

Geothermal Research and Development for Energy and Telecommunications Interim Committee

July 15, 2016

John Metesh, Montana Bureau of Mines and Geology

Background

HOUSE BILL 333 (61st Legislature)

An Act Allowing the Bureau of Mines and Geology to Conduct Geothermal Research

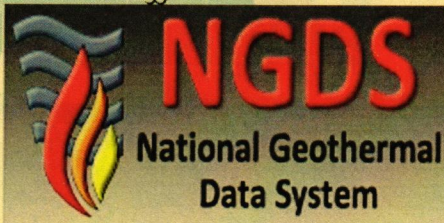
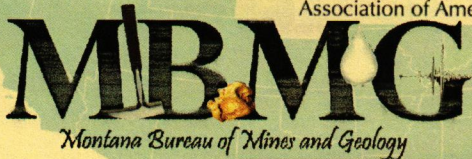
During the 2011 biennium the Montana Bureau of Mines and Geology shall conduct geothermal research that:

- (a) characterizes the geothermal resource base in Montana;
- (b) tests high-temperature and high-pressure drilling technologies benefiting geothermal well construction; and
- (c) determines reservoir characterization, monitoring, and modeling necessary for commercial application in Montana.

The MBMG shall submit a report to the Energy and Telecommunications Interim Committee. The report, based on research conducted, must include:

- (a) a ranking of the top five locations in Montana that offer the best opportunity for near-term development of geothermal energy; and
- (b) an estimate of the cost associated with development of each site.

State Geological Survey Contributions to the NGDS



The MBMG continues its participation in the National Geothermal Data System with regular updates. In addition, we improve public access to geothermal data through our own website - searchable by county or by project - to provide temperature and chemistry for each site.

searchable by county...

GWIC
Ground Water Information Center | MBMG Data Center
Montana Bureau of Mines and Geology
Montana Tech of the University of Montana
1300 West Park Street - Natural Resources Building Room 329
Butte Montana 59701-8597
Ph: (406) 456-4330 Fx: (406) 456-4343

Menus: | [Main](#) | [RWL](#) | [GWICP](#) | [Projects](#) | [Coal](#) | [Coal Quality](#) | [Geothermal](#)

Geothermal Data

The options listed below contain access to the various types of geothermal data that is stored in the database.

Bottom Hole Temperatures

The drop-down list below contains a list of Montana counties and how many bottom hole temperatures are recorded in each county.

- BEAVERHEAD (45)
- BEAVERHEAD (45)
- BIG HORN (379)
- BLAINE (546)
- BROADWATER (1)
- CARBON (458)
- CARTER (318)
- CASCADE (44)
- CHOUTEAU (321)
- CLUSTER (228)
- DANIELS (169)
- DAWSON (321)
- DEERLODGE (4)
- FALLON (779)
- FERGUS (197)
- FLATHEAD (8)
- GALLATIN (6)
- GARFIELD (207)
- GLACIER (887)
- GOLDEN VALLEY (83)
- GRANITE (10)

Sample Report

detailed chemistry...

Sample Id/Site Id: 201603 / 7121
 Location (TRS): 025 04E 14 DAD
 Latitude/Longitude: 45° 39' 38" N 111° 11' 16" W
 Datum: WGS84
 Altitude: 4735
 County/State: GALLATIN / MT
 Site Type: WELL
 Geology: 500PRB
 USGS 7.5' Quad: BOZEMAN HOT SPRINGS
 PWS Id:
 Project: GEOTHERM, GEOTHERMAL2011

Major Ion Results		mg/L		meq/L	
Calcium (Ca)	2,430	0.121	Bicarbonate (HCO ₃)	46,240	0.758
Magnesium (Mg)	<0.020 U	0.000	Carbonate (CO ₃)	23,970	0.838
Sodium (Na)	126,690	5.946	Chloride (Cl)	52,350	1.462
Potassium (K)	2,600	0.067	Sulfate (SO ₄)	129,200	2.691
Iron (Fe)	0.006 U	0.000	Nitrate (as N)	<0.010 U	0.000
Manganese (Mn)	<0.002 U	0.000	Fluoride (F)	9.590	0.516
Silica (SiO ₂)	62,890	0.000	Orthophosphate (as P)	<0.020 U	0.000
Total Cations	6.156		Total Anions	6.316	

