel; contains coal fragments	61-80
Gravel; coal fragments becoming more abundant; thin, sandy seam at 86 ft	80-99
Shale, steel-gray, shiny, hard, slippery (Bearpaw Shale)	99-106
Completion details:	
Well completion:	
4-in. PVC casing, with breather cap	+2.1-81
4-in. PVC factory-slotted casing (0.025-in. slot size)	81-101
4-in. PVC casing, with end cap for sediment trap	101-104
Finish:	
Bentonite grout	0.5-12
Natural cuttings and silica sand pack	12-104
Surface completion:	
6-in. steel protective casing, with locking cover	+2.1-1.9
2x2-ft cement pad	0-0.5

Remarks: Well drilled using mud rotary method; completed on June 28, 1993. Site geologist, J.N. Thamke. The purpose of this well is to help delineate extent of saline-water plume in glacial deposits.

Table 4. Data from aquifer test conducted in Quaternary alluvial deposits on August 18, 1993 in the East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana

[--, no data or not applicable]

Well	Time after start of test (minutes)	Depth to water below measuring point (feet)	Draw-down (feet)	Residual drawdown (feet)	Remarks
Observation well FPB92-15	0.00	9.65	0.00	--	Water-level measurements by S.D. Craigg (initial and
	.25	10.15	.50	--	final two measurements with steel tape; others with
	.50	10.27	.62	--	electric line and steel tape attached). Pumped well
	.75	10.34	.69	--	FPB93-1. Pump on at 0850 hours. Discharge held
	1.00	10.43	.78	--	constant at 40 gallons per minute for 180 minutes. Well
	1.25	10.48	.83	--	located 10.2 ft north of pumped well FPB93-1.
	1.50	10.52	.87	--	
	1.75	10.54	.89	--	
	2.00	10.56	.91	--	
	2.25	10.59	.94	--	
	2.50	10.63	.98	--	
	2.75	10.63	.98	--	
	3.00	10.63	.98	--	
	3.50	10.64	.99	--	
	4.00	10.66	1.01	--	
	4.50	10.68	1.03	--	
	5.00	10.68	1.03	--	
	6.00	10.70	1.05	--	
	7.00	10.71	1.06	--	
	8.00	10.72	1.07	--	
	9.00	10.73	1.08	--	
	10	10.73	1.08	--	
	12	10.73	1.08	--	
	14	10.73	1.08	--	
	16	10.73	1.08	--	
	18	10.73	1.08	--	
	20	10.73	1.08	--	
	25	10.74	1.09	--	
	30	10.74	1.09	--	
	35	10.74	1.09	--	
	40	10.74	1.09	--	
	45	10.74	1.09	--	
	50	10.74	1.09	--	
	60	10.74	1.09	--	
	70	10.74	1.09	--	
	80	10.74	1.09	--	
	90	10.74	1.09	--	
	100	10.74	1.09	--	
	120	10.75	1.10	--	
	140	10.75	1.10	--	
	160	10.76	1.11	--	
	180	10.76	1.11	--	Pump off at 1150 hours.
	180.25	10.53	--	0.88	Residual drawdown values measured during recovery.
	180.50	10.30	--	.65	
	180.75	10.15	--	.50	
	181.00	10.04	--	.39	
	181.25	9.94	--	.29	
	181.50	9.92	--	.27	
	181.75	9.89	--	.24	
	182.00	9.86	--	.21	
	182.25	9.84	--	.19	

Table 4. Data from aquifer test conducted in Quaternary alluvial deposits on August 18, 1993 in the East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana (Continued)

Well	Time after start of test (minutes)	Depth to water below measuring point (feet)	Draw-down (feet)	Residual drawdown (feet)	Remarks
Observation well FPB92-15 (Continued)	182.50	9.83	--	.18	
	182.75	9.81	--	.16	
	183.00	9.79	--	.14	
	183.50	9.77	--	.12	
	184.00	9.76	--	.11	
	184.50	9.74	--	.09	
	185	9.74	--	.09	
	186	9.73	--	.08	
	187	9.72	--	.07	
	188	9.70	--	.05	
	189	9.70	--	.05	
	190	9.70	--	.05	
	192	9.69	--	.04	
	194	9.68	--	.03	
	196	9.68	--	.03	
	198	9.68	--	.03	
	200	9.68	--	.03	
	205	9.68	--	.03	
	210	9.68	--	.03	
	215	9.67	--	.02	
	220	9.67	--	.02	
	225	9.67	--	.02	
	230	9.67	--	.02	
	240	9.66	--	.01	
	250	9.66	--	.01	
	260	9.65	--	.00	Ended test at 1310 hours on 08-18-93. Final measurement
	1,750	9.65	--	.00	made at approximately 1400 hours on August 19, 1993.
Observation well FPB92-16	.00	9.80	.00	--	Water-level measurements by Eloise Kendy for first 30
	.20	10.25	.45	--	minutes, and by D.W. Briar and S.D. Craigg thereafter
	.45	10.51	.71	--	(initial and final two measurements with steel tape;
	.60	10.62	.82	--	others with electric line and steel tape attached).
	.78	10.71	.91	--	Pumped well FPB93-1. Pump on at 0850 hours.
	1.20	10.79	.99	--	Discharge held constant at 40 gallons per minute for
	1.28	10.86	1.06	--	180 minutes. Well located 8.1 ft north of pumped well
	1.50	10.90	1.10	--	FPB93-1.
	1.73	10.94	1.14	--	
	1.95	10.98	1.18	--	
	2.15	10.99	1.19	--	
	2.43	11.01	1.21	--	
	2.67	11.02	1.22	--	
	2.88	11.03	1.23	--	
	3.05	11.04	1.24	--	
	3.40	11.06	1.26	--	
	3.58	11.07	1.27	--	
	3.90	11.07	1.27	--	
	4.13	11.07	1.27	--	
	4.53	11.09	1.29	--	
	4.87	11.10	1.30	--	
	5.20	11.11	1.31	--	
	5.38	11.11	1.31	--	
	5.82	11.11	1.31	--	
	6.28	11.11	1.31	--	
	6.83	11.13	1.33	--	
	7.20	11.13	1.33	--	

Table 4. Data from aquifer test conducted in Quaternary alluvial deposits on August 18, 1993 in the East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana (Continued)

Well	Time after start of test (minutes)	Depth to water below measuring point (feet)	Draw-down (feet)	Residual drawdown (feet)	Remarks
Observation well FPB92-16 (Continued)	7.78	11.13	1.33	--	
	8.90	11.13	1.33	--	
	9.30	11.14	1.34	--	
	10.92	11.15	1.35	--	
	11.90	11.15	1.35	--	
	13	11.15	1.35	--	
	14	11.15	1.35	--	
	15	11.15	1.35	--	
	16	11.15	1.35	--	
	17	11.15	1.35	--	
	18	11.16	1.36	--	
	19	11.16	1.36	--	
	20	11.16	1.36	--	
	23	11.16	1.36	--	
	25	11.16	1.36	--	
	30	11.15	1.35	--	
	35	11.16	1.36	--	
	40	11.16	1.36	--	
	45	11.17	1.37	--	
	50	11.18	1.38	--	
	60	11.18	1.38	--	
	70	11.18	1.38	--	
	80	11.19	1.39	--	
	90	11.19	1.39	--	
	100	11.19	1.39	--	
	120	11.19	1.39	--	
	140	11.19	1.39	--	
	160	11.20	1.40	--	
	180	11.21	1.41	--	Pump off at 1150 hours.
	197	9.85	--	.05	Residual drawdown values measured during recovery.
	201	9.85	--	.05	
	206	9.84	--	.04	
	211	9.84	--	.04	
	250	9.83	--	.03	
	260	9.80	--	.00	Ended test at 1310 hours on August 18, 1993. Final
	1,750	9.81	--	.01	measurement made at approximately 1400 hours on August 19, 1993.
Observation well FPB92-17	.00	9.21	.00	--	Water-level measurements by J.N. Thamke for first 30
	.25	9.30	.09	--	minutes, and by D.W. Briar and S.D. Craigg thereafter
	.50	9.41	.20	--	(initial and final two measurements with steel tape;
	.75	9.48	.27	--	others with electric line and steel tape attached).
	1.00	9.53	.32	--	Pumped well FPB93-1. Pump on at 0850 hours.
	1.25	9.58	.37	--	Discharge held constant at 40 gallons per minute for 180
	1.50	9.60	.39	--	minutes. Well located 72 ft south of pumped well
	1.75	9.63	.42	--	FPB93-1.
	2.00	9.65	.44	--	
	2.25	9.68	.47	--	
	2.50	9.70	.49	--	
	3.00	9.71	.50	--	
	3.50	9.73	.52	--	
	4.00	9.75	.54	--	
	4.50	9.76	.55	--	

Table 4. Data from aquifer test conducted in Quaternary alluvial deposits on August 18, 1993 in the East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana (Continued)

Well	Time after start of test (minutes)	Depth to water below measuring point (feet)	Draw-down (feet)	Residual drawdown (feet)	Remarks
Observation well FPB92-17 (Continued)	5.00	9.76	.55	--	
	6.00	9.77	.56	--	
	7.00	9.78	.57	--	
	8.00	9.79	.58	--	
	9.00	9.80	.59	--	
	10	9.80	.59	--	
	12	9.81	.60	--	
	14	9.81	.60	--	
	16	9.81	.60	--	
	18	9.81	.60	--	
	20	9.82	.61	--	
	25	9.82	.61	--	
	30	9.82	.61	--	
	36	9.82	.61	--	
	40	9.82	.61	--	
	47	9.83	.62	--	
	50	9.83	.62	--	
	60	9.84	.63	--	
	70	9.84	.63	--	
	80	9.84	.63	--	
	90	9.84	.63	--	
	100	9.84	.63	--	
	118	9.84	.63	--	
	140	9.85	.64	--	
	160	9.85	.64	--	
	180	9.85	.64	--	Pump off at 1150 hours.
	180.28	9.79	--	.58	Residual drawdown values measured during recovery.
	180.50	9.70	--	.49	
	180.75	9.61	--	.40	
	181.00	9.54	--	.33	
	181.25	9.50	--	.29	
	181.50	9.47	--	.26	
	181.75	9.43	--	.22	
	182.00	9.41	--	.20	
	182.25	9.39	--	.18	
	182.50	9.37	--	.16	
	182.75	9.36	--	.15	
	183.00	9.35	--	.14	
	183.50	9.34	--	.13	
	184.00	9.33	--	.12	
	184.50	9.32	--	.11	
	185	9.31	--	.11	
	186	9.29	--	.08	
	187	9.28	--	.07	
	188	9.28	--	.07	
	189	9.28	--	.07	
	190	9.28	--	.07	
	192	9.27	--	.06	
	194	9.26	--	.05	
	196	9.26	--	.05	
	198	9.26	--	.05	
	200	9.26	--	.05	
	205	9.26	--	.05	

Table 4. Data from aquifer test conducted in Quaternary alluvial deposits on August 18, 1993 in the East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana (Continued)

Well	Time after start of test (minutes)	Depth to water below measuring point (feet)	Draw-down (feet)	Residual drawdown (feet)	Remarks
Observation well FPB92-17 (Continued)	210	9.25	--	.04	
	215	9.25	--	.04	
	235	9.24	--	.03	
	250	9.24	--	.03	
	260	9.23	--	.02	Ended test at 1310 hours on August 18, 1993. Final measurement made at approximately 1400 hours on August 19, 1993.
	1,750	9.23	--	.02	

Table 5. Data from aquifer test conducted in Quaternary glacial deposits on August 19, 1993 in the East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana

[--, no data or not applicable]

Well	Time after start of test (minutes)	Depth to water below measuring point (feet)	Draw-down (feet)	Residual drawdown (feet)	Remarks
Observation well FPB93-4A	0.00	43.51	0.00	--	Water-level measurements by S.D. Craigg (initial and final six measurements with steel tape; others with electric line and steel tape attached). Pump on at 0830 hours. Discharge held constant at 12.5 gallons per minute for 110 minutes. Well located 7.1 ft south of pumped well FPB93-4B.
	.25	43.51	.00	--	
	.50	43.51	.00	--	
	.75	43.51	.00	--	
	1.00	43.51	.00	--	
	1.25	43.57	.06	--	
	1.50	43.61	.10	--	
	1.75	43.65	.14	--	
	2.00	43.69	.18	--	
	2.25	43.72	.21	--	
	2.50	43.75	.24	--	
	2.75	43.75	.24	--	
	3.00	43.76	.25	--	
	3.50	43.77	.26	--	
	4.00	43.79	.28	--	
	4.50	43.80	.29	--	
	5.00	43.81	.30	--	
	6.00	43.81	.30	--	
	7.00	43.82	.31	--	
	8.00	43.83	.32	--	
	9.00	43.84	.33	--	
	10	43.85	.34	--	
	12	43.85	.34	--	
	14	43.86	.35	--	
	16	43.87	.36	--	
	18	43.87	.36	--	
	20	43.88	.37	--	
	25	43.89	.38	--	
	30	43.90	.39	--	
	35	43.91	.40	--	
	40	43.91	.40	--	
	45	43.92	.41	--	
	50	43.93	.42	--	
	60	43.94	.43	--	
	70	43.95	.44	--	
	80	43.97	.46	--	
	90	43.98	.47	--	
	100	43.99	.48	--	
	110	43.99	.48	--	
	110.25	43.96	--	0.45	Residual drawdown values measured during recovery.
	110.50	43.91	--	.40	
	110.75	43.85	--	.34	
	111.00	43.80	--	.29	
	111.25	43.75	--	.24	
	111.50	43.72	--	.21	
	111.75	43.71	--	.20	
	112.25	43.71	--	.20	
	112.50	43.70	--	.19	
	112.75	43.69	--	.18	
	113.00	43.69	--	.18	

