

Montana Bureau of Mines and Geology
Final Technical Report for NGWMN Award G21AC10418-02

Miscellaneous Contribution 26

September 2026

John LaFave and James Madison

<https://doi.org/10.59691/MMRP5081>



Montana Bureau of Mines and Geology NGWMN Final Technical Report

Award Number: G23AC00307-01

Agency Name: Montana Bureau of Mines and Geology

Title: Montana Bureau of Mines and Geology 2023–2026—Persistent Data Services, Fort Peck Well Drilling, and Transducer Replacement/Upgrades

Author: John LaFave and James Madison
Montana Bureau of Mines and Geology
1300 W. Park St.
Butte, MT 59701
(406) 496-4306, JLafave@mtech.edu

Term Covered: 07/01/2023–06/30/2026

Date of Final Report: September 30, 2026

Background

The Montana Bureau of Mines and Geology (MBMG) maintains a statewide groundwater monitoring network to collect water-level and water-quality data from about 800 wells. Many of these wells are completed in Principal Aquifers, including the heavily developed intermontane basin aquifers in the west (S100NRMTIB), and the less intensively developed but widely used alluvial (N100ALLUVL), Lower Tertiary (N300LTRTRY), Upper Cretaceous (N300UPCTCS), Lower Cretaceous (N300LCRTCS), and Paleozoic aquifers (N500PLOZOC) in the east (Whitehead, 1996). The MBMG became a National Groundwater Monitoring Network (NGWMN) data provider in 2015 and, at the start of this project, provided water-level data for 224 sites and water-quality data for 58 sites.

In 2023, the MBMG submitted a proposal in response to Program Announcement/Funding Opportunity G23AS00358 to:

- (1) (Objective 2) Maintain ongoing web services to the NGWMN Portal, and update the NGWMN well registry for Montana sites.
- (2) (Objective 5) Drill three monitoring wells on the Fort Peck Reservation to fill NGWMN spatial gaps in (a) the glacial sand and gravel (N100GLCIAL) aquifer system, (b) the lower Tertiary (N300LTRTRY) aquifer, and (c) the upper Cretaceous (N300UPCTCS) aquifer.
- (3) (Objective 6) Replace or upgrade 15 wells with pressure transducers (and 11 barologgers).

Description of work done to *Maintain ongoing web services—Objective 2*

During the grant period, the MBMG Data Center revised the database structures supporting the NGWMN within the Groundwater Information Center (GWIC) database. These revisions streamlined the storage and reporting of NGWMN data and improved the database's ability to communicate with the NGWMN Application Programming Interface (API). The work improved the efficiency and reliability of maintaining NGWMN site and monitoring data within GWIC.

Throughout the grant period, the MBMG maintained the GWIC data tables and associated API software required to provide continuous online delivery of NGWMN data. These ongoing maintenance activities ensured that Montana's NGWMN data remained available to the NGWMN Portal through the project period and supported uninterrupted data exchange between GWIC and the national network.

Over the project period, the MBMG updated the NGWMN well registry to improve the quality and spatial coverage of Montana's contribution to the network. Two wells were removed from the registry because they provided redundant data, or were no longer accessible for monitoring. At the same time, 56 wells were added to the network to improve the completeness of groundwater monitoring coverage for Montana's principal aquifers. The removed and newly added wells are listed in appendix A.

Description of work done in *Well Drilling*—Objective 5

The work done under Objective 5 aimed to drill three monitoring wells on the Fort Peck Reservation to fill NGWMN spatial gaps in (1) the glacial sand and gravel (N100GLCIAL) aquifer system, (2) the Lower Tertiary (N300LTRTRY) aquifer, and (3) the Upper Cretaceous (N300UPCTCS) aquifer.

Three wells were targeted for the Fort Peck Reservation in northeastern Montana to monitor the buried glacial-alluvial aquifer system, the Lower Tertiary Fort Union Formation, and the Upper Cretaceous Fox Hills–Hell Creek Formations. In addition to filling an NGWMN spatial data gap, these wells will support the Fort Peck Tribe in establishing a groundwater monitoring network to track changes in groundwater storage. Two of the wells were co-located with Montana Mesonet stations operated by the Montana Climate Office. The Mesonet stations provide real-time meteorological and soil moisture data. These sites are located on tribal lands and will provide important information on recharge and the effects of long-term climate variability on the Fort Peck Reservation.

Well Drilling and Construction

Only one contractor—S&S Drilling of Williston, North Dakota, a company licensed to operate in Montana—responded to the Invitation to Bid. S&S employs mud-rotary drilling methods, in which drilling mud rather than air is used to circulate cuttings to the surface, manage subsurface pressures, and cool and lubricate the drill bit. The wells were installed between June 18 and 25, 2025.

A 4.5-inch pilot hole was drilled to total depth at each site, and lithology samples were collected and described along the way. After the appropriate screen interval was selected, the borehole was reamed to 7¾ inches down to the base of the screen zone. A 12-inch borehole was advanced from the surface to approximately 8 feet to accommodate the installation of an 8-inch steel surface casing, which provides protection around the PVC casing. Before a well was constructed in a borehole, fresh water was circulated to remove drill fluid and clean up the borehole.

Monitoring well construction used 4-inch flush-thread PVC casing and screen. The screen was manufactured with 0.020-inch slots. After the PVC casing and screen were set, 10/20 silica sand was placed in the borehole to create a filter pack around the screened interval. The sand pack was sounded during placement and brought to a height 5 feet above the top of the screen.

Bentonite chips were then added above the sand pack to seal the annulus, extending from the top of the sand to within 5 feet of land surface. The 8-inch steel surface casing was sealed from 8 feet below ground level up to the surface. Silica sand was also placed in the annular space between the 8-inch steel casing and the 4-inch PVC casing up to near the top of the PVC, allowing the steel casing to move with frost heave without pulling the PVC upward. The 4-inch PVC casing was capped, and a vented, sanitary, locking well cap was installed on the 8-inch steel surface casing. At the Big Muddy Site, bollards were placed around the well.

