ZONING ADVISORY PANEL PUBLIC COMMENT

Received Between August 6, 2021 (noon) and August 20, 2021 (noon)

As part of the County's strong commitment to an open and transparent public process, comments received from any Citizen which reference the Zoning Advisory Panel (ZAP) are usually made available to the general public through uploading the comments to the County's website prior to the next ZAP meeting. Similarly, if the commenter requests, the information may also be forwarded to the ZAP Members directly.

** Please Note: Inclusion of Public Comments herein, does not imply any support nor opposition of the comments by the County.*

*Any Web Links included in the Public Comment have not been vetted by the County and readers should proceed with caution when accessing Web links**

From: County_Planning_Mail
To: Greg McNally
Subject: FW: Attention Zap
Date: Wednesday, August 11, 2021 1:39:57 PM

From: Max Milton <maxmilton@mt.net>
Sent: Wednesday, August 11, 2021 1:30 PM
To: County_Planning_Mail <County_Planning_Mail@lccountymt.gov>
Subject: Attention Zap

As I promised in my comments at today's ZAP meeting here are three items that may be useful to the Panel as you begin to focus in on advising the BOCC on Helena Valley Planning Area zoning proposals for the Suburban and Urban transition zones.

Thanks,
Maxwell Milton

1. MANAGING GROWTH IN THE NEW WEST: AN EDUCATIONAL WEBINAR SERIES

IMPROVING CITY AND COUNTY COLLABORATION: BILLINGS AND YELLOWSTONE COUNTY, MT
https://youtu.be/_awXQ3fCbqw

A PDF of the slides to above presentation are at this website.
https://www.future-west.org/portfolio/managing-growth-in-the-new-west-an-educational-webinar-series/?portfolioCats=38%2C39%2C%2C40%2C48

2. Here are some links to information regarding The Mullan Area Plan on the west edge of Missoula. I believe Missoula County and City Planning Dept with major input from Planning Board and the public have worked together on this to address an area currently in the County but likely to be annexed into the City. The Ordinance linked below is a County Ordinance I believe.

The website still refers to the plan as a final draft so I am not sure whether it has been officially adopted. Would a process similar to what was done here make sense for a designated area in the Urban transition zone?

Information here.

http://www.ci.missoula.mt.us/DocumentCenter/View/54833/Mullan-Report_FINAL-DRAFT_2020-11-

20_RFS?bidId=

https://www.missoulacounty.us/home/showpublisheddocument/72784/637443122249030000

contact: ahagemeier@missoulacounty.us

what follows is from
https://www.missoulacounty.us/government/community-development/community-planning-services/planning-projects/mullan-area-master-plan

PROJECT INFORMATION

Items being considered for adoption specific to Missoula County

Item 1. An amendment to the Missoula County Growth Policy to adopt the Mullan Neighborhoods Master Plan as an area plan, and to amend the Missoula County Land Use Map (Map 18 in the Missoula County Growth Policy) to include the new land use designation, and amend the boundaries of the Wye-Mullan Comprehensive Area Plan.

> Click here to see the proposed Mullan Neighborhoods Master Plan
>
> *Click here to see the boundaries of the proposed master plan*
>
> *Click here to see the proposed text and boundaries for the new land use designation*

Item 2. Adoption of the Mullan Traditional Neighborhood Development Form Based Code (FBC). The FBC is a zoning regulation that will implement the vision in the plan. The FBC is designed to implement a mixed-use vision for the Mullan community that:

Provides the standards and review procedures necessary to ensure that the Mullan Traditional Neighborhood development program established in the Missoula County Growth Policy and Our Missoula City Growth Policy is achievable.

- Provides for standards of development through the implementation of the form based code.
- Provides for the organization of development through the establishment of Transect zones.
- Utilizes the public BUILD investment in the Mullan area.

The FBC is designed for predominantly undeveloped areas and has special provisions that allow a high level of flexibility for developers while ensuring a high-quality built environment for the public.

The FBC will be stand alone zoning regulation, not in addition to the current Missoula County Zoning Regulation.