Table 5. Data from aquifer test conducted in Quaternary glacial deposits on August 19, 1993 in the East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana (Continued)

Well	Time after start of test (minutes)	Depth to water below measuring point (feet)	Draw-down (feet)	Residual drawdown (feet)	Remarks
Observation well FPB93-4A (Continued)	113.50	43.69	--	.18	
	114.00	43.68	--	.17	
	114.50	43.67	--	.16	
	115.00	43.67	--	.16	
	116	43.66	--	.15	
	117	43.65	--	.14	
	118	43.65	--	.14	
	119	43.64	--	.13	
	120	43.63	--	.12	
	122	43.63	--	.12	
	124	43.63	--	.12	
	126	43.62	--	.11	
	128	43.62	--	.11	
	130	43.62	--	.11	
	135	43.61	--	.10	
	140	43.61	--	.10	
	145	43.60	--	.09	
	150	43.59	--	.08	
	155	43.59	--	.08	
	160	43.56	--	.05	
	170	43.56	--	.05	
	180	43.52	--	.01	
	190	43.52	--	.01	
	200	43.52	--	.01	
	210	43.52	--	.01	Ended test at 1200 hours on August 19, 1993. Final measurement made
	1,290	43.50	--	+.01	at approximately 0600 hours on August 20, 1993. Final measurement 0.01 ft above initial static water level.
Pumped well FPB93-4B	.00	43.88	.00	--	Water-level measurements by D.W. Briar (initial and final three measurements with steel tape; others with electric line and steel tape attached). Pump on at 0830 hours. Discharge held constant at 12.5 gallons per minute for 110 minutes.
	2.45	50.62	6.74	--	
	4.00	51.16	7.28	--	
	5.00	51.33	7.45	--	
	6.00	51.38	7.50	--	
	7.00	51.41	7.53	--	
	8.00	51.50	7.62	--	
	9.00	51.56	7.68	--	
	10	51.56	7.68	--	
	12	51.60	7.72	--	
	14	51.66	7.78	--	
	16	51.71	7.83	--	
	18	51.75	7.87	--	
	20	51.77	7.89	--	
	25	51.90	8.02	--	
	30	51.98	8.10	--	
	40	52.06	8.18	--	
	46	52.06	8.18	--	
	52	52.15	8.27	--	
	61	52.22	8.34	--	
	70	52.19	8.31	--	
	81	52.28	8.40	--	
	90	52.26	8.38	--	
	100	52.29	8.41	--	
	110	52.28	8.40	--	Pump off at 1020 hours.

Table 5. Data from aquifer test conducted in Quaternary glacial deposits on August 19, 1993 in the East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana (Continued)

Well	Time after start of test (minutes)	Depth to water below measuring point (feet)	Draw-down (feet)	Residual drawdown (feet)	Remarks
Pumped well FPB93-4B (Continued)	121	45.04	--	1.16	Begin water-level measurements by S.D. Craigg. Ended test at 1200 hours on August 19, 1993. Final measurement made at approximately 0600 hours on August 20, 1993. Final measurement 0.02 ft above initial static water level.
	140	43.92	--	.04	
	165	43.88	--	.00	
	1,290	43.86	--	+.02	
Observation well FPB93-4C	.00	43.87	.00	--	Water-level measurements by F.A. Bailey (initial and final two measurements with steel tape; others with electric line and steel tape attached). Pump on at 0830 hours. Discharge held constant at 12.5 gallons per minute for 110 minutes. Well located 29.5 ft north of pumped well FPB93-4B.
	.25	--	--	--	
	.50	--	--	--	
	.75	--	--	--	
	1.00	--	--	--	
	1.25	--	--	--	
	1.50	--	--	--	
	1.75	43.89	.02	--	
	2.00	43.90	.03	--	
	2.25	43.92	.05	--	
	2.50	43.93	.06	--	
	2.75	43.94	.07	--	
	3.00	43.95	.08	--	
	3.50	43.96	.09	--	
	4.00	43.97	.10	--	
	4.50	43.98	.11	--	
	5.00	43.99	.12	--	
	6.00	44.00	.13	--	
	7.00	44.01	.14	--	
	8.00	44.02	.15	--	
	9.00	44.03	.16	--	
	10	44.03	.16	--	
	12	44.04	.17	--	
	14	44.05	.18	--	
	16	44.05	.18	--	
	18	44.06	.19	--	
	20	44.06	.19	--	
	25	44.07	.20	--	
	30	44.08	.21	--	
	35	44.09	.22	--	
	40	44.10	.23	--	
	45	44.10	.23	--	
	51	44.11	.24	--	
	60	44.12	.25	--	
	70	44.13	.26	--	
	80	44.14	.27	--	
	90	44.15	.28	--	
	100	44.16	.29	--	
	110	44.16	.29	--	
	110.25	44.16	--	.29	Residual drawdown values measured during recovery.
	110.50	44.16	--	.29	
	110.75	44.15	--	.28	
	111.00	44.15	--	.28	
	111.25	44.13	--	.26	
	111.50	44.12	--	.25	
	111.75	44.11	--	.24	
	112.00	44.08	--	.21	

Table 5. Data from aquifer test conducted in Quaternary glacial deposits on August 19, 1993 in the East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana (Continued)

Well	Time after start of test (minutes)	Depth to water below measuring point (feet)	Draw-down (feet)	Residual drawdown (feet)	Remarks
Observation well FPB93-4C (Continued)	112.25	44.08	--	.21	
	112.50	44.07	--	.20	
	112.75	44.06	--	.19	
	113.00	44.05	--	.18	
	113.50	44.05	--	.18	
	114.00	44.04	--	.17	
	114.50	44.03	--	.16	
	115	44.03	--	.16	
	116	44.02	--	.15	
	117	44.01	--	.14	
	118	44.01	--	.14	
	119	44.01	--	.14	
	120	44.00	--	.13	
	122	44.00	--	.13	
	124	43.99	--	.12	
	126	43.99	--	.12	
	128	43.99	--	.12	
	130	43.98	--	.11	
	135	43.97	--	.10	
	140	43.97	--	.10	Begin water-level measurements by S.D. Craigg.
	145	43.96	--	.09	
	150	43.95	--	.08	
	155	43.95	--	.08	
	160	43.95	--	.08	
	170	43.93	--	.06	
	180	43.93	--	.06	
	190	43.94	--	.05	
	200	43.94	--	.05	
	210	43.89	--	.02	Ended test at 1200 hours on August 19, 1993. Final measurement made
	1,290	43.85	--	+.02	at approximately 0600 hours on August 20, 1993. Final measurement 0.02 ft above initial static water level.

Table 6. Physical properties and major-ion concentrations in water samples collected from privately owned wells, monitoring wells, oil wells, and brine-injection wells in the East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana

Site number--numbering system described in text.

Geologic unit (in which well is completed; for brine-injection wells, indicates unit that is the source of the brine)--

- Qal - Alluvium (Quaternary)
- Qt - Glacial till (Pleistocene)
- Qgo - Glacial outwash (Pleistocene)
- Qw - Wiota Gravel (Pleistocene)
- Kb - Bearpaw Shale (Upper Cretaceous)
- Kjr - Judith River Formation (Upper Cretaceous)
- Mh - Heath Formation (Upper Mississippian)
- Mk - Kibbey Formation (Upper Mississippian)
- Mm - Madison Group (Mississippian)
  - Mc - Charles Formation of Madison Group
  - Mmc - Mission Canyon Limestone of Madison Group
- Dn - Nisku Formation (Upper Devonian)

Depth of well--in feet below land surface.

Constituents are dissolved, except as indicated.

Collecting agency and analyzing laboratory:

ASCHM, Astro-Chem Service Laboratory,
CHNO, Chen-Northern, Inc.,
ELAB, Energy Laboratories, Inc.,
IHS, Public Health Service/Indian Health Service-Fort Peck Service Unit,
MBMG, Montana Bureau of Mines and Geology,
MDHES, Montana Department of Health and Environmental Sciences, Water Quality Bureau,
NALCO, Nalco Chemical Company,
PETRO, Petrolite Oil Field Chemicals Group,
USGS, U.S. Geological Survey,
YSB, Yapuncich, Sanderson, and Brown Laboratories, currently Energy Laboratories, Inc.

Abbreviations: µS/cm, microsiemens per centimeter at 25 degrees Celsius; °C, degrees Celsius; g/mL, grams per milliliter; mg/L, milligrams per liter. Symbols: <, less than; --, no data.

Table 6. Physical properties and major-ion concentrations in water samples collected from privately owned wells, monitoring wells, oil wells, and brine-injection wells in the East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana (Continued)

Site number	Geologic unit	Depth of well (feet)	Collecting agency	Analyzing agency	Date sample collected	Specific conductance, onsite (µS/cm)	pH, onsite (standard units)	Water temperature, onsite (°C)	Density (g/mL at 20°C)	Hardness, total (mg/L as $CaCO_3$)	Calcium, dissolved (mg/L as Ca)
28N51E01BBBB01	Qt	153	USGS	USGS	07-21-82	2,820	7.2	12.0	--	1,100	110
			USGS	USGS	07-20-91	3,930	6.7	12.0	--	1,700	170
28N51E02ACDB01[2]	Mm	834	--	--	09-14-64	173,000	8.1	--	--	2,900	970
28N51E03BCAC 01	Mh,Mm	3,575	--	NALCO	[3]09-22-89	--	[1]5.9	--	--	--	920
28N51E04CCCD01	Qt	50	USGS	USGS	08-25-90	2,650	7.6	10.0	--	410	69
28N51E08ADDA01	Qal	52	USGS	USGS	08-23-90	[1]2,050	7.7	11.0	--	280	48
28N51E08CCBB01	Qal	22	--	CHNO	11-08-88	[1]1,500	[1]7.6	--	--	440	99
28N51E08DDDB01	Qt	102	USGS	USGS	08-25-90	8,120	7.1	10.0	--	2,200	400
28N51E09BCBB01	Qt	90	USGS	USGS	07-17-91	2,610	7.5	18.0	--	380	61
28N51E09CCDD01	Qt	117	--	CHNO	04-07-89	[1]2,910	[1]7.3	--	--	540	100
			--	CHNO	08-16-89	[1]3,220	[1]7.2	--	--	570	100
			USGS	USGS	07-19-91	[1]3,180	7.3	11.5	--	650	120
28N51E09CDBB01	Qt	104	USGS	USGS	[4]08-12-93	18,300	6.9	11.0	1.005	4,600	870
			USGS	USGS	[4]08-12-93	18,300	6.9	11.0	1.005	4,700	890
28N51E09DCCC01	Qt	93	USGS	USGS	08-13-93	1,400	7.4	10.0	--	550	120
28N51E10DADC01	Mc,Dn	7,000	--	NALCO	08-24-84	--	[1]5.8	--	--	--	1,600
28N51E10DBAD01	Mm	780 (?)	USGS	USGS	07-24-89	[1]124,000	6.4	80.0	--	3,000	950
			--	NALCO	[3]12-11-89	--	[1]5.8	--	--	--	1,000
			USGS	USGS	08-29-90	117,000	[1]7.0	61.5	--	2,300	700
28N51E12CCBD01	Mm	[5]5,910-5,920	USGS	USGS	12-09-54	--	--	--	--	3,200	1,000
28N51E13CCCA01	Qt	33	USGS	USGS	08-22-90	3,600	7.4	11.0	--	1,700	240
28N51E13CCCC01	Qw	150	USGS	USGS	08-22-90	3,000	7.3	12.0	--	810	110
28N51E16DBCB01	Qt	104	USGS	USGS	07-23-89	10,000	7.3	10.0	--	2,900	580
			USGS	USGS	07-21-91	12,700	7.3	13.5	--	3,600	700
28N51E17ABDC01	Qal	36	USGS	USGS	08-26-90	7,000	7.3	11.0	--	1,900	350
28N51E17ABDD01	Qt	40	USGS	USGS	[4]08-26-90	8,600	7.2	10.0	--	2,500	480
			USGS	USGS	[4]08-26-90	8,600	7.2	10.0	--	2,500	480
28N51E17ADAD01	Qt	130	USGS	USGS	07-16-91	5,380	7.2	10.5	--	1,300	240
28N51E17DADA01	Qt	102	--	YSB	02-10-75	[1]1,080	[1]7.2	--	--	180	34
			USGS	USGS	08-25-90	4,400	7.4	10.5	--	900	160
28N51E21BDBC01	Qt	91	USGS	USGS	08-26-90	5,820	7.4	10.0	--	1,700	330
28N51E22BBBB01	Qt	68	USGS	USGS	07-24-93	3,050	7.3	11.0	1.001	1,800	280
28N51E22BDCA01	Mc	5,872	--	ASCHM	[3]04-30-81	[1]120,000	[1]7.3	--	--	--	4,000
28N51E22CBCB01	Qt	81	USGS	USGS	07-21-93	98,600	6.6	18.0	1.046	4,400	1,200
28N51E22CBCB02	Qt	49	USGS	USGS	07-20-93	97,200	6.5	19.0	1.045	4,500	1,300
28N51E22CDCC01	Qt	85	--	ELAB	07-09-85	[1]4,010	[1]7.1	--	--	1,900	300
			USGS	USGS	07-20-89	13,000	6.8	11.0	--	5,600	920
			USGS	USGS	07-20-91	26,500	6.3	12.5	--	9,800	1,600
28N51E25ACBC01	Mk	[5]5,350-5,380	USGS	USGS	01-09-67	73,200	7.1	--	--	2,400	810
	Mc	[5]5,640-5,680	USGS	USGS	01-09-67	160,000	6.8	--	--	3,200	1,000
28N51E27ABAA01	Qt	135	--	ASCHM	[3]10-11-89	[1]1,310	[1]8.2	--	--	280	44
			--	ASCHM	[3]11-09-89	[1]1,550	[1]7.6	--	--	570	95
			--	ELAB	12-15-89	[1]1,760	[1]7.5	--	--	300	32
			USGS	USGS	[4]08-24-90	1,120	7.2	17.5	--	400	71
			USGS	USGS	[4]08-24-90	1,120	7.2	17.5	--	410	72
			USGS	USGS	09-16-91	--	--	--	--	--	--
			USGS	USGS	04-15-92	1,550	7.2	7.0	.997	530	89
28N51E27ACDB01	Mh	[5]4,960-4,970	USGS	USGS	01-24-56	--	6.6	--	1.044	4,500	1,400
28N51E27BBBB01	Qt	68	--	ELAB	05-23-85	[1]3,470	[1]7.6	--	--	1,600	250
			--	CHNO	11-21-88	[1]15,400	[1]6.7	--	--	7,600	1,230