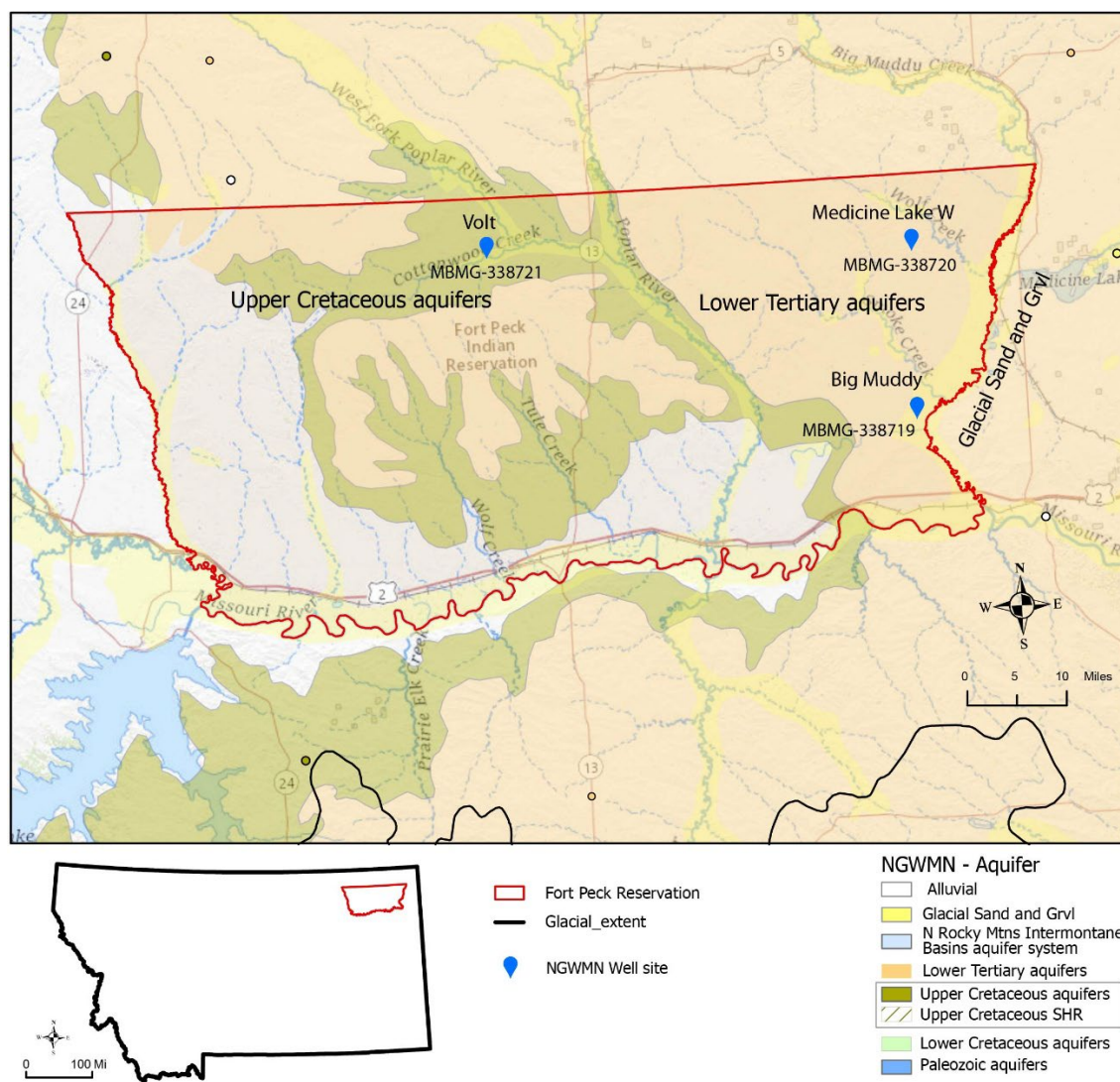


Figure 1. Locations of wells drilled on the Fort Peck Reservation.

Volt Well—MBMG-338721

The Volt well (MBMG-338721) is located approximately 31 miles east of Wolf Point, Montana, and about 11 miles northeast of Volt, Montana (fig. 1). The site is co-located with a Mesonet station.

Drilling began with a 4.5-inch pilot hole advanced to a depth of 200 feet. The hole was then reamed to 75 feet and completed with well screen from 65 to 75 feet, targeting the gray, fine-grained sandstone identified as the Upper Cretaceous (N300UPCTCS) Fox Hills–Hell Creek Aquifer. Below the screened interval, the sandstone grades into sandy shale and then into dark shale, both of which are interpreted as Bearpaw Shale and considered non-aquifer materials. This well was developed by air surging and produced about 10 gpm measured with a bucket and stopwatch. The well was equipped with an OTT PLS500 1-10M transducer. The well log, constructions details, and photos are included in appendix B.

Water Quality

The well was sampled for major ions, trace-element constituents, and stable-water isotopes on 09/23/2025. The sample was analyzed by the MBMG Analytical Laboratory; the results are included in appendix C. The water was moderately mineralized—the total dissolved solids (TDS) was 1,432 mg/L, with a sulfate concentration of 603 mg/L, above the secondary standard of 250 mg/L. There was a manganese concentration of 0.14 mg/L, above the primary standard of 0.1 mg/L. No other constituents exceeded a primary or secondary standard.

Specific Capacity

The initial static water level was 26.45 feet bls. The well was pumped at 1.5 gpm for about 1 hour for sampling, and the pumping water level was 31.35 feet bls, yielding a specific capacity of 0.31 gpm/ft.

All site information and well construction details have been included in the Montana Bureau of Mines and Geology Ground Water Information Center database and added to the National Groundwater Monitoring Network well registry.

Medicine Lake West Well—MBMG-338720

The Medicine Lake West well (MBMG-338720) is located approximately 10 miles west of Medicine Lake, Montana (fig. 1). The site is co-located with a Mesonet station.

Drilling began with a 4.5-inch pilot hole advanced to a depth of 160 feet. The hole was then reamed to 136 feet and completed with well screen from 126 to 136 feet, targeting the gray sandstone; this zone was dry. The casing was removed from the hole, and a pilot hole was drilled to 300 feet and completed with screen from 280 to 290 feet to tap the coalbed from 276 to 289 feet in the Lower Tertiary (N300LTRTRY) aquifer. The well log, construction details, and photos are included in appendix B.

The well was developed with water to remove fine sediment and blown out with air, but was very slow to recover. The static water level of this well was measured on 08/29/2025 and was 244.64 ft below land surface. Because of the deep static water level and very low yield, this site was not initially equipped with a pressure transducer for real-time monitoring. However, the Fort Peck Tribes supplied an In-Situ Level Troll transducer that will be downloaded quarterly by the MBMG. Because of the low yield, the well was unable to be sampled.

All site information and well construction details have been included in the Montana Bureau of Mines and Geology Ground Water Information Center database and added to the National Groundwater Monitoring Network well registry.

Big Muddy Well—MBMG-338719

The Big Muddy well (MBMG-338719) is located approximately 7.5 miles southwest of Medicine Lake, Montana, and about 3.5 miles west of Homestead, Montana (fig. 1).

Drilling began with a 4.5-inch pilot hole advanced to a depth of 140 feet. The unconsolidated fill/Fort Union contact was crossed at 125 feet below land surface. The hole was then reamed to 125 feet and completed with well screen from 114 to 124 feet, targeting the fine sand and gravel identified as the glacial sand and gravel (N100GLCIAL) aquifer system. This well was developed by air surging and was estimated to produce about 100 gpm.

Water Quality

The well was sampled for major ions, trace-element constituents, and stable-water isotopes on 09/16/2025. The sample was analyzed by the MBMG Analytical Laboratory; the results are included in appendix C. The water was moderately mineralized—the total dissolved solids (TDS) was 1,142 mg/L, with an iron concentration of 3.38 mg/L, above the secondary standard of 0.3 mg/L; no other constituents exceeded a primary or secondary standard.

Specific Capacity

The initial static water level was 2.14 feet bls. The well was pumped at 3.3 gpm for about 2 hours for sampling, and the pumping water level was 4.43 feet bls, yielding a specific capacity of 1.44 gpm/ft.

All site information and well construction details have been included in the Montana Bureau of Mines and Geology Ground Water Information Center database and added to the National Groundwater Monitoring Network well registry.

Objective 5 Accomplishments

The three monitoring wells were completed in the targeted principal aquifers on the Fort Peck Reservation (table 1): the Upper Cretaceous Fox Hills–Hell Creek aquifer at the Volt site, the Lower Tertiary aquifer at the Medicine Lake West site, and the glacial sand and gravel aquifer system at the Big Muddy site. The wells provide additional spatial coverage for the NGWMN in northeastern Montana and establish new monitoring locations for groundwater-level and groundwater-quality information.

Well construction information, site information, and associated data have been entered into the MBMG Ground Water Information Center database and the NGWMN Well Registry. Well logs, construction diagram, and photos are provided in appendix B, and water-quality analytical results are provided in appendix C.

Table 1. Well summary details. *Transducer in well MBMG-338720 supplied by Ft Peck Tribes.

Site Name	MBMG-338721	MBMG-338720	MBMG-338719
Location	Volt	Medicine Lake W	Big Muddy
National Aquifer	N300UPCTCS	N300LTRTRY	N100GLCIAL
Completion Date	6/18/2025	6/19/2026	6/25/2025
Screen Interval (ft bg)	65-75	126-136	114-124
Specific Capacity (gpm/ft)	0.31	NA	1.44
Water-Level Type	Trend	NA	Trend
Water_Level Characteristics	Background	NA	Background
Transducer Type	OTT PLS500	InSitu-400Troll*	InSitu-400Troll

Description of work done to *Support continuous water-level data collection—Objective 6*

Under Objective 6, the MBMG proposed replacing or upgrading 15 NGWMN wells with continuous water-level monitoring equipment. The proposed upgrades were intended to provide higher-frequency measurements at remote sites where access is difficult and to improve the availability and quality of groundwater-level data.

During implementation, field evaluation determined that most of the wells identified in the proposal could not be instrumented because of logistical constraints or conditions at the wellheads. Therefore, the MBMG received approval to evaluate alternative NGWMN sites that could be effectively instrumented (Jason Fine, personal communication). Based on our evaluation, we used grant funds and additional MBMG funds to instrument 23 NGWMN wells over the performance period.