> *Click here to see the proposed the Mullan Traditional Neighborhood Development Form Based Code (FBC)*

Item 3. A rezoning of approximately 685 acres to the Mullan Traditional Neighborhood Development Form Based Code. The FBC contains different Neighborhood Unit types which are a general description of the varying levels of development intensity and use for a large area. The rezone will apply four Neighborhood Unit types. The proposed Neighborhood Unit types are:

- Crossroad Center (181 acres)
- Community Center (276 acres)
- Town Center (167 acres)
- Workplace (61 acres)

To see the details of the proposed Neighborhood Units, see the FBC

3. Gallatin County is updated its Growth Policy. They are dealing with growth outside the Urban Boundary.

Garrett McAllister is the planner staffing the process.
406-582-3130

Here is a link to the 158 page Updated Growth Policy Draft. Garrett told me they are hoping to adopt it in September.
To be clear this a draft Growth Policy for the County not a zoning ordinance.

https://documentcloud.adobe.com/link/track?uri=urn:aaid:scds:US:cbb362dd-9f50-4ef6-93e7-bc2fe36408e0#pageNum=1

What can we learn from this fast growing County?
Again would it make sense to invite someone from the County Planning Dept to speak to the Panel and be available for questions?

From:	John W. Herrin
To:	Greg McNally; James Swierc; Andrew Thomas; NicoleGiacomini@gmail.com; billgowen@helenaabstract.com; ryan@casneinc.com; mkurmove@gmail.com; gharris@helenahar.com; Jerry Hamlin; Kim Ahsmoore; jdusenberry@janddtruckrepair.com; Jim McCormick; beth@triplersurveying.com; jonathon.ambarian@kxlh.com; jd2.dooling@gmail.com; Kim Smith <kimsmithvalley@hotmail.com>; Andy Hunthausen; Roger Baltz; Mike Fasbender; Peter Italiano; Ralph Kuney; Rae Lynn Christians <rlchristians@gmail.com>; steveburch@missouririvercontractors.com; sutick@mt.net; Tom Rolfe; trevoretaylor@hotmail.com
Subject:	Attention ZAP -- James Madison Power-point Presentation "Groundwater Basics" Presented to Helena Area Realtors Association in early August 2021
Date:	Tuesday, August 10, 2021 11:34:22 PM

ZAP Members plus L&C Co. Greg, James, Peter, Rodger and BoCC – and other Business a-owners nd Landowners,

August 10, 2021

Attached please find the power point presentation James Madison (Hydrologist -- Montana Bureau Mines & Geology) presented to the Helena Area Realtors Association last week.

Please submit this email and James Madison's Power-point to the ZAP committee and consider this issue be revisited by ZAP in upcoming Meetings.

The primary take away is that there is -- there is ample groundwater available in the Helena Valley Planning Area to support many more future homes, even in the North Hills, The grassland Spokane Creek bench-lands, etc. and the County's 2020 Zoning Regulations, 10-acre lot size restrictions has no legal or technical foundations, especially relative to the groundwater supply.

Again restated for the 10th time -- The County has no legal, administrative or technical basis for considering the 10-acre restriction on all roughly 150,000-acres of private property within the Rural Residential Mixed-use sub-zone of the Helena Valley Planning Area.

According to my conversation with Mr. Madison today (August 10), he has carefully been monitoring and evaluating the Helena Valley groundwater systems for the past 20 plus years, and we shared the following insights into the past development trends of the Western Montana Valley and in particular the Helena Valley relative to future groundwater resources supplies:

A. **NORTH STAR SUBDIVISION**

(Note: See slide 13 of Mr. Madison's attached Power-point Document for graphic explanation of well tapping two different types of groundwater aquifers – Confined and

Unconfined. Confined aquifers are capped by impermeable/semi-permeable layer that confine water flow to more permeable layers of valley fill sediments or bedding planes or fracture zones allowing water to develop pressure and rise above the source if tapped by supply wells. Unconfined aquifers are generally in Tertiary age or younger valley-fill or stream sediments—with groundwater levels in unpumped wells equaling the source aquifer static water levels).