Magnesium, dissolved (mg/L as Mg)	Sodium, dissolved (mg/L as Na)	Sodium adsorption ratio	Potassium, dissolved (mg/L as K)	Alkalinity, onsite (mg/L as $CaCO_3$)	Sulfate, dissolved (mg/L as SO_4)	Chloride, dissolved (mg/L as Cl)	Fluoride, dissolved (mg/L as F)	Bromide, dissolved (mg/L as Br)	Iodide, dissolved (mg/L as I)	Dissolved solids, computed (mg/L)	Site number
200	310	4	4.1	[1]886	590	29	0.4	--	--	1,900	28N51E01BBBB01
320	350	4	4.6	893	1,100	36	.4	0.34	0.034	2,540	
120	73,000	590	500	170	2,200	110,000	--	--	--	190,000	28N51E02ACDB01
170	56,000	81	--	[1]360	510	88,000	--	--	--	146,000	28N51E03BCAC01
58	410	9	8.1	434	230	420	.2	.27	.023	1,480	28N51E04CCCD01
38	360	9	6.1	436	230	260	.2	.16	.020	1,220	28N51E08ADDA01
46	170	3	8	[1]395	390	32	.3	--	--	1,370	28N51E08CCBB01
280	980	9	15	286	260	2,800	.2	1.4	.200	4,950	28N51E08DDDB01
55	400	9	7.2	461	300	430	.4	.25	.031	1,550	28N51E09BCBB01
69	450	8	9	[1]366	210	670	.2	--	--	1,720	28N51E09CCDD01
75	460	8	9	[1]359	190	690	.2	--	--	1,740	
84	500	9	7.6	373	210	780	.3	.30	.029	1,950	
590	2,000	13	20	269	340	6,300	.2	.67	.360	10,300	28N51E09CDBB01
600	2,000	13	19	269	300	6,100	.2	.60	.380	10,100	
61	65	1	1.4	[1]367	340	25	.4	--	--	856	28N51E09DCCC01
150	49,000	45	--	[1]210	1,600	78,000	--	--	--	130,000	28N51E10DADC01
140	39,000	310	500	[1]183	1,800	60,000	5.6	12	.880	103,000	28N51E10DBAD01
360	43,000	47	--	[1]360	840	69,000	--	--	--	114,000	
130	36,000	330	470	[1]204	1,900	60,000	13	16	1.1	99,500	
140	[6]77,000	--	--	[7]196	2,600	120,000	--	--	--	201,000	28N51E12CCBD01
270	110	1	18	610	210	200	.8	.45	.012	2,420	28N51E13CCCA01
130	440	7	8.1	1,040	820	20	.4	.13	.057	2,190	28N51E13CCCC01
360	940	8	16	307	490	3,100	.1	.77	.049	5,810	28N51E16DBCB01
440	1,200	9	18	309	580	3,700	.4	1.0	.061	7,070	
240	750	8	14	304	230	2,300	<.1	.67	.130	4,100	28N51E17ABDC01
320	1,000	9	17	282	250	3,000	<.4	1.6	.190	5,280	28N51E17ABDD01
320	990	9	17	282	250	3,100	<.1	1.7	.210	5,370	
170	620	7	9.9	320	390	1,400	.5	.59	.076	3,050	28N51E17ADAD01
22	220	7	--	[1]380	180	64	.4	--	--	757	28N51E17DADA01
120	530	8	8.7	342	150	1,100	.2	.37	.068	2,300	
200	590	6	12	314	330	1,700	.2	.46	.048	3,390	28N51E21BDBC01
270	100	1	13	445	1,500	15	.6	.19	.007	2,470	28N51E22BBBB01
970	26,000	97	--	--	2,300	50,000	--	--	--	83,400	28N51E22BDCA01
320	20,000	130	290	539	1,500	35,000	--	6.0	.440	58,700	28N51E22CBCB01
290	22,000	140	280	571	1,200	38,000	--	5.9	.440	63,500	28N51E22CBCB02
270	410	--	5	[1]952	1,700	66	--	--	--	3,370	28N51E22CDCC01
790	870	5	15	713	1,400	4,100	.2	3.5	.560	8,640	
1,400	2,200	10	20	708	1,600	7,900	.5	4.8	.510	15,200	
85	22,000	200	650	[7]360	1,800	35,000	--	--	--	60,800	28N51E25ACBC01
150	63,000	480	500	[7]310	1,500	98,000	--	--	--	164,000	
41	220	6	8	[1]395	150	160	--	--	--	856	28N51E27ABAA01
80	335	6	8	[1]886	380	24	--	--	--	1,445	
54	320	0	11	[1]788	230	11	.5	--	--	1,110	
54	100	2	4.9	530	81	11	.4	.04	.006	671	
55	110	2	4.6	530	80	11	.5	.04	.007	684	
--	200	--	--	--	--	27	--	--	--	--	
74	200	4	6.1	[1]750	220	22	.4	0.10	.016	1,100	
230	[6]22,000	--	--	[7]390	1,400	36,000	--	--	--	61,400	28N51E27ACDB01
240	370	--	6	[1]753	1,500	85	--	--	--	2,930	28N51E27BBBB01
1,100	970	5	20	[1]499	1,300	5,200	.3	--	--	10,100	

Table 6. Physical properties and major-ion concentrations in water samples collected from privately owned wells, monitoring wells, oil wells, and brine-injection wells in the East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana (Continued)

Site number	Geologic unit	Depth of well (feet)	Collecting agency	Analyzing agency	Date sample collected	Specific conductance, onsite (µS/cm)	pH, onsite (standard units)	Water temperature, onsite (°C)	Density (g/mL at 20°C)	Hardness, total (mg/L as $CaCO_3$)	Calcium, dissolved (mg/L as Ca)
28N51E27BBBB01			--	ASCHM	03-10-89	--	--	--	--	--	1,500
(Continued)			USGS	USGS	07-24-89	25,000	6.8	10.5	--	11,000	1,800
			USGS	USGS	08-27-90	48,000	6.5	11.5	--	16,000	2,800
			USGS	USGS	01-31-91	[1]52,700	5.8	7.0	--	16,000	2,900
			USGS	USGS	05-08-91	51,400	[1]6.7	11.5	--	16,000	2,900
			USGS	USGS	[4]07-22-91	63,000	6.3	10.0	--	16,000	2,900
			USGS	USGS	[4]07-22-91	63,000	6.3	10.0	--	16,000	3,000
			USGS	USGS	04-15-92	50,000	6.5	11.0	1.033	14,000	2,800
			USGS	USGS	07-23-93	81,500	6.6	10.5	1.038	12,000	2,800
28N51E29BACA01	Qal	50	USGS	USGS	08-17-93	2,090	7.5	10.5	.998	460	88
28N51E29CACB01	Qal	32	USGS	USGS	08-23-90	690	7.8	11.5	--	260	46
28N51E33BBBB01	Qt	120	--	CHNO	03-17-89	[1]2,630	[1]7.4	--	--	660	120
			USGS	USGS	08-24-90	2,670	7.1	11.0	--	760	140
28N51E33BBBC02	Qt	120	IHS	CHNO	03-16-89	[1]2,480	[1]7.4	--	--	570	100
28N51E33DDCC03	Qw	65	USGS	USGS	08-17-93	3,820	7.4	10.0	1.000	990	180
28N52E18ACCA01	Mmc	[5]6,020-6,080	USGS	USGS	05-17-52	60,000	7.4	--	1.043	2,800	890
28N52E20BBBB01	Qw	100	MBMG	MBMG	10-06-85	1,780	[1]7.3	10.0	--	390	74
28N52E20CCCC01	Qw	128	USGS	USGS	08-21-90	2,240	7.8	13.0	--	150	25
28N52E30DDDD01	Qw	170	MBMG	MBMG	10-05-85	2,950	8.0	10.0	--	120	25
29N51E07BCDB01	Mc	5,933	--	NALCO	07-06-79	--	[1]7.0	--	--	--	4,400
29N51E07BDBD01	Mm	1,207	--	NALCO	02-03-82	--	[1]6.4	--	--	--	4,800
29N51E08CCCA01	Mc	5,970	--	--	01-24-56	62,200	6.5	--	1.039	4,100	1,200
29N51E09ABBA04	Qal	36	USGS	USGS	08-16-93	1,260	7.7	9.0	.997	160	33
29N51E10CDAB01	Qt	60	IHS	ELAB	05-14-85	[1]1,940	[1]7.6	--	--	380	93
29N51E10CDBA01	Qt	90	USGS	USGS	07-21-82	1,360	7.4	9.0	--	340	87
29N51E15CACA01	Qal	62	USGS	USGS	07-19-91	1,710	7.3	11.5	--	430	85
29N51E16BDAA01	Qal	53	USGS	USGS	07-20-91	1,550	8.1	10.5	--	27	6.1
29N51E16CBCC01	Qal	25	MDHES	MDHES	07-23-79	[1]1,610	[1]8.0	--	--	260	47
			USGS	USGS	07-26-82	900	7.9	9.0	--	150	30
29N51E16CCAA01	Qal	23	USGS	USGS	07-20-82	1,140	7.7	9.5	--	160	27
			USGS	USGS	[4]07-18-91	1,220	7.6	11.5	--	160	27
			USGS	USGS	[4]07-18-91	1,220	7.6	11.5	--	160	27
29N51E16DACA01	Qal	25	--	ASCHM	[3]03-08-90	[1]1,220	[1]7.7	--	--	350	80
			USGS	USGS	08-23-90	1,520	7.5	16.5	--	330	72
29N51E17CCCC01	Qal or Kb	87	MDHES	MDHES	07-23-79	[1]1,070	[1]7.5	--	--	170	40
			USGS	USGS	07-27-82	[1]11,500	7.4	9.5	--	3,100	700
			USGS	USGS	07-22-89	9,500	7.4	10.5	--	2,600	600
29N51E19DCAC01	Kjr	740	USGS	USGS	07-22-82	17,000	7.6	--	--	300	91
[8]29N51E19DDBA01	Mm	3,583	USGS	USGS	07-22-82	130,000	6.4	--	--	4,600	1,500
			--	NALCO	12-11-89	--	[1]5.8	--	--	--	2,000
29N51E20ABBA02	Qal	44	MDHES	MDHES	07-23-79	[1]7,300	[1]7.4	--	--	1,800	340
			USGS	USGS	07-26-82	[1]7,430	7.5	--	--	1,600	290
29N51E20BCDB01	Mm	5,773	--	YSB	[3]03-01-76	[1]62,500	[1]7.9	--	--	--	800
29N51E20CCDB01	Mm	5,750	--	YSB	[3]03-01-76	[1]62,500	[1]7.7	--	--	--	840
29N51E20DABB01	Qal	56	USGS	USGS	08-15-93	14,200	7.5	--	1.003	2,900	500
29N51E21ABCC01	Qal	12	MDHES	MDHES	07-23-79	[1]1,240	[1]8.0	--	--	190	38
			USGS	USGS	07-20-82	1,200	7.6	9.5	--	180	36
			USGS	USGS	07-18-91	1,520	7.4	10.5	--	240	47
29N51E21ABDA01	Qal	33	USGS	USGS	08-15-93	1,500	7.5	10.5	.998	170	28
29N51E21BBAA01	Qal	17	MDHES	MDHES	07-23-79	[1]3,070	7.8	--	--	230	39