These additional installations increased the number of Montana NGWMN sites providing continuous water-level data and extended the project's benefits beyond the originally proposed sites. Thus, although the specific sites identified in the proposal could not all be instrumented, the overall objective of increasing the availability of high-frequency water-level data from the NGWMN network was advanced through a combination of grant-funded installations and additional MBMG-funded upgrades at other NGWMN sites. Table 2 lists the sites, equipment, and installation dates.

Table 2. Summary table of wells instrumented with continuous water-level data collection equipment.

Site Name	National Aquifer Code	WL Well Characteristics	WL Well Type	Transducer	Baro	Date Install
MBMG-2010	N300LCRTCS	Background	Trend	Solinst Levellogger-5	3001 Barologger	6/3/2026
MBMG-4211	N300LTRTRY	Anticipated Changes	Trend	Solinst Levellogger-5		7/8/2026
MBMG-4287	N100GLCIAL	Background	Trend	Solinst Levellogger-5	3001 Barologger	7/9/2026
MBMG-24903	N300UPCTCS	Background	Trend	Solinst Levellogger-5	3001 Barologger	6/3/2026
MBMG-48477	S100NRMTIB	Background	Trend	Solinst Levellogger-5		4/20/2026
MBMG-50727	S100NRMTIB	Background	Trend	Solinst Levellogger-5	3001 Barologger	4/23/2026
MBMG-60137	S100NRMTIB	Background	Trend	Solinst Levellogger-5		4/22/2026
MBMG-64077	S100NRMTIB	Background	Trend	Solinst Levellogger-5		4/22/2026
MBMG-128741	S100NRMTIB	Background	Trend	Solinst Levellogger-5	3001 Barologger	4/29/2026
MBMG-133382	S100NRMTIB	Background	Trend	Solinst Levellogger-5		6/10/2026
MBMG-154583	S100NRMTIB	Background	Trend	Solinst Levellogger-5		6/18/2026
MBMG-154584	S100NRMTIB	Background	Trend	Solinst Levellogger-5		6/18/2026
MBMG-158554	N100ALLUVL	Background	Trend	Solinst Levellogger-5	3001 Barologger	8/5/2026
MBMG-164350	S100NRMTIB	Background	Trend	Solinst Levellogger-5	3001 Barologger	6/18/2026
MBMG-169098	S100NRMTIB	Known Changes	Trend	Solinst Levellogger-5		10/8/2024
MBMG-216851	N500PLOZOC	Background	Trend	Solinst Levellogger-5	3001 Barologger	5/21/2024
MBMG-242404	S100NRMTIB	Background	Trend	Solinst Levellogger-5		7/16/2026
MBMG-250296	S100NRMTIB	Background	Trend	Solinst Levellogger-5	3001 Barologger	4/20/2026
MBMG-280978	S100NRMTIB	Background	Trend	Solinst Levellogger-5	3001 Barologger	4/20/2026
MBMG-286267	S100NRMTIB	Background	Trend	Solinst Levellogger-5		4/23/2026
MBMG-308703	S100NRMTIB	Background	Trend	Solinst Levellogger-5	3001 Barologger	7/1/2026
MBMG-331779	S100NRMTIB	Background	Trend	Solinst Levellogger-5		4/20/2026
MBMG-705232	N300LTRTRY	Background	Trend	Solinst Levellogger-5		8/5/2026

References

Whitehead, R.L., 1996, Ground water atlas of the United States segment 8—Montana, North Dakota, South Dakota, Wyoming: U.S. Geological Survey Hydrologic Investigations Atlas 370-I, 24 p.

Appendix A

NGWMN Well Registry Updates

Appendix A - Well Registry Updates

Sites Removed from the Registry

Site Name	National Aquifer Code	County	Aquifer Type	WL Well Characteristics	WL Well Type
MBMG-171672	S100NRMTIB	Madison County	UNCONFINED	Background	Trend
MBMG-50808	S100NRMTIB	Ravalli County	UNCONFINED	Background	Trend

Sites Added to the Registry

Site Name	National Aquifer Code	County	Aquifer Type	WL Well Characteristics	WL Well Type
MBMG-105523	S100NRMTIB	Carbon County	UNCONFINED	Background	Trend
MBMG-107951	S100NRMTIB	Madison County	UNCONFINED	Background	Trend
MBMG-108471	S100NRMTIB	Madison County	UNCONFINED	Background	Trend
MBMG-123132	S100NRMTIB	Ravalli County	UNCONFINED	Background	Trend
MBMG-128327	S100NRMTIB	Madison County	UNCONFINED	Background	Trend
MBMG-131122	S100NRMTIB	Beaverhead County	UNCONFINED	Background	Trend
MBMG-135736	S100NRMTIB	Beaverhead County	UNCONFINED	Background	Trend
MBMG-140123	N300LTRTRY	Musselshell County	CONFINED	Background	Trend
MBMG-150622	S100NRMTIB	Flathead County	UNCONFINED	Background	Trend
MBMG-151189	S100NRMTIB	Missoula County	UNCONFINED	Background	Trend
MBMG-153329	S100NRMTIB	Flathead County	UNCONFINED	Background	Trend
MBMG-161775	S100NRMTIB	Silver Bow County	UNCONFINED	Background	Trend
MBMG-164350	S100NRMTIB	Missoula County	UNCONFINED	Background	Trend
MBMG-168180	S100NRMTIB	Ravalli County	UNCONFINED	Background	Trend
MBMG-2010	N300LCRTCS	Judith Basin County	UNCONFINED	Background	Trend
MBMG-202245	S100NRMTIB	Sanders County	UNCONFINED	Background	Trend
MBMG-214910	S100NRMTIB	Gallatin County	UNCONFINED	Background	Trend
MBMG-215921	S100NRMTIB	Sanders County	UNCONFINED	Background	Trend
MBMG-240528	N300LCRTCS	Stillwater County	UNCONFINED	Background	Trend
MBMG-242404	S100NRMTIB	Beaverhead County	UNCONFINED	Background	Trend
MBMG-242406	S100NRMTIB	Beaverhead County	CONFINED	Background	Trend
MBMG-242408	S100NRMTIB	Madison County	CONFINED	Background	Trend
MBMG-242411	S100NRMTIB	Madison County	UNCONFINED	Background	Trend
MBMG-250296	S100NRMTIB	Jefferson County	UNCONFINED	Background	Trend
MBMG-260891	S100NRMTIB	Flathead County	UNCONFINED	Background	Trend
MBMG-260892	S100NRMTIB	Flathead County	CONFINED	Background	Trend
MBMG-262314	S100NRMTIB	Flathead County	UNCONFINED	Background	Trend
MBMG-262322	S100NRMTIB	Flathead County	UNCONFINED	Background	Trend
MBMG-262323	S100NRMTIB	Flathead County	UNCONFINED	Background	Trend
MBMG-262325	S100NRMTIB	Flathead County	CONFINED	Background	Trend
MBMG-267111	S100NRMTIB	Madison County	UNCONFINED	Background	Trend
MBMG-274392	S100NRMTIB	Missoula County	UNCONFINED	Background	Trend
MBMG-278304	S100NRMTIB	Lincoln County	UNCONFINED	Background	Trend
MBMG-279259	S100NRMTIB	Madison County	UNCONFINED	Background	Trend
MBMG-285897	S100NRMTIB	Lincoln County	UNCONFINED	Background	Trend
MBMG-286267	S100NRMTIB	Ravalli County	UNCONFINED	Background	Trend
MBMG-290632	S100NRMTIB	Missoula County	UNCONFINED	Background	Trend
MBMG-294771	S100NRMTIB	Sanders County	UNCONFINED	Background	Trend
MBMG-308703	S100NRMTIB	Gallatin County	UNCONFINED	Background	Trend
MBMG-310777	S100NRMTIB	Flathead County	UNCONFINED	Background	Trend
MBMG-310815	S100NRMTIB	Flathead County	UNCONFINED	Background	Trend
MBMG-318275	S100NRMTIB	Flathead County	UNCONFINED	Background	Trend