1. The one major problem area relative to declining groundwater levels and impacts to the directly supplied and indirectly affected households is the North Star Development. Important facts to consider and possible solutions for increasing water availability and reducing aquifer declines are:

    a. NorthStar is working on replacing the pumps to the community based on court ordered landscape watering allowances – but that will not fix the basic site specific groundwater aquifer characteristics nor the system design issues which have created excessive drawdown of groundwater levels in the bedrock confined aquifer.

    b. The impacts of the hundreds of homes on the North Star subdivision has dropped bedrock groundwater levels approaching 200 feet near the 6 well North Star cluster, but appear to have affected bedrock groundwater levels over a mile ESE (see Mr. Madison's PP figure 63).

    c. Based on monitoring wells completed in the overlying Tertiary age North Hills unconfined aquifer, the groundwater levels appear to be fairly stable seasonal pulsing fluctuations and overall roughly 10-year precipitation fluctuations -- yet generally no major severe dewatering problems like the bedrock confined aquifers tapped into for North Star.

    d. As a general rule, the North Hills aquifers have ample water to meet current and future Rural Growth if State Subdivision & DNRC Groundwater Appropriation Regulations are properly administered.

    e. Where higher elevation bedrock aquifers with more limited groundwater recharge and water supply fractures systems – DE and or DNRC may limit the amount of granted groundwater use and therein the density or number of subdivision lots based on applicant submitted on-site groundwater aquifer testing results. These agencies have written Subdivision Approval Statements that limit the size of irrigated landscape, or require installation of 1,200 to 2,000 gallon cistern vaults to allow homeowners to still have limited irrigation landscaping and still maintain enough water for inside domestic water supply.

2. Mr. Madison's recommendation is that the North Star and other nearby Subdivisions (e.g. Ranchview, Skyview and ?) combine resources with the County to create and Public Water Supply system and install piping along the Montana Avenue right-of-way –tapping the unlimited Helena Valley Unconfined Aquifer on the County owned section north ½ mile of

Bob's Valley Market near the Helena Valley irrigation canal.

3. Another cheaper solution – might be for the North Star Owners look into assessing the feasibility of completely additional wells at a shallower depth – tapping into the unconfined Tertiary gravel aquifers for some additional seasonal groundwater supplemental water to reduce the mining of groundwater from the confined bedrock aquifers.

4. Mr. Madison went back and reviewed the original pump test results submitted to DEQ for the original North Star subdivision and noted that after the pumps were turned off, the groundwater levels did not return to pre-pumping levels for days after the tests where completed – meaning the bedrock aquifer being drilled into had limited recharge capacity when pumping at higher flow rates – indicating the bedrock aquifer would not supply adequate water for the subdivision over the long haul.

5. Therefore he noted that whoever reviewed the public water supply application -- at L & C County, DNRC and DEQ -- missed the basic facts of the limited groundwater availability in the bedrock aquifer as a source of water for the number of houses proposed in the North Star permit application. Either the number of houses should have been reduced, the regulatory permit dictated limits on the amount of landscape irrigation or a supplemental water source be added to the system.

B. **Eastern half of North Hills** --- Generally ample Groundwater in Lower elevation areas tapping the Sloping Tertiary Valley Fill Unconfined Aquifers allowing moderate density development, with lower lot size densities reasonable for upper-elevation bedrock supplied properties. Near and below the Helena Valley aquifer, groundwater supply limits are not a real concern.

   Similarly – ample valley-bottom Helena Valley Unconfined Aquifers exists up to a mile north of Lincoln Road recharged in part by leakage from the Helena Valley Irrigation canal and by unlimited pool of valley bottom groundwater created by Hauser Lake and Lake Helena. Jim Taylor (PE) working for Mark Diehl back in the mid 2000s, noted that Mr. Diehl's proposed subdivision had a 500 gallon per minute well and that there was ample groundwater under his property to support a public water supply system with piping and a large storage tank well up on the east end of the North Hills, providing water for hundreds if not thousands of new homes for future growth in the Helena Valley Planning Area.