Magnesium, dissolved (mg/L as Mg)	Sodium, dissolved (mg/L as Na)	Sodium adsorption ratio	Potassium, dissolved (mg/L as K)	Alkalinity, onsite (mg/L as $CaCO_3$)	Sulfate, dissolved (mg/L as SO_4)	Chloride, dissolved (mg/L as Cl)	Fluoride, dissolved (mg/L as F)	Bromide, dissolved (mg/L as Br)	Iodide, dissolved (mg/L as I)	Dissolved solids, computed (mg/L)	Site number
1,300	1,200	--	19	[1]526	950	6,700	--	--	--	12,300	28N51E27BBBB01
1,600	1,700	7	28	510	1,200	9,700	<.1	5.8	.066	16,400	(Continued))
2,200	5,400	19	41	404	1,000	21,000	<.1	8.7	.150	32,800	
2,100	6,900	24	44	[1]449	1,200	22,000	5.1	9.6	<.110	35,500	
2,200	8,200	28	50	[1]446	1,400	25,000	8.2	9.2	.092	40,100	
2,000	9,000	31	52	466	1,200	23,000	1.9	8.1	.072	38,500	
2,100	9,200	32	49	466	1,300	25,000	1.9	9.0	.074	41,000	
1,800	11,000	40	61	[1]416	1,800	29,000	3.2	9.6	.087	46,800	
1,300	14,000	55	57	511	1,300	32,000	--	7.4	.110	51,900	
57	290	6	5.4	339	180	330	.4	.13	.016	1,170	28N51E29BACA01
36	47	1	5.2	254	47	7.3	.4	.040	.002	427	28N51E29CACB01
87	380	6	8	[1]604	810	47	.3	--	--	1,810	28N51E33BBBB01
100	400	6	6.4	660	1,000	40	.3	1.6	.190	2,120	
75	380	7	8	[1]558	770	34	.2	--	--	1,700	28N51E33BBBC02
130	610	8	6.4	775	1,200	62	.5	.18	.058	2,680	28N51E33DDCC03
130	[6]18,000	--	--	[7]215	2,400	28,000	--	--	--	50,000	28N52E18ACCA01
50	330	7	7	[1]738	360	15	.2	--	--	1,330	28N52E20BBBB01
20	520	19	4.3	810	460	20	.5	.060	.029	1,560	28N52E20CCCC01
15	800	31	4	[1]1,205	580	34	.7	--	--	2,200	28N52E30DDDD01
1,500	28,000	92	--	[1]152	810	54,000	--	--	--	88,500	29N51E07BCDB01
1,400	22,000	72	--	[1]360	700	46,000	--	--	--	75,700	29N51E07BDBD01
300	[6]20,000	--	--	119	120	33,000	--	--	--	54,300	29N51E08CCCA01
18	230	8	3.3	443	210	8.7	.4	.050	.007	787	29N51E09ABBA04
36	338	--	3	--	590	11	--	--	--	1,070	29N51E10CDAB01
30	180	4	3.6	[1]338	280	9.4	.3	--	--	809	29N51E10CDBA01
52	210	4	3.7	288	610	8.8	.4	.070	.014	1,160	29N51E15CACA01
2.8	330	28	1.9	581	97	110	.7	.48	.470	906	29N51E16BDAA01
35	230	6	--	[1]319	120	230	--	--	--	850	29N51E16CBCC01
18	130	5	3.8	[1]250	94	34	.5	--	--	488	
22	220	8	4.1	[1]473	160	18	.4	--	--	752	29N51E16CCAA01
22	210	7	4.3	461	200	13	.4	.070	.005	772	
22	200	7	4.1	461	190	13	.4	.090	.005	750	
36	215	5	4.0	[1]381	440	16	--	--	--	1,250	29N51E16DACA01
37	220	5	4.0	384	430	13	.3	.090	.008	1,020	
17	130	4	--	--	64	240	--	--	--	530	29N51E17CCCC01
320	1,400	11	12	[1]234	1,300	3,300	.1	--	--	7,210	
270	1,300	11	12	348	1,400	3,000	.1	3.3	.048	7,750	
18	3,900	98	10	[1]198	<5.0	6,500	.6	--	--	10,600	29N51E19DCAC01
200	33,000	212	550	[1]76	1,500	61,000	4.4	--	--	97,900	29N51E19DDBA01
390	42,000	220	--	[1]440	740	68,000	--	--	--	113,000	
240	790	8	--	[1]254	230	2,200	--	--	--	3,950	29N51E20ABBA02
220	890	10	11	[1]213	260	2,300	.2	--	--	4,120	
160	17,000	148	--	--	1,600	27,000	--	--	--	47,700	29N51E20BCDB01
170	19,000	30	--	--	1,500	30,000	--	--	--	52,300	29N51E20CCDB01
410	2,000	16	35	[1]332	170	4,600	.4	3.6	.300	7,960	29N51E20DABB01
24	220	7	--	[1]454	150	34	--	--	--	734	29N51E21ABCC01
22	220	7	4.1	[1]474	160	30	.4	--	--	773	
29	240	7	5.0	554	250	32	.4	.12	.003	952	
24	290	10	5.1	568	190	15	.5	.030	.013	916	29N51E21ABDA01
32	530	15	--	[1]312	180	630	--	--	--	1,600	29N51E21BBAA01

Table 6. Physical properties and major-ion concentrations in water samples collected from privately owned wells, monitoring wells, oil wells, and brine-injection wells in the East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana (Continued)

Site number	Geologic unit	Depth of well (feet)	Collecting agency	Analyzing agency	Date sample collected	Specific conductance, onsite (µS/cm)	pH, onsite (standard units)	Water temperature, onsite (°C)	Density (g/mL at 20°C)	Hardness, total (mg/L as $CaCO_3$)	Calcium, dissolved (mg/L as Ca)
29N51E21BBAA01			USGS	USGS	07-26-82	3,100	7.5	--	--	220	39
(Continued)			USGS	USGS	07-22-89	4,600	7.7	8.5	--	300	55
29N51E29CBBB01	Qal	45	USGS	USGS	11-03-82	10,000	6.9	10.0	--	3,500	750
[8]29N51E30DDDD01	Mm	3,431	USGS	MDHES	07-23-79	[1]100,000	--	--	--	4,300	1,500
			USGS	USGS	07-22-82	170,000	6.6	--	--	6,000	2,000
			--	PETRO	11-29-89	--	[1]6.7	--	--	8,800	3,300
29N51E31AABB01	Qal	54	USGS	USGS	11-03-82	17,000	7.1	10.0	--	2,500	670
			USGS	USGS	07-23-89	13,500	8.1	10.0	--	3,400	790
29N51E31ABDD01	Qal	43	USGS	USGS	08-10-93	15,100	7.0	13.5	1.004	3,000	700
29N51E31BDBA01	Qal	40	USGS	USGS	08-10-93	8,900	6.9	16.5	1.002	2,200	520
29N51E31CABB01	Qal	33	USGS	USGS	08-11-93	24,500	6.9	13.0	1.008	3,500	910
29N51E31DBAD01	Qal	37	USGS	USGS	08-11-93	[1]26,300	7.1	11.0	1.009	1,300	320
29N51E31DBDD01	Qal	33	USGS	USGS	08-12-93	31,500	7.2	9.5	1.010	2,000	450
29N51E32ABAC01	Qal	41	USGS	USGS	08-13-93	25,600	7.0	10.5	--	3,300	620
29N51E32ACCA01	Qal	30	USGS	USGS	08-14-93	18,600	7.5	24.0	1.004	650	160
29N51E32BAAD01	Qal	39	USGS	USGS	08-14-93	35,400	7.3	12.0	1.012	2,000	380
29N51E32BABB01	Qal	46	USGS	USGS	07-26-93	102,000	6.9	17.0	1.051	15,000	1,100
29N51E32BBAA01	Qal	42	USGS	USGS	11-02-82	70,000	6.8	12.0	--	4,700	1,300
29N51E32BBBA02	Qal	47	USGS	USGS	11-02-82	58,000	6.7	10.5	--	4,700	1,400
29N51E32BBBA03	Qal	53	USGS	USGS	07-25-93	127,000	6.7	11.0	1.060	11,000	3,300
29N51E32BBBA04	Qal	27	USGS	USGS	[4]07-25-93	12,300	7.5	12.0	1.004	670	170
			USGS	USGS	[4]07-25-93	12,300	7.5	12.0	1.003	630	160
29N51E32BBBB01	Qal	49	USGS	USGS	11-03-82	120,000	6.6	25.0	--	7,800	2,500
			USGS	USGS	07-23-89	65,000	6.7	16.0	--	5,000	1,500
29N51E32BCCA01	Qal	40	USGS	USGS	11-02-82	70,000	6.8	10.0	--	16,000	4,100
29N51E32BCCA02	Qal	45	USGS	USGS	08-11-93	41,700	7.3	12.0	1.015	4,200	1,000
29N51E36CCCC01	Qgo	30	MBMG	MBMG	10-05-85	658	[1]7.5	10.0	--	270	40

[1] Laboratory measurement.
[2] Brine-injection well completed in Judith River Formation.
[3] Date analyzed.
[4] Replicate analyses.
[5] Depth of sample interval; well depth unavailable.
[6] Sodium plus potassium.
[7] Onsite fixed-endpoint titration.
[8] Brine-injection well completed in Dakota Sandstone.

Magnesium, dissolved (mg/L as Mg)	Sodium, dissolved (mg/L as Na)	Sodium adsorption ratio	Potassium, dissolved (mg/L as K)	Alkalinity, onsite (mg/L as $CaCO_3$)	Sulfate, dissolved (mg/L as SO_4)	Chloride, dissolved (mg/L as Cl)	Fluoride, dissolved (mg/L as F)	Bromide, dissolved (mg/L as Br)	Iodide, dissolved (mg/L as I)	Dissolved solids, computed (mg/L)	Site number
30	510	15	6.1	[1]323	190	620	.4	--	--	1,610	29N51E21BBAA01
40	820	21	9.3	442	170	1,100	.3	1.2	.110	2,630	(Continued)
400	870	6	12	[1]246	630	3,400	.1	--	--	6,250	29N51E29CBBB01
140	70,000	457	--	[1]140	1,700	110,000	--	--	--	--	29N51E30DDDD01
250	56,000	314	910	[1]153	1,200	100,000	4.6	--	--	161,000	
110	37,000	170	--	[1]150	1,400	62,000	--	--	--	103,000	
210	4,100	35	20	[1]395	1,000	7,500	.2	--	--	13,800	29N51E31AABB01
350	1,800	13	15	334	740	4,800	.1	3.7	.150	8,860	
300	1,900	15	18	308	640	4,600	.5	1.6	.180	8,400	29N51E31ABDD01
220	950	9	12	263	980	2,100	.3	1.0	.024	4,960	29N51E31BDBA01
290	3,900	29	19	330	650	7,700	.6	0.66	.450	13,700	29N51E31CBAB01
110	5,900	73	34	388	560	9,100	.7	1.3	.430	16,300	29N51E31DBAD01
200	6,300	62	29	396	490	10,000	.7	0.74	.380	18,000	29N51E31DBDD01
420	3,900	30	42	[1]212	320	8,500	.5	--	--	13,900	29N51E32ABAC01
61	3,800	65	32	428	290	5,800	1.6	1.1	.130	10,400	29N51E32ACAC01
260	7,100	69	57	453	710	12,000	.8	1.4	.270	20,800	29N51E32BAAD01
2,900	5,200	19	340	279	1,300	35,000	--	8.7	.690	46,100	29N51E32BABB01
350	25,000	160	250	[1]245	840	42,000	<.1	--	--	69,900	29N51E32BBAA01
300	19,000	120	89	[1]301	800	34,000	<.1	--	--	55,800	29N51E32BBBA02
750	28,000	110	1.6	217	720	58,000	--	4.5	1.5	91,100	29N51E32BBBA03
58	2,200	37	15	449	510	3,200	.7	1.7	.210	6,450	29N51E32BBBA04
54	2,200	38	13	449	500	3,100	.5	1.8	.210	6,310	
380	43,000	210	150	[1]172	1,100	67,000	<.1	--	--	114,000	29N51E32BBBB01
290	17,000	110	83	323	770	30,000	.1	9.2	1.1	50,000	
1,300	23,000	80	97	[1]126	440	46,000	<.1	--	--	75,100	29N51E32BCCA01
400	8,000	54	37	407	530	14,000	.8	1.4	.270	24,300	29N51E32BCCA02
40	60	2	4.5	[1]296	85	1.5	.6	--	--	435	29N51E36CCCC01

Table 7. Trace-element and organic-carbon concentrations and stable-isotope ratios in water samples collected from privately owned wells, monitoring wells, and brine-injection wells in the East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana

Site number--numbering system described in text.