MBMG-322962	N300UPCTCS	Glacier County	CONFINED	Background	Trend
MBMG-324104	S100NRMTIB	Lincoln County	UNCONFINED	Background	Trend
MBMG-327700	S100NRMTIB	Lincoln County	UNCONFINED	Background	Trend
MBMG-327701	S100NRMTIB	Lincoln County	UNCONFINED	Background	Trend
MBMG-328234	S100NRMTIB	Beaverhead County	UNCONFINED	Background	Trend
MBMG-328235	S100NRMTIB	Beaverhead County	UNCONFINED	Background	Surveillance
MBMG-331779	S100NRMTIB	Jefferson County	UNCONFINED	Background	Trend
MBMG-48477	S100NRMTIB	Jefferson County	UNCONFINED	Background	Trend
MBMG-50727	S100NRMTIB	Ravalli County	UNCONFINED	Background	Trend
MBMG-65432	S100NRMTIB	Lewis and Clark County	UNCONFINED	Background	Trend
MBMG-85274	S100NRMTIB	Flathead County	UNCONFINED	Background	Trend
MBMG-86974	S100NRMTIB	Lincoln County	UNCONFINED	Background	Trend
MBMG-87873	S100NRMTIB	Flathead County	UNCONFINED	Background	Trend
MBMG-90519	S100NRMTIB	Lincoln County	UNCONFINED	Background	Trend

Appendix B

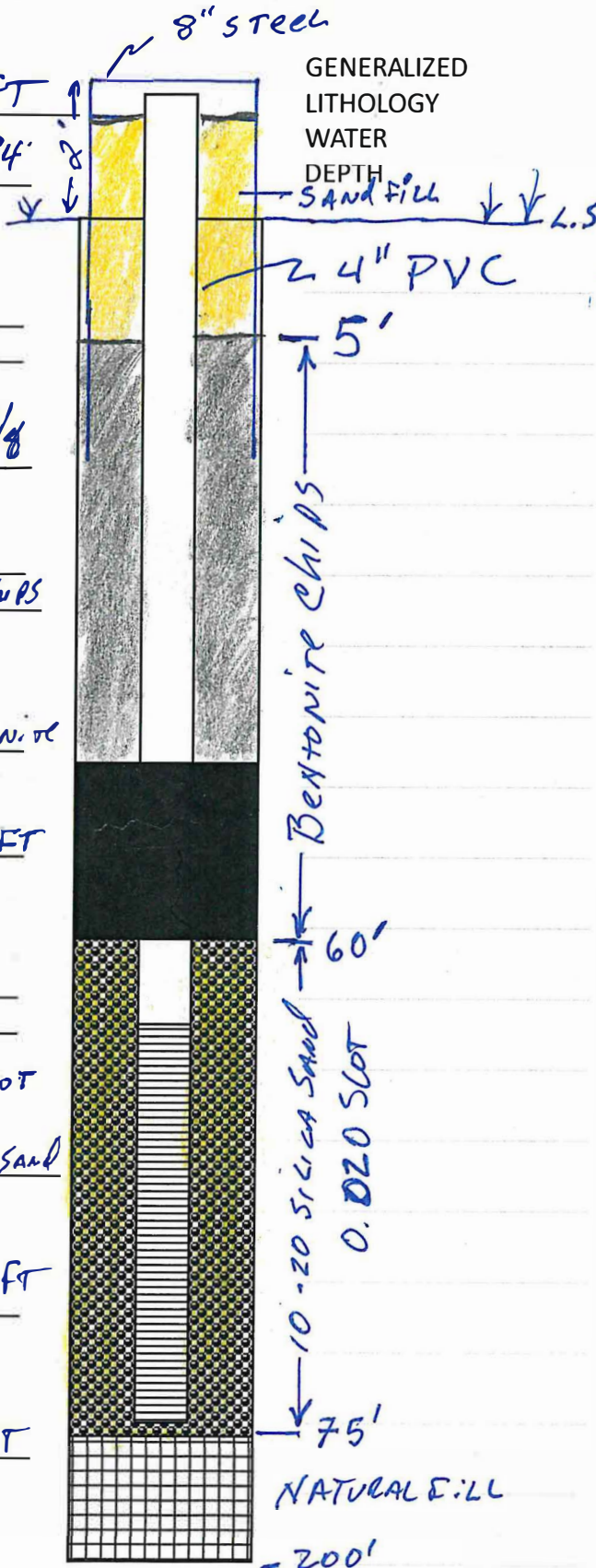
Well Logs and Photos

Other Options

[Return to menu](#)
[Plot this site in State Library Digital Atlas](#)
[Plot this site in Google Maps](#)
[View hydrograph for this site](#)
[View field visits for this site](#)
[View water quality for this site](#)

Date Completed: 6/18/2025

DEPTHS BELOW GROUND SURFACE IN FEET

COMPLETIONMP 1.52 FTGS 2392.94'CASING
SIZE/MATERIAL4" PVCBOREHOLE
DIAMETER 7 7/8BACKFILL
MATERIAL
Bentonite chipsSEAL
TOP/MATERIAL
1 ft / BentoniteSEAL
BOTTOM 60 FTSCREEN
TOP/SIZE/TYPE65 FT
4"
PVC
0.020 slotPACK MATERIAL
10-20 silica sandSCREEN
BOTTOM 75 FTDRILLED
DEPTH 200 FTPROJECTFort Peck NGWMNGWIC 338721

WELL NAME

MBMG-VOLTLOCATIONT 32N S, R 47E WS07 TRACT BDCALATITUDE48.5421577LONGITUDE-105.6622625DATUM/METHODNA083 / SURGPSDATE WELL STARTED6-18-2025DATE WELL COMPLETED6-18-2025RECORDED BYJAMES P. MADISONDRILLER/LICENSEJAMES P. MADISON / MWC #477COMPANYSJS DRILLINGNOTESMud RotaryBorehole0-200 ft - 4 1/2"0-75 ft - 7 7/8"0-0 ft - 1 1/2" SURFACE CASING

SWL_MP	29.5	YIELD	10 gpm - Educator Pipe ; Air ; Bucket ; stopwatch
SWL_GS	27.5	DURATION	2 hrs
PWL_MP	—	DEVELOPMENT TIME	2 hrs

CONNECTION

PAGE 2 OF 2. COMPLETION DETAILS ON FRONT.

MONTANA WELL LOG REPORT**Other Options**

This well log reports the activities of a licensed Montana well driller, serves as the official record of work done within the borehole and casing, and describes the amount of water encountered. This report is compiled electronically from the contents of the Ground Water Information Center (GWIC) database for this site. Acquiring water rights is the well owner's responsibility and is NOT accomplished by the filing of this report.

[Return to menu](#)
[Plot this site in State Library Digital Atlas](#)
[Plot this site in Google Maps](#)
[View hydrograph for this site](#)
[View field visits for this site](#)

Site Name: MBMG--MEDICINE LAKE WEST * MBMG FRUN
GWIC Id: 338720

Section 7: Well Test Data

Total Depth: 290
 Static Water Level: 248
 Water Temperature:

** During the well test the discharge rate shall be as uniform as possible. This rate may or may not be the sustainable yield of the well. Sustainable yield does not include the reservoir of the well casing.*

Section 1: Well Owner(s)

1) FORT PECK TRIBE (MAIL)
 DAVIS VALLEY ROAD
 N/A MT N/A [04/09/2025]

Section 2: Location

Township	Range	Section	Quarter Sections			
32N	54E	17	SW¼	SW¼	SE¼	SW¼
County		Geocode		Parcel		
SHERIDAN						
Latitude	Longitude	Geomethod		Datum		
48.51993	-104.73094	NAV-GPS		WGS84		
Ground Surface Altitude	Ground Surface Method	Datum	Date			
2483	DIGITALMAP	NAVD88	6/20/2025			
Measuring Point Altitude	MP Method	Datum	Date Applies			
2485.1	DIGITALMAP	NAVD88	6/20/2025			
Addition	Block	Lot				

Section 8: Remarks

DRILLED BY S & S DRILLING JAMES MADISON ON SITE. VERY LOW YIELDING; BLEW DRY; SLOW RECOVERY.