Trace Element Results (µg/L)		mg/L		meq/L	
Aluminum (Al)	8,959				
Antimony (Sb)	<0.100 U				
Arsenic (As)	8,710				
Barium (Ba)	1,990				
Beryllium (Be)	<0.100 U				
Boron (B)	210,510				
Bromide (Br)	297,000				

Cadmium (Cd)	2.530
Chromium (Cr)	<0.100 U
Cobalt (Co)	<0.100 U
Copper (Cu)	0.370 U
Gallium (Ga)	1.510
Lanthanum (La)	<0.100 U
Lithium (Li)	<0.040 U
Manganese (Mn)	31.420
Niobium (Nb)	NR

You are currently signed in. | 7/8/2016 | [Sign Out](#)

searchable by project...

GWIC Project Data

The table below contains the standard links to GWIC data for sites that have been included in geothermal-related MBMG publications or projects. Click on any purple dot to view the associated data.

Project Name	Site Data	Site Visit Data	Water Quality Data	Isotope Data	Surface Water Data	Water Level Data	Photo Data	Weather Data
ALL GEOTHERMAL SITES IN MONTANA (GEOTHERMAL2011)	•	•	•	•	•	•	•	•
WEST YELLOWSTONE GEOTHERMAL INVENTORY 1979 (WESTYELLGEO)	•	•	•	•	•	•	•	•
DATA FOR GEOTHERMAL SITES IN MONTANA (MBMG OPEN FILE 415) (GEOTHERM)	•	•	•	•	•	•	•	•
GEOTHERMAL RESOURCES MAP OF MONTANA (HMM)	•	•	•	•	•	•	•	•
PHASE ZERO STUDY RESULTS-GEOTHERMAL POTENTIAL OF THE MADISON GROUP AT SHALLOW DEPTHS IN EASTERN MONTANA FINAL REPORT (MBMGPR29)	•	•	•	•	•	•	•	•
DRILLING OF CAMPAGUA GEOTHERMAL TEST WELL #1 HOT SPRINGS, MONTANA (MBMGPR80)	•	•	•	•	•	•	•	•
GEOTHERMAL DATA-BASE STUDY: MINE-WATER TEMPERATURES (MBMGSP79)	•	•	•	•	•	•	•	•
WHITE SULPHUR SPRINGS GEOTHERMAL STUDY (WSSGS)	•	•	•	•	•	•	•	•

ENERGY & TELECOMMUNICATIONS INTERIM COMMITTEE 2015-2016

July 15, 2016

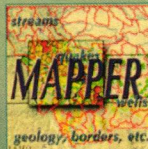
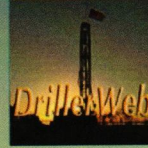
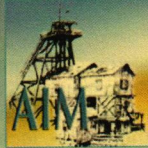
Exhibit 12



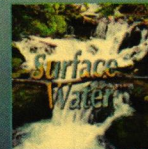
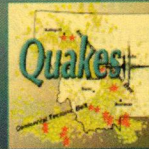
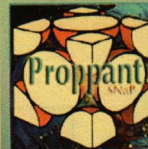
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- ▶ EXPLORING EARTH SCIENCES WITH KIDS
- ▶ GIS - GEOGRAPHIC INFORMATION SYSTEMS
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- ▶ GROUNDWATER
 - ▶ GWAP - MONTANA GROUND WATER ASSESSMENT PROGRAM
 - ▶ GWIP - GROUND WATER INVESTIGATION PROGRAM
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- ▶ PUBLICATIONS/INFORMATION SERVICES
- ▶ SWAMP - SURFACE WATER ASSESSMENT AND MONITORING PROGRAM

Welcome to MBMG's Data Center. Here you'll find shortcuts to the datasets from our different programs and projects.

Click on the icons for databases.