Geologic unit (in which well is completed; for brine-injection wells, indicates unit that is the source of the brine)--

- Qal - Alluvium (Quaternary)
- Qt - Glacial till (Pleistocene)
- Qgo - Glacial outwash (Pleistocene)
- Qw - Wiota Gravel (Pleistocene)
- Kb - Bearpaw Shale (Upper Cretaceous)
- Kjr - Judith River Formation (Upper Cretaceous)
- Mm - Madison Group (Mississippian)

Depth of well--in feet below land surface.

Constituents are dissolved, except as indicated.

Collecting agency and analyzing laboratory:

ASCHM, Astro-Chem Service Laboratory,
CHNO, Chen-Northern, Inc.,
ELAB, Energy Laboratories, Inc.,
MBMG, Montana Bureau of Mines and Geology,
USGS, U.S. Geological Survey,
YSB, Yapuncich, Sanderson, and Brown Laboratories, currently Energy Laboratories, Inc.

Abbreviations: µg/L, micrograms per liter; mg/L, milligrams per liter; per mil, parts per thousand. D/H, deuterium/hydrogen; O-18/O-16, oxygen 18/oxygen 16. Symbols: <, less than; --, no data.

Table 7. Trace-element and organic-carbon concentrations and stable-isotope ratios in water samples collected from privately owned wells, monitoring wells, and brine-injection wells in the East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana (Continued)

Site number	Geologic unit	Depth of well (feet)	Collecting agency	Analyzing agency	Date sample collected	Barium, dissolved (µg/L as Ba)	Boron, dissolved (µg/L as B)
28N51E01BBBB01	Qt	153	USGS	USGS	07-21-82	--	--
			USGS	USGS	07-20-91	<100	760
28N51E04CCCD01	Qt	50	USGS	USGS	08-25-90	<100	870
28N51E08ADDA01	Qal	52	USGS	USGS	08-23-90	<100	800
28N51E08CCBB01	Qal	22	--	CHNO	11-08-88	--	--
28N51E08DDDB01	Qt	102	USGS	USGS	08-25-90	200	810
28N51E09BCBB01	Qt	90	USGS	USGS	07-17-91	<100	790
28N51E09CCDD01	Qt	117	--	CHNO	04-07-89	--	--
			--	CHNO	08-16-89	--	--
			USGS	USGS	07-19-91	<100	640
28N51E09CDBB01	Qt	104	USGS	USGS	[1]08-12-93	300	640
			USGS	USGS	[1]08-12-93	300	680
29N51E09DCCC01	Qt	93	USGS	USGS	08-13-93	--	240
28N51E10DBAD01	Mm	--	USGS	USGS	07-24-89	590	20,000
			USGS	USGS	08-29-90	1,000	22,000
28N51E13CCCA01	Qt	33	USGS	USGS	08-22-90	300	630
28N51E13CCCC01	Qw	150	USGS	USGS	08-22-90	<100	810
28N51E16DBCB01	Qt	104	USGS	USGS	07-23-89	140	680
			USGS	USGS	07-21-91	<100	680
28N51E17ABDC01	Qal	36	USGS	USGS	08-26-90	300	800
28N51E17ABDD01	Qt	40	USGS	USGS	[1]08-26-90	<100	800
			USGS	USGS	[1]08-26-90	<100	800
28N51E17ADAD01	Qt	130	USGS	USGS	07-16-91	<100	630
28N51E17DADA01	Qt	102	--	YSB	02-10-75	--	--
			USGS	USGS	08-25-90	100	670
28N51E21BDBC01	Qt	91	USGS	USGS	08-26-90	100	720
28N51E22BBBB01	Qt	68	USGS	USGS	07-24-93	<100	220
28N51E22CBCB01	Qt	81	USGS	USGS	07-21-93	200	15,000
28N51E22CBCB02	Qt	49	USGS	USGS	07-20-93	200	14,000
28N51E22CDCC01	Qt	85	--	ELAB	07-09-85	--	--
			USGS	USGS	07-20-89	52	660
			USGS	USGS	07-20-91	<100	710
28N51E27ABAA01	Qt	135	--	ASCHM	[2]10-11-89	--	--
			--	ASCHM	[2]11-09-89	--	--
			--	ELAB	12-15-89	--	--
			USGS	USGS	[1]08-24-90	41	570
			USGS	USGS	[1]08-24-90	42	560
			USGS	USGS	04-15-92	43	610
28N51E27BBBB01	Qt	68	--	ELAB	05-23-85	--	--
			--	CHNO	11-21-88	--	--
			--	ASCHM	03-10-89	--	--
			USGS	USGS	07-24-89	78	670
			USGS	USGS	08-27-90	<100	760
			USGS	USGS	01-31-91	200	770
			USGS	USGS	05-08-91	300	620
			USGS	USGS	[1]07-22-91	<100	680
			USGS	USGS	[1]07-22-91	200	--
			USGS	USGS	04-15-92	200	670
			USGS	USGS	07-23-93	200	540
28N51E29BACA01	Qal	50	USGS	USGS	08-17-93	<100	630
28N51E29CACB01	Qal	32	USGS	USGS	08-23-90	86	180
28N51E33BBBB01	Qt	120	--	CHNO	03-17-89	--	--
			USGS	USGS	08-24-90	<100	730

Iron, dissolved (µg/L as Fe)	Lithium, dissolved (µg/L as Li)	Manganese, dissolved (µg/L as Mn)	Strontium, dissolved (µg/L as Sr)	Carbon, organic, dissolved (mg/L as C)	D/H stable-isotope ratio (per mil)	O-18/O-16 stable-isotope ratio (per mil)	Site number
40	--	430	--	--	--	--	28N51E01BBBB01
20	270	520	3,400	2.9	-143.0	-18.65	
390	120	670	910	3.8	--	--	28N51E04CCCD01
2,800	110	160	550	3.5	-125.0	-15.05	28N51E08ADDA01
2,400	--	790	--	--	--	--	28N51E08CCBB01
18,000	250	930	4,500	3.9	--	--	28N51E08DDDB01
2,200	130	190	850	2.2	--	--	28N51E09BCBB01
7,500	--	490	--	--	--	--	28N51E09CCDD01
6,500	--	360	--	--	--	--	
6,100	150	260	1,500	2.4	-127.0	-15.70	
3,500	300	1,100	9,300	--	--	--	28N51E09CDBB01
--	290	970	9,100	--	--	--	
16	--	--	--	--	--	--	29N51E09DCCC01
690	5,200	240	54,000	7.0	-138.5	-16.25	28N51E10DBAD01
1,300	100	270	47,000	8.5	-133.0	-16.20	
30	230	130	1,800	--	--	--	28N51E13CCCA01
7,800	150	60	2,100	6.3	--	--	28N51E13CCCC01
24,000	320	3,300	5,500	1.4	-139.5	-17.40	28N51E16DBCB01
28,000	300	3,600	7,400	4.6	-137.0	-17.50	
18,000	230	1,300	3,800	--	-132.0	-16.45	28N51E17ABCD01
24,000	260	1,300	5,100	--	-131.0	-16.50	28N51E17ABDD01
25,000	260	1,300	4,900	4.2	--	--	
9,500	210	290	2,600	1.2	--	--	28N51E17ADAD01
2,500	--	--	--	--	--	--	28N51E17DADA01
7,500	160	360	1,900	3.9	-128.0	-15.65	
14,000	220	2,100	3,100	--	-138.0	-17.65	28N51E21BDBC01
<10	230	20	2,000	--	--	--	28N51E22BBBB01
50	3,500	310	48,000	--	--	--	28N51E22CBCB01
50	3,300	310	44,000	--	--	--	28N51E22CBCB02
460	--	--	--	--	--	--	28N51E22CDCC01
430	560	6,600	13,000	5.5	-141.5	-18.35	
5,900	530	5,000	28,000	18	--	--	
100	--	--	--	--	--	--	28N51E27ABAA01
200	--	--	--	--	--	--	
70	--	160	--	--	--	--	
17	52	97	1,000	7.6	-151.0	-19.75	
22	53	97	1,000	7.6	-153.0	-19.80	
17	92	67	1,400	--	--	--	
<30	--	--	--	--	--	--	28N51E27BBBB01
700	--	1,100	--	--	--	--	
100	--	--	--	--	--	--	
1,100	880	940	29,000	6.5	-135.0	-17.70	
4,000	1,200	1,600	41,000	--	-133.0	-17.40	
3,500	680	1,600	44,000	--	--	--	
2,700	720	1,800	--	--	--	--	
2,400	760	1,700	47,000	2.7	--	--	
2,400	270	1,700	52,000	1.2	--	--	
17,000	870	1,900	42,000	--	--	--	
3,100	2,300	1,400	49,000	--	--	--	
800	110	250	670	--	--	--	28N51E29BACA01
6	24	<1	290	1.7	--	--	28N51E29CACB01
1,400	--	220	--	--	--	--	28N51E33BBBB01
11,000	220	510	1,700	3.7	-144.0	-18.95	

Table 7. Trace-element and organic-carbon concentrations and stable-isotope ratios in water samples collected from privately owned wells, monitoring wells, and brine-injection wells in the East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana (Continued)

Site number	Geologic unit	Depth of well (feet)	Collecting agency	Analyzing agency	Date sample collected	Barium, dissolved (µg/L as Ba)	Boron, dissolved (µg/L as B)
28N51E33BBBC02	Qt	102	--	CHNO	03-16-89	--	--
28N51E33DDCC03	Qw	65	USGS	USGS	08-17-93	<100	890
28N52E20BBBB01	Qw	100	MBMG	MBMG	10-06-85	--	--
28N52E20CCCC01	Qw	128	USGS	USGS	08-21-90	<100	960
28N52E30DDDD01	Qw	170	MBMG	MBMG	10-05-85	--	--
29N51E09ABBA04	Qal	36	USGS	USGS	08-16-93	45	670
29N51E10CDBA01	Qt	90	USGS	USGS	07-21-82	--	--
29N51E15CACA01	Qal	62	USGS	USGS	07-19-91	24	400
29N51E16BDAA01	Qal	53	USGS	USGS	07-20-91	74	1,900
29N51E16CBCC01	Qal	25	USGS	USGS	07-26-82	--	--
29N51E16CCAA01	Qal	23	USGS	USGS	07-20-82	--	--
			USGS	USGS	[1]07-18-91	43	670
			USGS	USGS	[1]07-18-91	43	650
29N51E16DACA01	Qal	25	USGS	USGS	08-23-90	25	510
29N51E17CCCC01	Qal or Kb	87	USGS	USGS	07-27-82	--	--
			USGS	USGS	07-22-89	15	500
29N51E19DCAC01	Kjr	740	USGS	USGS	07-22-82	--	--
29N51E19DDBA01[3]	Mm	3,583	USGS	USGS	07-22-82	--	--
29N51E20ABBA02	Qal	44	USGS	USGS	07-26-82	--	--
29N51E20DABB01	Qal	56	USGS	USGS	08-15-93	500	690
29N51E21ABCC01	Qal	12	USGS	USGS	07-20-82	--	660
			USGS	USGS	07-18-91	53	760
29N51E21ABDA01	Qal	33	USGS	USGS	08-15-93	64	1,100
29N51E21BBAA01	Qal	17	USGS	USGS	07-26-82	--	--
			USGS	USGS	07-22-89	89	1,600
29N51E29CBBB01	Qal	45	USGS	USGS	11-03-82	--	--
29N51E30DDDD01[3]	Mm	3,431	USGS	USGS	07-22-82	--	--
29N51E31AABB01	Qal	54	USGS	USGS	11-03-82	--	--
			USGS	USGS	07-23-89	67	730
29N51E31ABDD01	Qal	43	USGS	USGS	08-10-93	<100	1,900
29N51E31BDBA01	Qal	40	USGS	USGS	08-10-93	<100	490
29N51E31CABB01	Qal	33	USGS	USGS	08-11-93	<100	510
29N51E31DBAD01	Qal	37	USGS	USGS	08-11-93	<100	5,900
29N51E31DBDD01	Qal	33	USGS	USGS	08-12-93	200	1,200
29N51E32ABAC01	Qal	41	USGS	USGS	08-13-93	--	1,100
29N51E32ACCA01	Qal	30	USGS	USGS	08-14-93	200	3,300
29N51E32BAAD01	Qal	39	USGS	USGS	08-14-93	200	1,400
29N51E32BABB01	Qal	46	USGS	USGS	07-26-93	300	13,000
29N51E32BBAA01	Qal	42	USGS	USGS	11-02-82	--	--
29N51E32BBBA02	Qal	47	USGS	USGS	11-02-82	--	--
29N51E32BBBA03	Qal	53	USGS	USGS	07-25-93	200	2,900
29N51E32BBBA04	Qal	27	USGS	USGS	[1]07-25-93	<100	2,000
			USGS	USGS	[1]07-25-93	<100	2,000
29N51E32BBBB01	Qal	49	USGS	USGS	11-03-82	--	--
			USGS	USGS	07-23-89	150	5,500
29N51E32BCCA01	Qal	40	USGS	USGS	11-02-82	--	--
29N51E32BCCA02	Qal	45	USGS	USGS	08-11-93	300	860
29N51E36CCCC01	Qgo	30	MBMG	MBMG	10-05-85	--	--

[1]Replicate analyses.
[2]Date of analysis.
[3]Brine-injection well completed in Dakota Sandstone.