Section 9: Well Log**Geologic Source**

Unassigned

From	To	Description
0	20	YELLOW SHALE
20	25	GRAY SANDY SHALE
25	28	COAL
28	45	YELLOW SHALE
45	55	GRAY SHALE
55	58	COAL
58	65	GREEN SHALE WITH COAL
65	75	GRAY SILTY SHALE
75	95	SILT STONE AND FINE SAND LAYERS; GRAY
95	97	SILT STONE
97	100	COAL
100	126	GRAY SHALE
126	136	GRAY SAND STONE; DRY
136	139	SHALE
139	142	SANDSTONE

Section 3: Proposed Use of Water

MONITORING (1)

Section 4: Type of Work

Drilling Method: MUD ROTARY
 Status: NEW WELL

Section 5: Well Completion Date

Date well completed: Thursday, June 19, 2025

Section 6: Well Construction Details**Borehole dimensions**

From	To	Diameter
0	8	12
0	290	7.875
0	300	4.5

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
-2	8	8				STEEL
-1.5	280	4				PVC

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
280	290	4		0.020	FACTORY SLOTTED

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?
0	5	SANDFILL	
5	275	BENTONITE CHIPS	
275	290	10/20 SILICA SAND	

Driller Certification

All work performed and reported in this well log is in compliance with the Montana well construction standards. This report is true to the best of my knowledge.

Name: JAMES MADISON
Company: MT BUREAU OF MINES & GEOLOGY
License No: MWC-477
Date Completed: 6/19/2025

Site Name: MBMG--MEDICINE LAKE WEST

GWIC Id: 338720

Additional Lithology Records

From	To	Description
142	153	SHALE
153	160	COAL
160	165	GRAY SHALE; COAL
165	170	GRAY SHALE
170	175	SHALE; COAL
175	180	SAND AND SHALE LAYERS
180	185	SAND AND SHALE LAYERS
185	200	SANDSTONE; DRY
200	205	GRAY SHALE
205	220	THIN SANDSTONE, SHALE AND COAL LAYERS
220	230	SHALE
230	245	SHALE WITH DARK SHALE LAYERS
245	247	SANDSTONE
247	275	SHALE WITH HARD LAYERS
275	276	SHALE
276	289	COAL
289	300	SHALE



DEPTHS BELOW GROUND SURFACE IN FEET

COMPLETION

MP 2.1 FT

GS 2483 FT

CASING

SIZE/MATERIAL

- 2 - 8' - 8" steel
- 1.5 - 280' - 4" PVC

BOREHOLE

DIAMETER 7 7/8

BACKFILL

MATERIAL

Bentonite chips

SEAL

TOP/MATERIAL

5 Ft / Bentonite

SEAL

BOTTOM 275'

SCREEN

TOP/SIZE/TYPE

280 FT

4"

PVC

0.020 slot

PACK MATERIAL

10-20 SILICA SAND

SCREEN

BOTTOM 290 FT

DRILLED

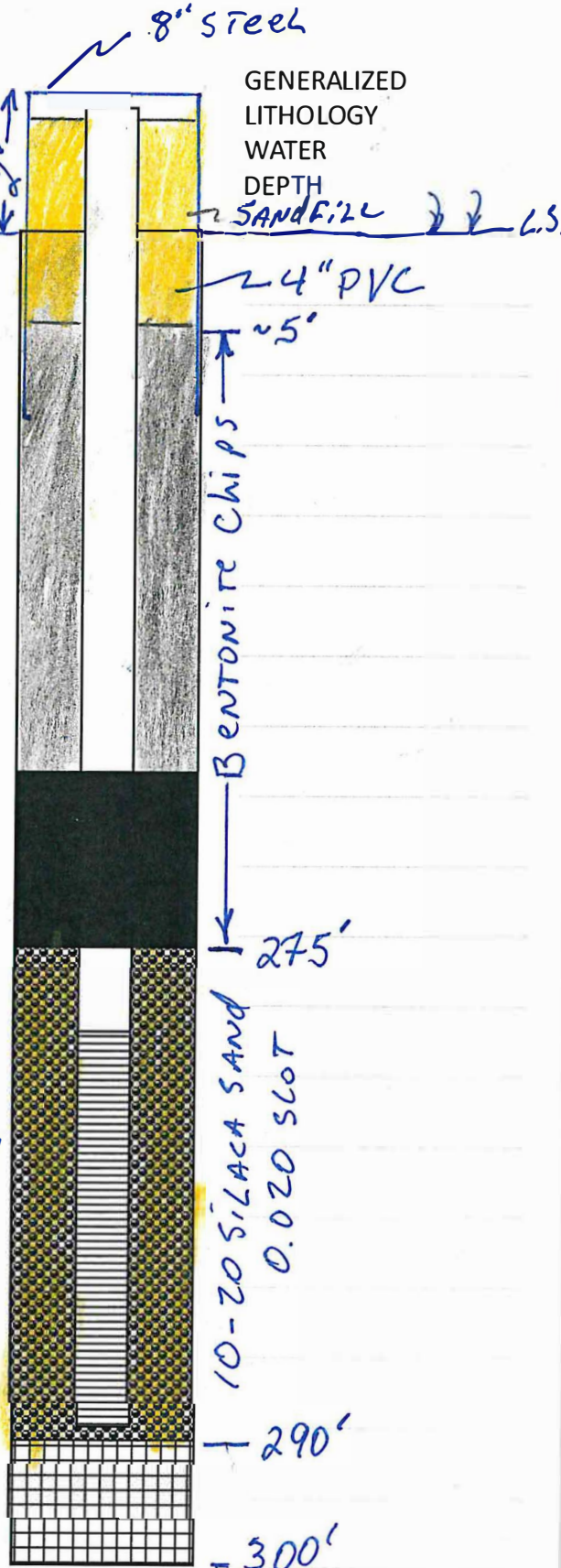
DEPTH 300 FT

Borehole

0-300' - 4 1/2"

-290' - 7 7/8"

-8' - 17" For SURFACE CASING



PROJECT

FORT PECK NGWMN

GWIC 338720

WELL NAME

MBMG - Medicine Lake West

LOCATION

T 320/S, R 54/W

S 17 TRACT CDCC

LATITUDE

48.51993

LONGITUDE

-104.73094

DATUM/METHOD

WGS84 / NAVGPS

DATE WELL STARTED

6-19-2025

DATE WELL COMPLETED

6-21-2025

RECORDED BY

JAMES P. MADISON

DRILLER/LICENSE

JAMES P. MADISON / MWC 477

COMPANY

S&S DRILLING

NOTES

Mud Rotary

site details

PROJECT: FORT PECK N6W44 WELL NAME: MBMG-Medicine Lake WestLANDOWNER: FORT PECK TRIBECONTACT INFO: MBMG 1300 W PARK ST BUTTE, MT 59701406-496-4174 GROUNDWATER CHARACTERIZATION

ACCESS INSTRUCTIONS _____

SWL_MP ~248YIELD VERY LOW YIELDING; BLEW DRY; SLOW RECOVERY

SWL_GS _____

DURATION _____

PWL_MP _____

DEVELOPMENT TIME _____

DRILLING LOG

FROM	TO	CUTTINGS DESCRIPTION/WATER CONDITIONS/DEVELOPMENT/ ACTIVITY NOTES	CONNECTION		
			DEPTH	TIME	WATER YIELD
0	20	yellow shale			
20	25	Gray sandy shale			
25	28	COAL			
28	45	yellow shale			
45	55	Gray shale			
55	58	COAL			
58	65	Green shale with COAL			
65	70	Gray silty shale			
75	95	SILT STONE and Fine sand layers; GRAY			
95	97	SILT STONE			
97	100	COAL			
100	120	Gray shale			
120	136	Gray sand stone; DRY			
136	139	shale			
139	142	sandstone			
142	153	shale			
153	160	COAL			
160	165	Gray shale; COAL			
165	170	Gray shale			
170	175	shale; COAL			
175	180	Sand and shale layers			
180	185	Sand and shale layers			
185	200	Sandstone; DRY			
200	205	Gray shale			
205	220	Thin sandstone, shale and COAL layers			
220	230	shale			
230	245	shale with dark shale layers			
245	247	sandstone			
247	275	shale with hard layers			
275	276	shale			
276	289	COAL			
289	300	shale			

MONTANA WELL LOG REPORT

Other Options

This well log reports the activities of a licensed Montana well driller, serves as the official record of work done within the borehole and casing, and describes the amount of water encountered. This report is compiled electronically from the contents of the Ground Water Information Center (GWIC) database for this site. Acquiring water rights is the well owner's responsibility and is NOT accomplished by the filing of this report.