   The County Planning & Technical and BoCC have not wanted to look into any reasonable alternative plans for public wastewater treatment or other dispersed public water supply systems despite the fact that L & C County managers have repeatedly ignored or dismissed reasonable non-city solution in strong bias towards protecting and enhance the City of East Helena and Helena public systems as the only reasonable systems dating back decades. WHY?

C. **Emerald Ridge Subdivision**.

1. Most properties in the Emerald Ridge tap into the shallower Tertiary Elkhorn Volcanic deposits with variable layers of sandier layers interspersed with tighter clay dominated layers leading to localized more productive (perched) water bearing zones which can be highly variable leaving some homes in the Emerald Ridge Subdivision with low producing wells – requiring those unfortunate homeowners limit landscaping irrigation or resort to deepening wells to tap into the more productive bedrock aquifers lying about 500-600 feet below the land surface.

2. Although the number of low producing wells is in the minority – it does get a lot of bad press. But two solutions exist for those few unfortunate landowners -- either drill deeper wells which will provide ample groundwater support 1-2-acres of vegetative landscaped lawns, shrubs and trees.

3. The Second and more costly solution requires a large number of landowners to band together and invest in a public water supply district and make arrangements to tap into the Helena Valley alluvial aquifer which exists less than a mile to the west of most properties.

4. Proof of adequate groundwater exists east of Lake Helena Drive is the 500 gallon per minute well located **on Bob Utick's 320-acre corner parcel east of and abuts Lake Helena Drive, and south of and abuts York Road** (NW Corner of new MDT round-about—a due east of NE Corner of Fox Ridge Golf Course). The County incorrectly classified this pre-engineered parcel as part of the 2020 HVPA Rural Zoning Regulations with restrictive 10-acre lot size restrictions hanging over it like a sludge hammer. This property is ideally located to supply affordable lots to new perspective landowners in one of the more desirable places in the entire HVPA – yet the L & C County 2020 Zoning Regulations at 10-acres would limit this attractive development parcel to only about 30 lots where up to 500 or more new homes on larger than city size lots would be possible and desirable given it's closeness to East Helena and Helena with adequate state and County paved roads going in 4 different directions.

   This parcel of land has no basis for being included in the L & C County 2020 Zoning Regulations for Rural Mixed-use zoning given it has ample water for lot size density way less than 1-acre in size – which is a major technical, administrative and regulatory mistake by the County.

D. **Birdseye Road, Priest Pass Road, Rimini Road, Scratchgravel Hills area etc** – will likely never see any major subdivisions because Compliance with County Subdivision Regulations makes rural development in the entire county Largely Uneconomic.
   1. Very limited development and most certainly no major new subdivision developments will likely occur on or feeding into Birdseye Road, Rimini Road or Priest Pass Areas or other non-state owned roads -- will ever happen under the Current L & C County's current subdivision regulations, given the County's unreasonable requirements that any new major subdivision must have two road entrances into the development site and both roads must be evaluated relative the projected engineering costs to upgrade

the road to meet the current County Subdivision Standards.

2. Then the subdivision applicant must pay the county before final plat approval for their proportionate share contributions to upgrade any Non-State owned roads up to the County Design Standards. Given the fact that most of L & C County's 500 plus miles of road and nearly all gravel/dirt privately maintained roads -- not within modern County Approved subdivisions – all fall well short of meeting the ideal County Standards for gravel and paved roads.

3. At paved road costs now exceeding $1,000,000/mile and the County high estimate of 9 plus vehicle trips per day generated from a single household, very few rural developments in this county will ever pencil out and lead to a real development. And the further a property is away from a state Highway, the worst the economic costs become for any landowner or developer.

4. Couple the high costs off-site road improvement costs, is the fact that most development in Lewis and Clark County and actually state wide is happening wherein the developments are occurring within the Boundaries of Cities and towns with ample already allocated DNRC Senior Water Rights – because of the District Court Ruling in 2014 limiting the agency use of exempted water rights to 10-acre feet of water use per development (again about 13-lots maximum) without triggering costly and time consuming Water Rights transference permitting hurdles.