Iron, dissolved (µg/L as Fe)	Lithium, dissolved (µg/L as Li)	Manganese, dissolved (µg/L as Mn)	Strontium, dissolved (µg/L as Sr)	Carbon, organic, dissolved (mg/L as C)	D/H stable-isotope ratio (per mil)	O-18/O-16 stable-isotope ratio (per mil)	Site number
1,400	--	220	--	--	--	--	28N51E33BBBC02
<10	220	860	2,300	--	--	--	28N51E33DDCC03
2,300	--	64	--	--	--	--	28N52E20BBBB01
1,100	110	60	460	--	--	--	28N52E20CCCC01
1,200	--	23	--	--	--	--	28N52E30DDDD01
1,500	100	92	360	--	--	--	29N51E09ABBA04
1,600	--	190	--	--	--	--	29N51E10CDBA01
<3	170	13	780	--	--	--	29N51E15CACA01
18	78	23	150	--	--	--	29N51E16BDAA01
27	--	27	--	--	--	--	29N51E16CBCC01
470	--	170	--	--	--	--	29N51E16CCAA01
1,500	66	160	360	3.5	-133.0	-16.75	
1,500	65	160	360	3.6	--	--	
170	92	100	620	8.0	-130.0	-16.75	29N51E16DACA01
17,000	--	1,800	--	--	--	--	29N51E17CCCC01
26,000	480	1,500	5,500	4.5	-135.5	-17.00	
30	--	80	--	--	--	--	29N51E19DCAC01
730	--	160	--	--	--	--	29N51E19DDBA01
270	--	1,200	--	--	--	--	29N51E20ABBA02
16,000	280	1,800	5,800	--	--	--	29N51E20DABB01
5	--	3	--	--	--	--	29N51E21ABCC01
33	77	1	520	3.5	--	--	
1,700	88	680	390	--	--	--	29N51E21ABDA01
2,800	--	460	--	--	--	--	29N51E21BBAA01
5,400	190	230	710	3.0	-138.5	-17.05	
22,000	--	1,800	--	--	--	--	29N51E29CBBB01
1,400	--	300	--	--	--	--	29N51E30DDDD01
9,500	--	1,500	--	--	--	--	29N51E31AABB01
27,000	550	2,000	12,000	5.0	-134.0	-16.80	
19,000	450	1,400	13,000	--	--	--	29N51E31ABDD01
20	390	320	4,600	--	--	--	29N51E31BDBA01
16,000	460	2,400	11,000	--	--	--	29N51E31CBAB01
18,000	600	710	7,800	--	--	--	29N51E31DBAD01
13,000	530	760	9,800	--	--	--	29N51E31DBDD01
60	--	--	--	--	--	--	29N51E32ABAC01
20	350	620	2,700	--	--	--	29N51E32ACAC01
13,000	840	980	8,200	--	--	--	29N51E32BAAD01
35,000	3,200	2,500	49,000	--	--	--	29N51E32BABB01
49,000	--	3,300	--	--	--	--	29N51E32BBAA01
21,000	--	3,200	--	--	--	--	29N51E32BBBA02
71,000	2,600	6,600	110,000	--	--	--	29N51E32BBBA03
2,100	350	420	4,900	--	--	--	29N51E32BBBA04
2,200	350	420	5,000	--	--	--	
33,000	--	6,900	--	--	--	--	29N51E32BBBB01
21,000	2,300	6,400	52,000	7.0	-122.0	-16.15	
55,000	--	14,000	--	--	--	--	29N51E32BCCA01
17,000	610	3,000	23,000	--	--	--	29N51E32BCCA02
36	--	--	--	--	--	--	29N51E36CCCC01

Table 8. Physical properties and major-ion concentrations in deionized-water field blanks collected during ground-water sampling in the East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana

[Site number indicates site where sampling equipment was used prior to collecting field blank. Constituents are dissolved, except as indicated. Laboratory analyses by the U.S. Geological Survey. Abbreviations: µS/cm, microsiemens per centimeter at 25 degrees Celsius; °C, degrees Celsius; g/mL, grams per milliliter; mg/L, milligrams per liter. Symbols: <, less than; --, no data]

Site number of previous site	Date sample collected	Specific conductance, laboratory (µS/cm)	pH, laboratory (standard units)	Water temperature, onsite (°C)	Density (g/mL at 20 °C)	Hardness, total (mg/L as $CaCO_3$)	Calcium, dissolved (mg/L as Ca)	Magnesium, dissolved (mg/L as Mg)	Sodium, dissolved (mg/L as Na)
28N51E27BBBB01	08-29-90	6	6.2	--	--	1	0.39	0.05	0.80
28N51E16DBCB01	07-21-91	734	7.6	--	--	15	3.6	1.5	11
28N51E22CBCB01	07-21-93	39	6.9	24.0	--	4	.99	.29	5.4
29N51E32ABAC01	08-13-93	26	5.6	23.5	0.997	4	1.1	.17	<.20

Sodium adsorption ratio	Potassium, dissolved (mg/L as K)	Alkalinity, laboratory (mg/L as $CaCO_3$)	Sulfate, dissolved (mg/L as SO_4)	Chloride, dissolved (mg/L as Cl)	Fluoride, dissolved (mg/L as F)	Bromide, dissolved (mg/L as Br)	Iodide, dissolved (mg/L as I)	Dissolved solids, computed (mg/L)	Site number of previous site
0.3	0.10	3.0	<1.0	0.40	<0.10	<0.010	<0.001	--	28N51E27BBBB01
1	.20	194	46	15	.10	.040	.002	196	28N51E16DBCB01
1	.10	3.2	2.0	7.7	<.10	.010	<.001	45	28N51E22CBCB01
--	<.10	8.6	1.5	.30	<.10	<.010	<.001	--	29N51E32ABAC01

Table 9. Trace-element and dissolved organic-carbon concentrations in deionized-water field blanks collected during groundwater sampling in the East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana

[Site number indicates site where sample was collected prior to collecting field blank. Constituents are dissolved, except as indicated. Laboratory analyses by the U.S. Geological Survey. Abbreviations: µg/L, micrograms per liter; mg/L, milligrams per liter. Symbols: <, less than; --, no data]

Site number of previous site	Date sample collected	Barium, dissolved (µg/L as Ba)	Boron, dissolved (µg/L as B)	Iron, dissolved (µg/L as Fe)	Lithium, dissolved (µg/L as Li)	Manganese, dissolved (µg/L as Mn)	Strontium, dissolved (µg/L as Sr)	Carbon, organic, dissolved (mg/L as C)
28N51E27BBBB01	08-29-90	<2	<10	6	<4	2	20	0.6
28N51E16DBCB01	07-21-91	<2	30	12	<4	2	20	.6
28N51E22CBCB01	07-21-93	<2	20	6	<4	1	17	--
29N51E32ABAC01	08-13-93	3	20	41	6	11	6	--

Table 10. Locations and descriptions of streamflow-measurement sites on the Poplar River in the East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana

Site number (described in text)	Latitude	Longitude	Physical description of site
PR-0	481655	1050512	Poplar River above Empire Bridge, near Poplar, Mont. Located about 13 mi northeast of Poplar, 3.5 mi southwest of Geddart Lake, 0.5 mi upstream from Empire Bridge; in SW 1/4, SE 1/4, NE 1/4, sec. 09, T. 29 N., R. 51 E.
PR-1	481625	1050517	U.S. Geological Survey miscellaneous streamflow-measurement station 06180600 (Poplar River above Slims Coulee, near Poplar, Mont.). Located about 12 mi northeast of Poplar, 0.4 mi west of Route 251, 1.5 mi above Slims Coulee; in NW 1/4, NE 1/4, NE 1/4, sec. 16, T. 29 N., R. 51 E.
PR-2	481515	1050516	Poplar River above Slims Coulee, near Poplar, Mont. Located about 11 mi northeast of Poplar, 5.0 mi southwest of Geddart lake, 1.5 mi south of Empire Bridge; in SW 1/4, SE 1/4, NE 1/4, sec. 21, T. 29 N., R. 51 E.
PR-2A	481458	1050459	Poplar River below Slims Coulee, near Poplar, Mont. Located about 10 mi northeast of Poplar, 0.75 mi southwest of Slims Coulee, 0.75 mi northeast of concrete culvert bridge; in SE 1/4, SW 1/4, SW 1/4, sec. 21, T. 29 N., R. 51 E.
PR-3	481413	1050641	Poplar River below Slims Coulee, near Poplar, Mont. Located about 9 mi northeast of Poplar, 1.6 mi southwest of Slims Coulee, at concrete culvert bridge; in NE 1/4, NW 1/4, SE 1/4, sec. 29, T. 29 N., R. 51 E.
PR-3A	481318	1050719	Poplar River above Culbertson Creek, near Poplar, Mont. Located about 8 mi northeast of Poplar, 0.75 mi upstream from Culbertson Creek, in NE 1/4, NW 1/4, SW 1/4, sec. 32, T. 29 N., R. 51 E.
PR-3B	481330	1050803	Poplar River above Culbertson Creek, near Poplar, Mont. Located about 8 mi northeast of Poplar, 500 ft upstream from Culbertson Creek; in NE 1/4, SW 1/4, NE 1/4, sec. 31, T. 29 N., R. 51 E.
PR-4	481327	1050817	Poplar River below Culbertson Creek, near Poplar, Mont. Located about 8 mi northeast of Poplar, 0.25 mi downstream from Culbertson Creek; in SE 1/4, SW 1/4, NW 1/4, sec. 31, T. 29 N., R. 51 E.
PR-5	481249	1050831	Poplar River below Culbertson Creek, near Poplar, Mont. Located about 7 mi northeast of Poplar, 1 mi downstream from Culbertson Creek; in SE 1/4, NE 1/4, NW 1/4, sec. 04, T. 28 N., R. 51 E.
PR-6	481151	1050907	Poplar River below Flea Creek, near Poplar, Mont. Located about 6 mi northeast of Poplar, 0.5 mi downstream from Flea Creek, at a culvert bridge; in SE 1/4, NE 1/4, NE 1/4, sec. 08, T. 28 N., R. 51 E.
PR-7	481108	1050956	Poplar River below Badger Creek, near Poplar, Mont. Located about 5 mi northeast of Poplar, 0.75 mi downstream from Badger Creek at ford 1 mi downstream from a culvert bridge; in NW 1/4, NE 1/4, NW 1/4, sec. 17, T. 28 N., R. 51 E.
PR-8	481015	1051042	U.S. Geological Survey streamflow-gaging station 06181000 (Poplar River near Poplar, Mont.). Located on right bank, about 4 mi north of Poplar, at river mi 11; in SW 1/4, NE 1/4, NE 1/4, sec. 19, T. 28 N., R. 51 E.
PR-9	480904	1051008	Poplar River below gage, near Poplar, Mont. Located about 3 mi northeast of Poplar, at ford 1.25 mi downstream from streamflow-gaging station 06181000; in SE 1/4, SW 1/4, NW 1/4, sec. 29, T. 28 N., R. 51 E.