[Return to menu](#)
[Plot this site in State Library Digital Atlas](#)
[Plot this site in Google Maps](#)
[View hydrograph for this site](#)
[View field visits for this site](#)
[View water quality for this site](#)

Site Name: MBMG--BIG MUDDY * MBMG BURIED CHANNEL
GWIC Id: 338719

Section 7: Well Test Data

Total Depth: 124
 Static Water Level: 3.89
 Water Temperature:

Section 1: Well Owner(s)

1) FORT PECK RESERVATION (MAIL)
 N/A
 N/A N/A N/A [No Date]

Section 2: Location

Township	Range	Section	Quarter Sections
31N	55E	21	SE¼ SW¼ SW¼ SE¼
County	Geocode	Parcel	
SHERIDAN			
Latitude	Longitude	Geomethod	Datum
48.41861212	-104.5714503	SUR-GPS	NAD83
Ground Surface Altitude	Ground Surface Method	Datum	Date
1933.18	SUR-GPS	NAVD88	9/23/2025
Measuring Point Altitude	MP Method	Datum	Date Applies
1934.57	SUR-GPS	NAVD88	6/25/2025 1:40:00 AM
Addition	Block	Lot	

** During the well test the discharge rate shall be as uniform as possible. This rate may or may not be the sustainable yield of the well. Sustainable yield does not include the reservoir of the well casing.*

Section 8: Remarks

DRILLED BY S&S DRILLING WITH JAMES MADISON ON SITE. 100 GPM EDUCIOR PIPE AND AIR; ESTIMATED.

Section 9: Well Log

Geologic Source

112DRFT - GLACIAL DRIFT

From	To	Description
0	15	BROWN CLAY
15	58	BLUE CLAY
58	61	SILT
61	107	BLUE CLAY
107	108	COAL GRAVEL AND SILT
108	115	SILT
115	120	FINE SAND
120	123	FINE SAND
123	125	COAL GRAVEL AND 3/4 INCH MINUS WELL ROUNDED GRAVEL
125	140	FORT UNION SHALE

Section 3: Proposed Use of Water

MONITORING (1)

Section 4: Type of Work

Drilling Method: MUD ROTARY
 Status: NEW WELL

Section 5: Well Completion Date

Date well completed: Sunday, June 1, 2025

Section 6: Well Construction Details

Borehole dimensions

From	To	Diameter
0	8	12
0	125	7.875
0	140	4.5

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
-2	8	8				STEEL
-1.39	114	4				PVC

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
114	124	4		0.020	FACTORY SLOTTED

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?
0	5	SANDFILL	
5	109	BENTONITE CHIPS	
109	124	10/20 SILICA SAND	

Driller Certification

All work performed and reported in this well log is in compliance with the Montana well construction standards. This report is true to the best of my knowledge.

Name: JAMES MADISON

Company: MT BUREAU OF MINES & GEOLOGY

License No: MWC-477

Date Completed: 6/1/2025

MBMG - Big Muddy



DEPTHS BELOW GROUND SURFACE IN FEET

COMPLETION

MP 1.39' Top of PVC

GS 1933.18

CASING
SIZE/MATERIAL

-2- 8' - 8" steel
-1.39-114' -4" PVC

BOREHOLE
DIAMETER 7 7/8

BACKFILL
MATERIAL Bentonite

SEAL
TOP/MATERIAL 5' Bentonite Chips

SEAL
BOTTOM 109'

SCREEN
TOP/SIZE/TYPE 114 FT

PVC
0.020 SLOT
PACK MATERIAL
10-20 Silica Sand

SCREEN
BOTTOM 124'

DRILLED
DEPTH 140'

GENERALIZED
LITHOLOGY

WATER DEPTH Sand Fill
L.S.

PROJECT

Fort Peck NGWMN

GWIC 338719

WELL NAME

MBMG - Big Muddy

LOCATION

T31 N/S, R55 E/W

S21 TRACT DCCD

LATITUDE

48.41861212

LONGITUDE

-104.5714503

DATUM/METHOD

NAD 88 / SUR-GPS

DATE WELL STARTED

6-25-2025

DATE WELL COMPLETED

6-25-2025

RECORDED BY

JAMES R. MADISON

DRILLER/LICENSE

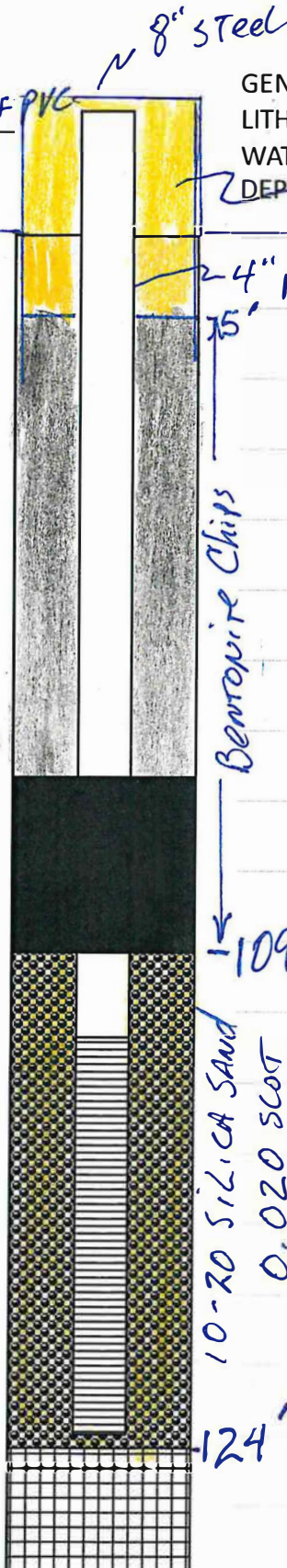
JAMES R. MADISON/MWC 477

COMPANY

SIS DRILLING

NOTES

Mud Rotary



0-8' - 12\"/>



Figure A1. Wells were drilled with a mud rotary rig.



Figure A2. The monitoring wells were constructed with 4-nch PVC casing and factory slotted screen.



Figure A3. An 8-inch steel protective casing was installed around the PVC monitoring wells.



Figure A4. Bollards were installed around the MBMG—Big Muddy well (MBMG-338719).



Figure 5. The Volt well (MBMG-338721) was co-located with a Montana Climate Office Mesonet station.



Figure A6. The Medicine Lake West well (MBMG-338720) was co-located with a Montana Climate Office Mesonet station.



Figure A7. Cuttings from the Big Muddy well (MNMG-338719) showing the sand and gravel just above the Fort Union Formation.



Figure A8. The Big Muddy well (MBMG-338719) produced and estimated 100 gpm during well development.

Appendix C

Water-Quality Results

Location Information

Sample Id/Site Id: 260507 / 338721	Sample Date: 9/23/2025 11:31:00 AM
Location (TRS): 32N 47E 07 BDCA	Agency/Sampler: MBMG / EDINBERG, SARA
Latitude/Longitude: 48° 32' 31" N 105° 39' 44" W	Field Number: MBMG - FHHC
Datum: NAD83	Lab Date: 11/24/2025 11:14:50 AM
Altitude: 2392.944	Lab/Analyst: MBMG / TIMMER, JACKIE
County/State: ROOSEVELT / MT	Sample Method/Handling: PUMPED / ru:1 ra:0 fu:1 fa:2
Site Type: WELL	Procedure Type: DISSOLVED
Geology: 211FHHC	Total Depth (ft): 75
USGS 7.5' Quad: NORTH OF VOLT	SWL-MP (ft): 27.97
PWS Id:	Depth Water Enters (ft): 65
Project: GWAAMON, GWCP11, HB935	