Summary.

Groundwater supplies for new subdivisions located within the Helena Valley Planning Area is in no way a valid justification for requiring 10-acre lot size restriction that were part of the 2020 Zoning Regulations – tabled until the ZAP committed final findings and BoCC final ruling due by July 1, 2022.

James Madison, I and many other informed professionals agree that existing Subdivision and Water Rights regulations adequately protect existing and future groundwater users and isolated problem areas within the HVPA can be addressed on a individual basis without unfairly and illegally targeting all rural property for harsh unnecessary regulatory controls like the 10-acre lot size restrictions.

Mr. Madison is very aware that this is a sensitive political issue, and therefore I (John Herrin) want to make sure that there is no adverse criticism targeting Mr. Madison, given I have included additional specifics statements that go a bit beyond our 30 minute conversation, but I believe in all honesty that Mr. Madison would not object to any single word herein written involving the actual groundwater supply technical issues herein presented.

The political and administrative statements are mine and mine alone and therefore any counter arguments along those lines should be directed at me and not Mr. Madison.

John W. Herrin

Sent from Mail for Windows 10

From: HAR Admin (via Dropbox)
Sent: Tuesday, August 10, 2021 4:42 PM
To: 2freedomrings@gmail.com
Subject: HAR Admin shared "Groundwater Basics" with you

Hi John,

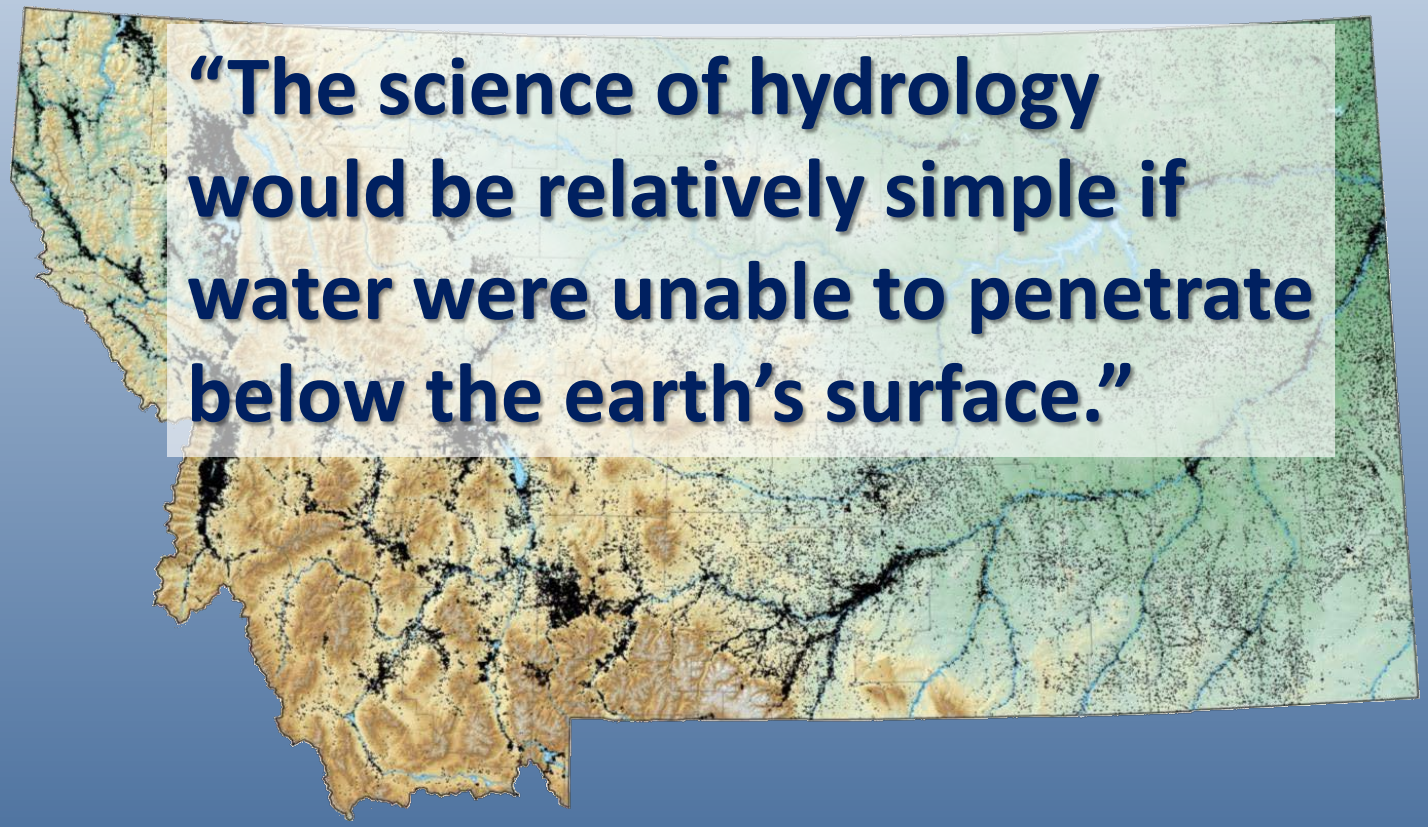
HAR Admin (angela@helenahar.com) invited you to edit the folder "**Groundwater Basics**" on Dropbox.