Table 11. Streamflow and miscellaneous water-quality measurements for the Poplar River in the East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana

[Abbreviations: ft^3/s, cubic feet per second; µS/cm, microsiemens per centimeter at 25 degrees Celsius; °C, degrees Celsius; mg/L, milligrams per liter. Symbol: --, no data]

Date	Site number (described in text)	Streamflow, instantaneous (ft^3/s)	Specific conductance, onsite (µS/cm)	Temperature, water (°C)	Chloride, dissolved (mg/L as Cl)
09-09-81	PR-1	1.7	1,560	20.0	20
	PR-2	--	1,590	--	18
	PR-3	1.4	3,090	23.0	600
	PR-4	--	3,620	--	540
	PR-5	.7	3,790	25.0	880
10-22-90	PR-0	--	1,480	--	12
	PR-1	--	1,490	--	15
10-24-90	PR-2	--	1,480	--	16
	PR-2A	--	1,500	--	17
	PR-3	--	1,580	--	42
	PR-3A	--	1,610	--	56
	PR-4	--	1,940	--	210
	PR-5	--	1,730	--	110
10-25-90	PR-6	--	1,970	--	200
	PR-7	--	1,970	--	210
	PR-8	--	2,020	--	240
	PR-9	--	2,030	--	240
04-03-91	PR-0	82	946	10.5	11
	PR-1	86	922	11.0	9.6
	PR-2	83	949	11.0	8.9
	PR-2A	94	946	11.5	10
	PR-3	91	953	12.0	8.1
	PR-3A	76	956	12.5	11
	PR-3B	87	956	13.0	13
	PR-4	84	976	13.0	13
	PR-5	79	998	13.0	21
	PR-6	85	1,000	13.0	23
	PR-7	82	1,000	13.0	24
	PR-8	88	996	13.0	25
	PR-9	85	1,000	12.5	29
07-23-91	PR-0	47	1,270	19.5	10
	PR-1	49	1,260	20.0	9.5
	PR-2	46	1,280	20.0	9.9
	PR-3	46	1,300	22.0	22
	PR-4	49	1,340	23.0	35
	PR-6	52	1,410	24.0	51
	PR-8	44	--	--	61
09-12-91	PR-1	7.9	--	--	17
	PR-2	11	--	--	15
	PR-3	11	--	--	41
	PR-3B	--	--	--	47
	PR-4	11	--	--	47
	PR-5	10	--	--	160
	PR-6	11	--	--	170
	PR-8	11	--	--	160

Table 12. Physical properties and major-ion concentrations in water samples collected from the Poplar River, East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana

[Samples collected and analyzed by the U.S. Geological Survey. Abbreviations: ft^3/s, cubic feet per second; µS/cm, microsiemens per centimeter at 25 degrees C; °C, degrees Celsius; mg/L, milligrams per liter. Symbols: <, less than; --, no data]

Site number (described in text)	Date	Streamflow, instantaneous, (ft^3/s)	Specific conductance, onsite (µS/cm)	pH, onsite (standard units)	Water temperature, onsite (°C)	Hardness, total (mg/L as $CaCO_3$)	Calcium, dissolved (mg/L as Ca)
PR-1	10-25-79	22	1,380	8.8	7.0	190	24
	09-09-81	1.7	1,560	9.0	20.0	140	12
	02-21-91	2.0	1,380	[1]8.1	0.0	160	23
	04-03-91	86	922	--	11.0	--	--
	04-24-91	36	1,180	[1]8.6	16.0	160	24
	07-23-91	49	1,260	--	20.0	--	--
	07-24-91	38	1,280	[1]8.6	22.0	160	22
	09-12-91	7.9	--	--	--	--	--
	09-23-91	13	1,430	[1]8.7	9.5	150	18
	10-28-91	9.8	1,550	[1]8.6	.5	170	21
	04-21-92	51	1,120	[1]8.4	4.5	160	29
	06-23-92	17	1,470	[1]8.8	19.0	150	17
	08-05-92	12	[1]1,430	[1]8.9	21.0	140	15
	10-16-92	8.9	1,530	[1]8.7	1.0	150	19
	04-07-93	102	900	[1]8.5	6.0	130	22
	06-17-93	29	1,330	[1]8.8	15.5	140	17
	08-12-93	118	1,210	[1]8.5	17.0	200	33
PR-8	08-13-75	37	1,650	8.9	21.5	230	23
	09-15-75	35	1,670	8.8	19.5	220	27
	12-23-75	10	2,150	8.3	0.0	320	53
	03-16-76	37	980	8.0	0.0	180	35
	04-07-76	444	590	8.2	11.0	130	26
	06-22-76	221	1,080	8.5	20.5	200	31
	07-09-76	471	920	8.8	25.0	180	29
	08-06-76	60	1,390	8.8	20.0	200	26
	09-10-76	21	1,550	8.7	14.5	210	26
	10-01-76	21	1,550	9.3	13.0	210	26
	11-11-76	28	1,520	8.7	.5	230	31
	12-10-76	26	1,890	8.1	0.0	330	45
	01-28-77	7.0	2,530	7.8	0.0	420	74
	02-11-77	19	2,050	7.9	0.0	370	65
	03-31-77	168	1,330	8.5	4.0	150	27
	04-26-77	44	1,420	8.5	19.0	190	30
	05-09-77	29	1,560	8.5	21.0	200	28
	06-06-77	52	1,550	8.5	22.5	230	30
	07-19-77	7.4	2,140	8.6	26.0	220	25
	08-22-77	6.6	3,180	8.6	18.5	260	28
	09-15-77	15	2,590	8.5	17.5	210	27
	10-28-77	29	1,930	8.5	8.0	230	31
	11-15-77	30	1,690	8.3	2.0	210	29

Magnesium, dissolved (mg/L as Mg)	Sodium, dissolved (mg/L as Na)	Sodium adsorption ratio	Potassium, dissolved (mg/L as K)	Alkalinity, onsite (mg/L as $CaCO_3$)	Sulfate, dissolved (mg/L as SO_4)	Chloride, dissolved (mg/L as Cl)	Fluoride, dissolved (mg/L as F)	Dissolved solids, computed (mg/L)
31	280	9	7.4	500	250	12	0.40	917
27	320	12	8.5	560	240	20	.50	967
24	270	9	6.0	--	230	14	.40	912
--	--	--	--	--	--	9.6	--	--
24	240	8	5.7	--	220	8.8	.40	827
--	--	--	--	--	--	9.5	--	--
26	230	8	7.9	--	180	10	.40	802
--	--	--	--	--	--	17	--	--
25	280	10	6.2	--	220	17	.50	897
29	320	11	6.0	--	270	15	.60	1,030
21	210	7	6.5	--	180	13	.40	721
25	290	10	6.1	--	240	21	.40	935
26	280	10	6.4	--	200	16	.50	880
26	320	11	5.6	--	250	12	.60	976
19	150	6	6.5	--	130	7.3	.30	553
23	270	10	6.0	--	210	10	.50	828
28	210	6	8.4	--	180	9.9	.40	778
41	320	9	14	539	300	46	.40	1,070
37	330	10	12	549	290	92	.50	1,120
45	370	9	7.9	633	290	120	.50	1,280
23	160	5	10	360	130	35	.40	619
16	79	3	8.2	222	73	11	.30	356
29	170	5	10	379	170	15	.30	662
26	150	5	11	363	140	9.6	.30	593
34	260	8	12	449	260	38	.40	904
35	290	9	10	476	250	77	.40	981
36	280	8	9.2	468	240	84	.40	962
36	280	8	7.4	506	250	48	.40	965
53	340	8	8.1	661	310	70	.50	1,230
56	380	8	7.6	582	290	290	.50	1,460
50	420	10	7.8	633	280	280	.40	1,490
21	240	8	5.4	330	140	150	.40	787
28	270	9	6.9	450	210	81	.40	901
32	300	9	7.7	460	240	110	.50	999
38	290	8	9.7	480	260	87	.50	1,010
38	420	12	9.9	510	270	270	.50	1,350
45	600	16	13	500	290	590	.40	1,870
35	480	14	10	500	240	380	.60	1,480
36	380	11	7.6	510	260	190	.60	1,220
34	310	9	6.7	510	240	96	.50	1,030

Table 12. Physical properties and major-ion concentrations in water samples collected from the Poplar River, East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana (Continued)

Site number (described in text)	Date	Streamflow, instantaneous, (ft^3/s)	Specific conductance, onsite ($\mu S/cm$)	pH, onsite (standard units)	Water temperature, onsite (^oC)	Hardness, total (mg/L as $CaCO_3$)	Calcium, dissolved (mg/L as Ca)
PR-8 (Continued)	12-21-77	9.0	2,530	7.7	0.0	340	54
	01-09-78	7.0	2,560	7.9	0.0	410	66
	02-13-78	1.0	2,510	7.9	0.0	480	83
	03-24-78	3,500	271	7.4	1.0	68	15
	04-18-78	237	882	8.4	7.0	180	34
	05-11-78	184	1,180	8.6	14.5	210	32
	06-12-78	77	1,390	8.7	19.5	230	29
	07-21-78	63	1,180	8.5	21.5	200	31
	08-15-78	17	1,680	8.6	22.0	210	26
	09-18-78	139	1,180	8.8	12.5	120	18
	10-26-78	40	1,410	8.7	6.0	200	30
	11-17-78	36	1,610	8.6	.5	270	38
	12-11-78	18	2,060	8.1	.5	390	62
	01-15-79	4.1	3,400	7.7	0.0	580	100
	02-20-79	2.5	2,530	7.8	0.0	500	99
	03-30-79	945	493	8.0	1.0	120	25
	04-19-79	5,500	310	8.0	4.0	88	17
	05-15-79	375	1,180	8.5	15.0	250	45
	06-18-79	75	1,420	8.7	19.0	270	38
	07-17-79	51	1,280	8.4	21.0	190	30
	08-13-79	23	1,660	8.4	20.5	230	31
	09-17-79	13	1,870	8.6	18.5	260	32
	10-16-79	16	2,010	8.5	10.0	260	36
	11-26-79	46	1,780	8.8	.5	260	38
	12-11-79	24	1,750	8.6	.5	260	38
	01-08-80	17	2,000	8.4	0.0	320	51
	03-28-80	96	1,040	8.1	.5	150	22
	04-17-80	128	841	8.6	12.5	160	26
	05-01-80	52	1,270	8.7	17.5	200	32
	06-24-80	10	1,600	8.7	21.0	180	19
	07-31-80	1.0	2,300	9.0	26.0	260	24
	08-21-80	12	1,780	8.6	19.0	200	21
	09-18-80	7.3	1,980	8.6	13.5	230	26
	10-23-80	29	1,660	8.8	4.0	200	27
	11-13-80	30	1,540	8.6	3.0	210	29
	01-21-81	24	1,650	8.1	.5	270	43
	03-24-81	69	1,120	8.5	7.0	180	29
	04-27-81	34	1,420	8.6	14.5	210	30
	07-02-81	24	1,480	8.7	21.0	190	19
	07-29-81	5.3	1,710	8.7	25.0	190	20
	08-25-81	.85	2,150	8.7	24.0	240	22
	09-09-81	.14	2,100	8.9	24.5	240	23
	09-23-81	.12	1,940	8.7	13.5	230	25
	11-18-86	27	1,860	8.6	0.0	290	42
	01-14-87	18	1,710	8.3	0.0	280	48

Magnesium, dissolved (mg/L as Mg)	Sodium, dissolved (mg/L as Na)	Sodium adsorption ratio	Potassium, dissolved (mg/L as K)	Alkalinity, onsite (mg/L as $CaCO_3$)	Sulfate, dissolved (mg/L as SO_4)	Chloride, dissolved (mg/L as Cl)	Fluoride, dissolved (mg/L as F)	Dissolved solids, computed (mg/L)
51	460	11	9.5	660	330	240	.50	1,550
60	470	10	8.6	690	340	250	.60	1,620
65	430	9	7.8	540	310	380	.40	1,610
7.5	26	1	8.7	110	34	4.1	.10	167
24	140	4	7.0	330	140	24	.30	576
31	200	6	7.6	430	180	22	.40	737
38	260	7	9.4	530	200	49	.40	909
30	210	6	8.9	410	170	51	.40	760
36	300	9	9.2	440	210	150	.50	1,000
19	230	9	6.2	420	170	20	.40	727
31	260	8	7.1	470	220	68	.40	906
42	300	8	7.1	550	270	60	.40	1,060
57	360	8	10	680	320	130	.50	1,360
79	550	10	11	530	280	540	.40	1,890
61	420	8	8.5	430	280	460	.30	1,600
15	61	2	12	170	93	4.9	.10	324
11	33	2	7.4	110	40	2.7	.20	189
33	180	5	7.7	400	200	24	.30	739
42	240	6	8.6	430	220	82	.40	895
28	220	7	8.0	380	190	80	.40	796
38	300	9	8.2	430	240	180	.40	1,060
43	390	11	9.1	430	260	260	.40	1,260
42	340	9	9.2	450	250	230	.40	1,190
40	320	9	9.1	530	270	93	.40	1,100
39	310	8	7.7	580	280	64	.50	1,100
47	370	9	8.2	610	320	100	.70	1,270
24	180	6	6.5	330	180	13	.30	631
22	130	5	7.1	290	130	19	.30	515
30	230	7	7.4	420	190	47	.70	796
32	300	10	8.6	490	270	71	.50	1,000
48	420	11	11	440	300	300	.60	1,370
35	350	11	8.1	430	250	160	.50	1,090
39	350	10	7.9	430	260	240	.50	1,190
32	310	10	8.1	410	250	130	.50	1,010
34	290	9	7.9	490	240	59	.40	962
40	310	8	6.8	550	290	35	.60	1,060
25	190	6	5.5	320	170	32	.30	650
32	270	8	6.4	420	240	55	.40	892
34	280	9	6.6	510	260	61	.40	973
35	310	10	6.9	420	240	170	.40	1,040
44	390	11	8.2	430	280	280	.50	1,280
44	380	11	11	450	260	260	.40	1,250
41	380	11	7.7	460	310	220	.40	1,260
44	350	9	7.1	632	310	66	.50	1,210
39	300	8	5.6	592	260	61	.50	1,080

Table 12. Physical properties and major-ion concentrations in water samples collected from the Poplar River, East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana (Continued)