Major Ion Results

	mg/L	meq/L		mg/L	meq/L
Calcium (Ca)	32.045	1.599	Bicarbonate (HCO ₃)	612.300	10.036
Magnesium (Mg)	13.506	1.111	Carbonate (CO ₃)	0.000	0.000
Sodium (Na)	429.055	18.664	Chloride (Cl)	35.520	1.002
Potassium (K)	2.699	0.069	Sulfate (SO ₄)	603.400	12.569
Iron (Fe)	0.090 J	0.000	Nitrate (as N)	0.044 J	0.003
Manganese (Mn)	0.140	0.005	Fluoride (F)	0.269	0.014
Silica (SiO ₂)	14.085		Orthophosphate (as P)	<0.020 U	0.000
Total Cations		21.494	Total Anions		23.624

Trace Element Results (µg/L)

Aluminum (Al):	<5.000 U	Cesium (Cs):	<0.250 U	Molybdenum (Mo):	<0.250 U	Strontium (Sr):	358.921
Antimony (Sb):	<0.250 U	Chromium (Cr):	<0.250 U	Nickel (Ni):	<0.250 U	Thallium (Tl):	<0.250 U
Arsenic (As):	0.975 J	Cobalt (Co):	<0.250 U	Niobium (Nb):	<0.250 U	Thorium (Th):	<0.250 U
Barium (Ba):	21.033	Copper (Cu):	<1.250 U	Neodymium (Nd):	<0.250 U	Tin (Sn):	<0.250 U
Beryllium (Be):	<0.250 U	Gallium (Ga):	0.733 J	Palladium (Pd):	<0.250 U	Titanium (Ti):	6.796
Boron (B):	407.636	Lanthanum (La):	<0.250 U	Praseodymium (Pr):	<0.250 U	Tungsten (W):	<0.250 U
Bromide (Br):	218.000	Lead (Pb):	<0.150 U	Rubidium (Rb):	2.483	Uranium (U):	1.598
Cadmium (Cd):	<0.250 U	Lithium (Li):	171.474	Silver (Ag):	<0.250 U	Vanadium (V):	<0.250 U
Cerium (Ce):	<0.250 U	Mercury (Hg):	NR	Selenium (Se):	<0.250 U	Zinc (Zn):	<1.250 U
						Zirconium (Zr):	<0.250 U

Field Chemistry and Other Analytical Results

**Total Dissolved Solids (mg/L):	1432.03	Field Hardness as CaCO ₃ (mg/L):	NR	Ammonia (mg/L):	NR
**Sum of Diss. Constituents (mg/L):	1742.55	Hardness as CaCO ₃ :	135.61	T.P. Hydrocarbons (µg/L):	NR
Field Conductivity (µmhos):	2010	Field Alkalinity as CaCO ₃ (mg/L):	425	PCP (µg/L):	NR
Lab Conductivity (µmhos):	2371.012	Alkalinity as CaCO ₃ (mg/L):	501.94	Phosphorus, TD (mg/L):	<0.030 U
Field pH:	8.02	Ryznar Stability Index:	6.717	Field Nitrate (mg/L):	0.000
Lab pH:	7.87	Sodium Adsorption Ratio:	16.0303	Field Chloride (mg/L):	NR
Water Temp (°C):	9	Langlier Saturation Index:	0.576	Field Redox (mV):	-105.7
Air Temp (°C):	NR	Nitrite (mg/L as N):	<0.010 U	Lab, Dissolved Organic Carbon (mg/L):	NR
Nitrate + Nitrite (mg/L as N)	0.216 J	Hydroxide (mg/L as OH):	0.000	Lab, Total Organic Carbon (mg/L):	NR
Total Kjeldahl Nitrogen (mg/L as N)	NR	Lab, Dissolved Inorganic Carbon (mg/L):	NR	Acidity to 8.3 (mg/L CaCO ₃)	NR
Total Nitrogen (mg/L as N)	NR	Acidity to 4.5 (mg/L CaCO ₃)	NR	Total Susp Solids (mg/L)	NR
As(III) (ug/L)	NR	As(V) (ug/L)	NR		

Sample Condition:

Field Remarks:

Lab Remarks:

Notes

Explanation: **mg/L** = milligrams per Liter; **µg/L** = micrograms per Liter; **ft** = feet; **NR** = No Reading in GWIC

Qualifiers: **J** = Estimated quantity above detection limit but below reporting limit; **P** = Preserved sample; **S** = Method of standard additions; **U** = Undetected quantity below detection limit; ***** = Duplicate analysis not within control limits; ****** = Sum of Dissolved Constituents is the sum of major cations (Na, Ca, K, Mg, Mn, Fe) and anions (HCO₃, CO₃, SO₄, Cl, SiO₂, NO₃, F) in mg/L. Total Dissolved Solids is reported as equivalent weight of evaporation residue.

Disclaimer

These data represent the contents of the GWIC databases at the Montana Bureau of Mines and Geology at the time and date of the retrieval. The information is considered unpublished and is subject to correction and review on a daily basis. The Bureau warrants the accurate transmission of the data to the original end user. Retransmission of the data to other users is discouraged and the Bureau claims no responsibility if the material is retransmitted.

Ground-Water Information Center

Site Name: MBMG VOLT MBMG FHHC

Isotope Tracer Report

Report Date: 8/4/2026

Location Information

Sample Id/Site Id: 260551 / 338721
Location (TRS): 32N 47E 07 BDCA
Latitude/Longitude: 48° 32' 31" N 105° 39' 44" W
Datum: NAD83
Altitude: 2392.94
County/State: ROOSEVELT / MT
Site Type: WELL
Geology: 211FHHC
USGS 7.5' Quad: NORTH OF VOLT
PWS Id:
Project: GWAAMON, GWCP11, HB935

Sample Date: 9/23/2025 11:31:00 AM
Agency/Sampler: MBMG / EDINBERG, SARA
Field Number: MBMG - FHHC
Lab Date: 12/16/2025 12:16:05 PM
Lab/Analyst: MBMG / TIMMER, JACKIE
Sample Method/Handling: PUMPED / ru:0 ra:0 fu:1 fa:0
Procedure Type: DISSOLVED
Total Depth (ft): 75
SWL-MP (ft): 27.97
Depth Water Enters (ft): 65

Radon (Rn222 - pCi/L):	NR	Argon (Ar39):	NR
Carbon (C13):	NR	Silicon (Si32):	NR
Carbon (C14):	NR	Chlorine (Cl36):	NR
Tritium (H3 - TU):	NR	Lithium (Li6):	NR
H3/He3 Ratio:	NR	Krypton (Kr85):	NR
Deuterium (H2):	-142.000	Boron (B11)	NR
Oxygen (O18):	-18.300	Strontium (Sr87)	NR
Sulphur (S34):	NR	Chloro-fluorocarbon (CFC-11):	NR
Iodine (I129):	NR	Chloro-fluorocarbon (CFC-12):	NR
Nitrogen (N15):	NR	Chloro-fluorocarbon (CFC-113):	NR
Nitrogen (N15 of Nitrate):	NR	Oxygen (O18 of Nitrate):	NR
Sulphur (S34 of Sulfate):	NR	Oxygen (O18 of Sulfate):	NR

Sample Condition:
Field Remarks:
Lab Remarks:

Notes

Explanation: **pCi/L** = picocuries per Liter; **TU** = Tritium Units; **NR** = No Reading in GWIC

Disclaimer

These data represent the contents of the GWIC databases at the Montana Bureau of Mines and Geology at the time and date of the retrieval. The information is considered unpublished and is subject to correction and review on a daily basis. The Bureau warrants the accurate transmission of the data to the original end user. Retransmission of the data to other users is discouraged and the Bureau claims no responsibility if the material is retransmitted.