Data Preservation/Mining Archive
Mining-related data for Montana state properties. Ranges from engineering, geologic, and historical reports to pictures, correspondence, and production information.



For more information contact:

We are capturing additional data such as site history, past use, or anecdotal information through our Data Preservation Program - just one of several databases available through the new MBMG Data Center at <http://www.mbmgt.mtech.edu/>

Mining Archives Database: Map File

The table below lists the records available in the MBMG Mining Archives database for the requested record.

Id	Map Name	Map Type	District	County
13733	SHOWING SAMPLE LOCATIONS GEOLOGY AND GEOTHERMAL TESTING SITES	TOPO	GOULD-STEMPLE (FOOL HEN/POORMAN)	LEWIS & CLARK

Latitude	Longitude	GeoMethod	Datum
46.8555	-112.3267		

Map Date	Drawer	Scanned	Optimized
	90	0	0

Company
J.F. DAVIS, GEOLOGIST

Comments
PAPER: 1"=24,000'

THIS RECORD HAS BEEN RELATED TO THE FOLLOWING CLAIM FILES

Id	Opt	Name	Number	Type
17792	View	MEADOW CREEK		LODE

THIS RECORD HAS BEEN RELATED TO THE FOLLOWING PROPERTY FILES

Id	Opt	Associated Name	County	State	District
There are no currently related property file records.					

geothermal mine discharge | Display Format: Card | Refine Search

Mining Archives Database

The records displayed below match your search criteria. To view more detail for any record, click the highlighted identification number. To view any scanned documents, click the PDF icon where available.

Record: MAP: 13733
 Title: SHOWING SAMPLE LOCATIONS GEOLOGY AND GEOTHERMAL TESTING SITES
 Latitude/Longitude: 46.8555°N, -112.3267°W
 Location (TRS):
 County: LEWIS & CLARK
 Mining District:

Record: MAP: 31107
 Title: USBOM MINERAL RESOURCES (FIGURE 39) KNOWN GEOTHERMAL RESOURCE AREAS GEOTHERMAL WELLS AND HOT SPRINGS IN GALLATIN NATIONAL FOREST
 Latitude/Longitude: 45.387578°N, -110.335428°W
 Location (TRS):
 County: PARK
 Mining District:

2 records listed.



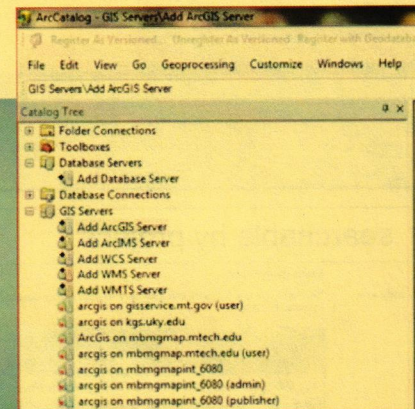
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How do I get to MBMG's ArcGIS Server?

ArcGIS Web Services we offer

Our ArcGIS Server can be added to your list of ArcGIS Servers by adding it from ArcCatalog.

Mineral_resources	PP1300_images_service	potential. Scanned and georeferenced images from US Geological Survey Prof. Paper 1300 showing areas of mineral potential.	US Geological Survey Professional Paper 1300	Map service
NPS_Yellowstone	YNP_color_imagery	High resolution color imagery for areas within Yellowstone National Park including selected areas outside the park border.	Yellowstone National Park	Map service; Image service
NPS_Yellowstone	YNP_elevation_raster	Raster image of elevations for areas within Yellowstone National Park including selected areas outside the park border.	Yellowstone National Park	Image service
NPS_Yellowstone	YNP_ms_ortho	Multispectral orthometric photography for areas within Yellowstone National Park including selected areas outside the park border.	Yellowstone National Park	Image service
NPS_Yellowstone	YNP_shaded_relief	Shaded relief imagery on the land surface for areas within Yellowstone National Park including selected areas outside the park border. Derived from LIDAR surveys.	Yellowstone N	



The MBMG also provides map data related to geothermal imaging in the Montana Portion of Yellowstone National Park. We can serve similar data related to other areas in Montana as they come available.