Site number (described in text)	Date	Streamflow, instantaneous, (ft^3/s)	Specific conductance, onsite ($\mu S/cm$)	pH, onsite (standard units)	Water temperature, onsite (°C)	Hardness, total (mg/L as $CaCO_3$)	Calcium, dissolved (mg/L as Ca)
PR-8 (Continued)	03-25-87	118	894	8.2	.5	160	29
	05-29-87	60	1,470	8.5	16.5	190	26
	07-09-87	5.6	2,150	8.6	23.0	220	22
	09-21-87	12	1,840	8.5	15.0	210	26
	11-09-87	25	1,840	8.5	2.0	210	29
	01-27-88	1.6	3,730	7.7	0.0	630	120
	03-24-88	90	840	8.2	.5	130	20
	05-26-88	15	[1]1,770	8.5	21.0	190	21
	07-07-88	25	1,250	8.4	20.0	130	18
	09-23-88	.02	1,730	8.6	10.0	200	22
	10-26-88	5.4	2,210	8.5	4.0	290	37
	12-12-88	7.0	2,280	8.2	0.0	310	46
	03-28-89	729	400	8.0	0.0	81	17
	05-04-89	62	1,370	8.8	11.5	200	32
	07-18-89	7.4	1,820	8.5	19.0	200	22
	09-20-89	4.8	2,550	8.6	12.5	250	26
	10-26-89	8.0	2,200	8.5	7.5	240	31
	12-06-89	19	[1]1,950	8.5	0.0	240	34
	02-22-90	4.2	[1]2,600	8.1	0.0	320	53
	04-04-90	124	1,040	8.7	8.0	150	24
	06-26-90	6.4	1,860	8.5	22.5	200	19
	08-14-90	15	1,220	8.3	21.0	190	31
	10-17-90	5.7	2,300	8.7	4.0	250	31
	12-03-90	7.6	2,330	8.4	0.0	310	45
	02-20-91	1.7	1,560	8.1	0.0	210	34
	04-24-91	38	1,320	8.5	13.5	180	29
	07-24-91	44	1,390	8.4	22.0	190	27
	09-23-91	14	1,850	8.6	10.5	210	27
	10-28-91	16	1,840	8.7	.5	220	30
	12-04-91	11	2,240	8.4	0.0	330	51
	02-04-92	19	1,710	8.1	0.0	240	39
	04-21-92	57	1,240	8.4	5.5	140	26
	06-18-92	31	1,490	8.4	20.0	150	22
	08-05-92	12	1,790	9.0	19.5	190	20
	10-09-92	7.7	2,100	8.8	8.0	220	26
	12-01-92	--	1,840	8.6	0.0	240	34
	02-04-93	--	2,440	7.8	0.0	420	77
	04-07-93	103	914	8.7	6.0	130	22
	06-17-93	20	1,660	8.8	13.5	170	21
	08-12-93	143	1,330	8.6	17.0	230	41
	10-14-93	45	1,630	8.8	5.0	220	30
	12-03-93	35	1,820	8.3	0.0	270	39
	03-18-94	1,880	394	8.1	.5	85	16

[1]Laboratory measurement.

Magnesium, dissolved (mg/L as Mg)	Sodium, dissolved (mg/L as Na)	Sodium adsorption ratio	Potassium, dissolved (mg/L as K)	Alkalinity, onsite (mg/L as $CaCO_3$)	Sulfate, dissolved (mg/L as SO_4)	Chloride, dissolved (mg/L as Cl)	Fluoride, dissolved (mg/L as F)	Dissolved solids, computed (mg/L)
22	150	5	4.6	311	130	33	.30	564
31	260	8	6.6	427	200	83	.40	868
41	380	11	8.2	440	270	270	.40	1,260
35	340	10	7.4	455	230	170	.40	1,090
33	300	9	6.0	511	250	71	.50	1,010
79	550	10	9.7	683	410	590	.50	2,190
20	150	6	4.3	305	140	13	.30	541
34	340	11	6.6	511	270	120	.50	1,110
21	240	9	6.9	363	170	68	.40	752
36	310	9	6.9	424	250	150	.30	1,030
48	450	11	7.5	465	270	320	.40	1,410
48	470	12	6.8	669	340	210	.50	1,540
9.4	57	3	5.9	122	70	5.4	.10	244
30	240	7	6.1	422	220	49	.40	840
34	360	11	8.5	415	220	250	.40	1,160
44	510	14	11	474	280	410	.50	1,580
39	430	12	8.0	495	280	300	.50	1,390
38	380	11	6.1	567	300	110	.40	1,240
45	490	12	8.2	638	330	260	.40	1,590
22	190	7	5.3	387	170	22	.20	675
36	370	12	7.4	476	270	200	<.10	1,200
28	230	7	10	377	160	95	.40	798
42	430	12	8.2	447	230	300	.20	1,320
47	440	11	7.7	718	--	180	.60	--
31	330	10	8.4	--	250	92	.40	1,090
25	240	8	5.7	469	200	52	.50	846
29	260	8	9.0	499	160	58	.40	865
34	340	10	7.0	494	240	170	.60	1,130
34	360	11	6.6	548	240	120	.60	1,130
48	420	10	7.0	665	330	140	.80	1,410
35	320	9	6.2	572	240	72	.60	1,080
19	230	8	5.1	404	180	40	.50	755
23	290	10	6.0	427	230	57	.40	898
33	330	11	6.4	492	230	140	.50	1,060
38	400	12	7.0	--	270	200	.50	1,260
38	330	9	6.6	--	290	63	.10	1,130
54	360	8	6.9	--	280	350	.30	1,430
19	150	6	6.8	--	120	22	.30	542
28	300	10	6.4	--	230	110	.50	983
31	220	6	8.7	--	190	41	.40	834
35	290	9	6.0	--	250	78	.40	1,020
42	320	8	6.2	--	280	70	.50	1,130
11	56	3	9.2	--	72	4.7	.10	263

Table 13. Trace-element concentrations in water samples collected from the Poplar River, East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana

[Samples collected and analyzed by the U.S. Geological Survey. Abbreviations: ft^3/s, cubic feet per second; µg/L, micrograms per liter. Symbols: <, less than; --, no data]

Site number (described in text)	Date	Streamflow, instantaneous (ft^3/s)	Barium, dissolved (µg/L as Ba)	Boron, dissolved (µg/L as B)	Iron, dissolved (µg/L as Fe)	Lithium, dissolved (µg/L as Li)	Manganese, dissolved (µg/L as Mn)	Strontium, dissolved (µg/L as Sr)
PR-1	10-25-79	22	--	960	10	--	--	--
	09-09-81	1.7	--	1,200	21	--	--	--
	02-21-91	2.0	--	790	74	--	--	--
	04-24-91	36	--	760	46	--	6	--
	07-24-91	38	--	1,000	35	--	--	--
	09-23-91	13	--	1,000	15	--	--	--
	10-28-91	9.8	--	1,100	22	--	--	--
	04-21-92	51	--	640	3,400	--	190	--
	06-23-92	17	--	1,100	62	--	--	--
	08-05-92	12	--	1,100	58	--	--	--
	10-16-92	8.9	--	1,100	15	--	--	--
	04-07-93	102	--	540	190	--	5	--
	06-17-93	29	--	950	44	--	--	--
	08-12-93	118	--	1,000	35	--	--	--
PR-8	08-13-75	37	--	1,600	60	--	<10	--
	09-15-75	35	--	1,200	60	--	<10	--
	12-23-75	10	--	1,000	<10	--	60	--
	03-16-76	37	--	500	130	--	30	--
	04-07-76	444	--	290	120	--	20	--
	06-22-76	221	--	800	60	--	4	--
	07-09-76	471	--	870	110	--	--	--
	08-06-76	60	--	1,300	20	--	--	--
	09-10-76	21	--	1,200	<10	110	<10	--
	10-01-76	21	--	1,100	20	--	--	--
	11-11-76	28	--	990	20	--	--	--
	12-10-76	26	--	1,100	<10	130	30	--
	01-28-77	7.0	--	870	20	--	--	--
	02-11-77	19	--	890	30	--	--	--
	03-31-77	168	--	520	90	70	20	--
	04-26-77	44	--	790	30	--	--	--
	05-09-77	29	--	880	20	--	--	--
	06-06-77	52	--	1,200	20	90	<10	--
	07-19-77	7.4	--	1,200	20	--	--	--
	08-22-77	6.6	--	810	<10	150	<10	--
	09-15-77	15	--	1,200	20	--	--	--
	10-28-77	29	--	1,100	30	--	--	--
	11-15-77	30	--	--	30	--	--	--
	12-21-77	9.0	--	1,200	30	140	40	--
	01-09-78	7.0	--	1,100	40	--	--	--
	02-13-78	1.0	--	840	<10	--	--	--
	03-24-78	3,500	--	150	160	<10	30	--
	04-18-78	237	--	460	80	--	--	--
	05-11-78	184	--	670	50	--	--	--
	06-12-78	77	--	910	<10	110	<10	--

Table 13. Trace-element concentrations in water samples collected from the Poplar River, East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana (Continued)

Site number (described in text)	Date	Streamflow, instantaneous (ft^3/s)	Barium, dissolved (µg/L as Ba)	Boron, dissolved (µg/L as B)	Iron, dissolved (µg/L as Fe)	Lithium, dissolved (µg/L as Li)	Manganese, dissolved (µg/L as Mn)	Strontium, dissolved (µg/L as Sr)
PR-8	07-21-78	63	--	920	130	--	--	--
(Continued)	08-15-78	17	--	1,100	<10	--	--	--
	09-18-78	139	--	880	40	90	<10	--
	10-26-78	40	--	940	<10	--	<10	--
	11-17-78	36	--	1,100	<10	--	--	--
	12-11-78	18	--	1,200	30	--	70	--
	01-15-79	4.1	--	990	<10	--	--	--
	02-20-79	2.5	--	720	50	--	--	--
	03-30-79	945	--	300	150	--	<10	--
	04-19-79	5,500	--	200	50	--	20	--
	05-15-79	375	--	630	50	--	--	--
	06-18-79	75	--	1,100	<10	--	<10	--
	07-17-79	51	--	760	30	--	--	--
	08-13-79	23	--	660	<10	--	--	--
	09-17-79	13	--	1,000	<10	--	20	--
	10-16-79	16	--	990	<10	--	--	--
	12-11-79	24	--	1,100	--	--	20	--
	01-08-80	17	--	950	20	--	--	--
	03-28-80	96	--	680	40	--	10	--
	04-17-80	128	--	640	40	--	5	--
	05-01-80	52	--	760	10	--	--	--
	06-24-80	10	--	1,200	20	--	8	--
	07-31-80	1.0	--	1,200	20	--	0	--
	08-21-80	12	--	1,100	20	--	--	--
	09-18-80	7.3	--	1,000	<10	--	10	--
	10-23-80	29	--	800	10	--	--	--
	11-13-80	30	--	830	20	--	--	--
	01-21-81	24	--	1,100	10	--	--	--
	03-24-81	69	--	570	40	--	10	--
	04-27-81	34	--	780	20	--	--	--
	07-02-81	24	--	1,100	<10	--	3	--
	07-29-81	5.3	--	940	10	--	--	--
	08-25-81	.85	--	1,000	80	--	10	--
	09-09-81	.14	--	1,000	30	--	--	--
	09-23-81	.12	--	1,000	19	--	13	--
	11-18-86	27	76	--	17	120	22	610
	03-25-87	118	55	--	95	52	17	350
	07-09-87	5.6	57	--	17	110	6	480
	09-21-87	12	63	--	8	90	5	450
	11-09-87	25	52	--	7	91	5	460
	03-24-88	90	35	--	45	44	7	290
	07-07-88	25	49	--	150	68	3	300
	09-23-88	.02	52	--	11	95	2	410
	10-26-88	5.4	60	--	19	120	9	660
	03-28-89	729	45	--	300	18	7	170

Table 13. Trace-element concentrations in water samples collected from the Poplar River, East Poplar oil field, Fort Peck Indian Reservation, northeastern Montana (Continued)

Site number (described in text)	Date	Streamflow, instantaneous (ft^3/s)	Barium, dissolved (µg/L as Ba)	Boron, dissolved (µg/L as B)	Iron, dissolved (µg/L as Fe)	Lithium, dissolved (µg/L as Li)	Manganese, dissolved (µg/L as Mn)	Strontium, dissolved (µg/L as Sr)
PR-8	07-18-89	7.4	55	--	7	100	5	500
(Continued)	09-20-89	4.8	58	--	7	140	6	650
	10-26-89	8.0	50	--	21	120	6	630
	02-22-90	4.2	72	--	21	130	45	830
	06-26-90	6.4	53	--	5	110	5	450
	08-14-90	15	89	--	18	68	2	460
	10-17-90	5.7	57	--	9	130	11	610
	02-20-91	1.7	51	--	73	95	62	450
	07-24-91	44	89	--	35	100	3	460
	09-23-91	14	63	--	19	110	8	470
	10-28-91	16	56	--	7	110	14	480
	02-04-92	19	55	--	18	110	37	530
	06-18-92	31	57	--	57	89	<1	400
	08-05-92	12	50	--	13	110	3	420
	10-09-92	7.7	52	--	21	130	6	520
	02-04-93	--	89	--	18	120	260	900
	06-17-93	20	50	--	40	95	2	420
	08-12-93	143	89	--	24	81	5	520
	10-14-93	45	57	--	11	97	18	490
	03-18-94	1,880	39	--	160	19	22	170