Report Date: 3/11/2026

[Compare to Water Quality Standards](#)**Location Information**

Sample Id/Site Id: 260506 / 338719
 Location (TRS): 31N 55E 21 DCCD
 Latitude/Longitude: 48° 25' 7" N 104° 34' 17" W
 Datum: NAD83
 Altitude: 1933.18
 County/State: SHERIDAN / MT
 Site Type: WELL
 Geology: 112DRFT
 USGS 7.5' Quad: HOMESTEAD
 PWS Id:
 Project: GWAAMON, GWCP11

Sample Date: 9/16/2025 4:17:00 PM
 Agency/Sampler: MBMG / EDINBERG, SARA
 Field Number: MBMG BIG MUDDY
 Lab Date: 11/24/2025 11:14:50 AM
 Lab/Analyst: MBMG / TIMMER, JACKIE
 Sample Method/Handling: PUMPED / ru:1 ra:0 fu:1 fa:2
 Procedure Type: DISSOLVED
 Total Depth (ft): 124
 SWL-MP (ft): 3.53
 Depth Water Enters (ft): 114

Major Ion Results

	mg/L	meq/L		mg/L	meq/L
Calcium (Ca)	52.285	2.609	Bicarbonate (HCO ₃)	1,226.710	20.106
Magnesium (Mg)	32.666	2.688	Carbonate (CO ₃)	0.000	0.000
Sodium (Na)	379.411	16.504	Chloride (Cl)	34.570	0.975
Potassium (K)	4.605	0.118	Sulfate (SO ₄)	7.690	0.160
Iron (Fe)	3.376	0.121	Nitrate (as N)	<0.010 U	0.000
Manganese (Mn)	0.080 J	0.000	Fluoride (F)	0.842	0.044
Silica (SiO ₂)	22.318		Orthophosphate (as P)	0.028 J	0.000
Total Cations		22.074	Total Anions		21.286

Trace Element Results (µg/L)

Aluminum (Al):	<5.000 U	Cesium (Cs):	<0.250 U	Molybdenum (Mo):	<0.250 U	Strontium (Sr):	592.776
Antimony (Sb):	<0.250 U	Chromium (Cr):	<0.250 U	Nickel (Ni):	<0.250 U	Thallium (Tl):	<0.250 U
Arsenic (As):	1.954	Cobalt (Co):	0.737 J	Niobium (Nb):	<0.250 U	Thorium (Th):	<0.250 U
Barium (Ba):	350.581	Copper (Cu):	<1.250 U	Neodymium (Nd):	<0.250 U	Tin (Sn):	<0.250 U
Beryllium (Be):	<0.250 U	Gallium (Ga):	17.487	Palladium (Pd):	0.657 J	Titanium (Ti):	<0.250 U
Boron (B):	221.833	Lanthanum (La):	<0.250 U	Praseodymium (Pr):	<0.250 U	Tungsten (W):	<0.250 U
Bromide (Br):	1,010.000	Lead (Pb):	<0.150 U	Rubidium (Rb):	1.371	Uranium (U):	<0.250 U
Cadmium (Cd):	<0.250 U	Lithium (Li):	41.419	Silver (Ag):	<0.250 U	Vanadium (V):	<0.250 U
Cerium (Ce):	<0.250 U	Mercury (Hg):	NR	Selenium (Se):	<0.250 U	Zinc (Zn):	<1.250 U
						Zirconium (Zr):	<0.250 U

Field Chemistry and Other Analytical Results

**Total Dissolved Solids (mg/L):	1142.38	Field Hardness as CaCO ₃ (mg/L):	NR	Ammonia (mg/L):	NR
**Sum of Diss. Constituents (mg/L):	1764.95	Hardness as CaCO ₃ :	265.01	T.P. Hydrocarbons (µg/L):	NR
Field Conductivity (µmhos):	1869	Field Alkalinity as CaCO ₃ (mg/L):	1021	PCP (µg/L):	NR
Lab Conductivity (µmhos):	2162.321	Alkalinity as CaCO ₃ (mg/L):	1006.35	Phosphorus, TD (mg/L):	0.765
Field pH:	7.71	Ryznar Stability Index:	5.938	Field Nitrate (mg/L):	0.000
Lab pH:	7.62	Sodium Adsorption Ratio:	10.1303	Field Dissolved O ₂ (mg/L):	0.190
Water Temp (°C):	8.9	Langlier Saturation Index:	0.841	Field Chloride (mg/L):	NR
Air Temp (°C):	NR	Nitrite (mg/L as N):	<0.010 U	Field Redox (mV):	-167.3
Nitrate + Nitrite (mg/L as N)	0.574 J	Hydroxide (mg/L as OH):	0.000	Lab, Dissolved Organic Carbon (mg/L):	NR
Total Kjeldahl Nitrogen (mg/L as N)	NR	Lab, Dissolved Inorganic Carbon (mg/L):	NR	Lab, Total Organic Carbon (mg/L):	NR
Total Nitrogen (mg/L as N)	NR	Acidity to 4.5 (mg/L CaCO ₃)	NR	Acidity to 8.3 (mg/L CaCO ₃)	NR
As(III) (ug/L)	NR	As(V) (ug/L)	NR	Total Susp Solids (mg/L)	NR

Sample Condition:

Field Remarks: SULFUR ODOR

Lab Remarks:

NotesExplanation: **mg/L** = milligrams per Liter; **µg/L** = micrograms per Liter; **ft** = feet; **NR** = No Reading in GWIC

Qualifiers: **J** = Estimated quantity above detection limit but below reporting limit; **P** = Preserved sample; **S** = Method of standard additions; **U** = Undetected quantity below detection limit; ***** = Duplicate analysis not within control limits; ****** = Sum of Dissolved Constituents is the sum of major cations (Na, Ca, K, Mg, Mn, Fe) and anions (HCO₃, CO₃, SO₄, Cl, SiO₂, NO₃, F) in mg/L. Total Dissolved Solids is reported as equivalent weight of evaporation residue.

Disclaimer

These data represent the contents of the GWIC databases at the Montana Bureau of Mines and Geology at the time and date of the retrieval. The information is considered unpublished and is subject to correction and review on a daily basis. The Bureau warrants the accurate transmission of the data to the original end user. Retransmission of the data to other users is discouraged and the Bureau claims no responsibility if the material is retransmitted.

Ground-Water Information Center
Site Name: MBMG--BIG MUDDY MBMG BURIED CHANNEL

Isotope Tracer Report
Report Date: 8/4/2026

Location Information

Sample Id/Site Id: 260542 / 338719	Sample Date: 9/16/2025 4:17:00 PM
Location (TRS): 31N 55E 21 DCCD	Agency/Sampler: MBMG / EDINBERG, SARA
Latitude/Longitude: 48° 25' 7" N 104° 34' 17" W	Field Number: BIG MUDDY
Datum: NAD83	Lab Date: 12/16/2025 12:16:05 PM
Altitude: 1933.18	Lab/Analyst: MBMG / TIMMER, JACKIE
County/State: SHERIDAN / MT	Sample Method/Handling: PUMPED / ru:0 ra:0 fu:1 fa:0
Site Type: WELL	Procedure Type: DISSOLVED
Geology: 112DRFT	Total Depth (ft): 124
USGS 7.5' Quad: HOMESTEAD	SWL-MP (ft): 3.53
PWS Id:	Depth Water Enters (ft): 114
Project: GWAAMON, GWCP11	

Radon (Rn222 - pCi/L):	NR	Argon (Ar39):	NR
Carbon (C13):	NR	Silicon (Si32):	NR
Carbon (C14):	NR	Chlorine (Cl36):	NR
Tritium (H3 - TU):	NR	Lithium (Li6):	NR
H3/He3 Ratio:	NR	Krypton (Kr85):	NR
Deuterium (H2):	-150.000	Boron (B11)	NR
Oxygen (O18):	-18.700	Strontium (Sr87)	NR
Sulphur (S34):	NR	Chloro-fluorocarbon (CFC-11):	NR
Iodine (I129):	NR	Chloro-fluorocarbon (CFC-12):	NR
Nitrogen (N15):	NR	Chloro-fluorocarbon (CFC-113):	NR
Nitrogen (N15 of Nitrate):	NR	Oxygen (O18 of Nitrate):	NR
Sulphur (S34 of Sulfate):	NR	Oxygen (O18 of Sulfate):	NR

Notes

Sample Condition:
Field Remarks:
Lab Remarks:

Explanation: **pCi/L** = picocuries per Liter; **TU** = Tritium Units; **NR** = No Reading in GWIC

Disclaimer

These data represent the contents of the GWIC databases at the Montana Bureau of Mines and Geology at the time and date of the retrieval. The information is considered unpublished and is subject to correction and review on a daily basis. The Bureau warrants the accurate transmission of the data to the original end user. Retransmission of the data to other users is discouraged and the Bureau claims no responsibility if the material is retransmitted.