Go to folder

Enjoy!
The Dropbox team

Report to Dropbox

Groundwater Basics and The Ground Water Information Center



"The science of hydrology would be relatively simple if water were unable to penetrate below the earth's surface."

Outline

- MBMG
- Hydro 101
- MT GW
- Tracking WL's
- GWIC
- Helena Area GW

James Madison
Montana Ground Water Assessment Program
jmadison2@mtech.edu

Helena Area Realtors
July 15,2021
Helena, MT

MBMG Montana Bureau of Mines and Geology

Montana Bureau of Mines and Geology

a department of Montana Tech

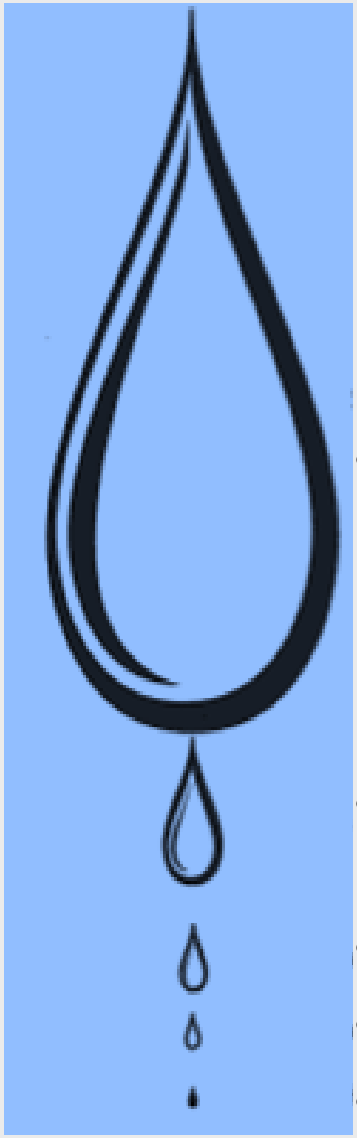
- **Established in 1919 to provide reliable and unbiased earth science information**

- **Non regulatory, applied research**
  - **Geologic Mapping**
  - **Earthquake Studies**
  - **Economic Geology**
  - **Environmental Assessment**
  - **Ground Water Assessment**

1935 Helena Quake M:6.2

http://www.mbmg.mtech.edu/

Where's the water?



Distribution of world's water supply

- Oceans: 97.2%
- Ice caps: 2.1%
- Groundwater: 0.7%
- Surface water: 0.01%
- Atmosphere: 0.001%

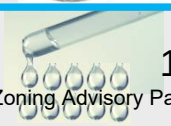
10 Gallons

9.7 gallons

4 cups

1 cup

1 teaspoon



10 drops

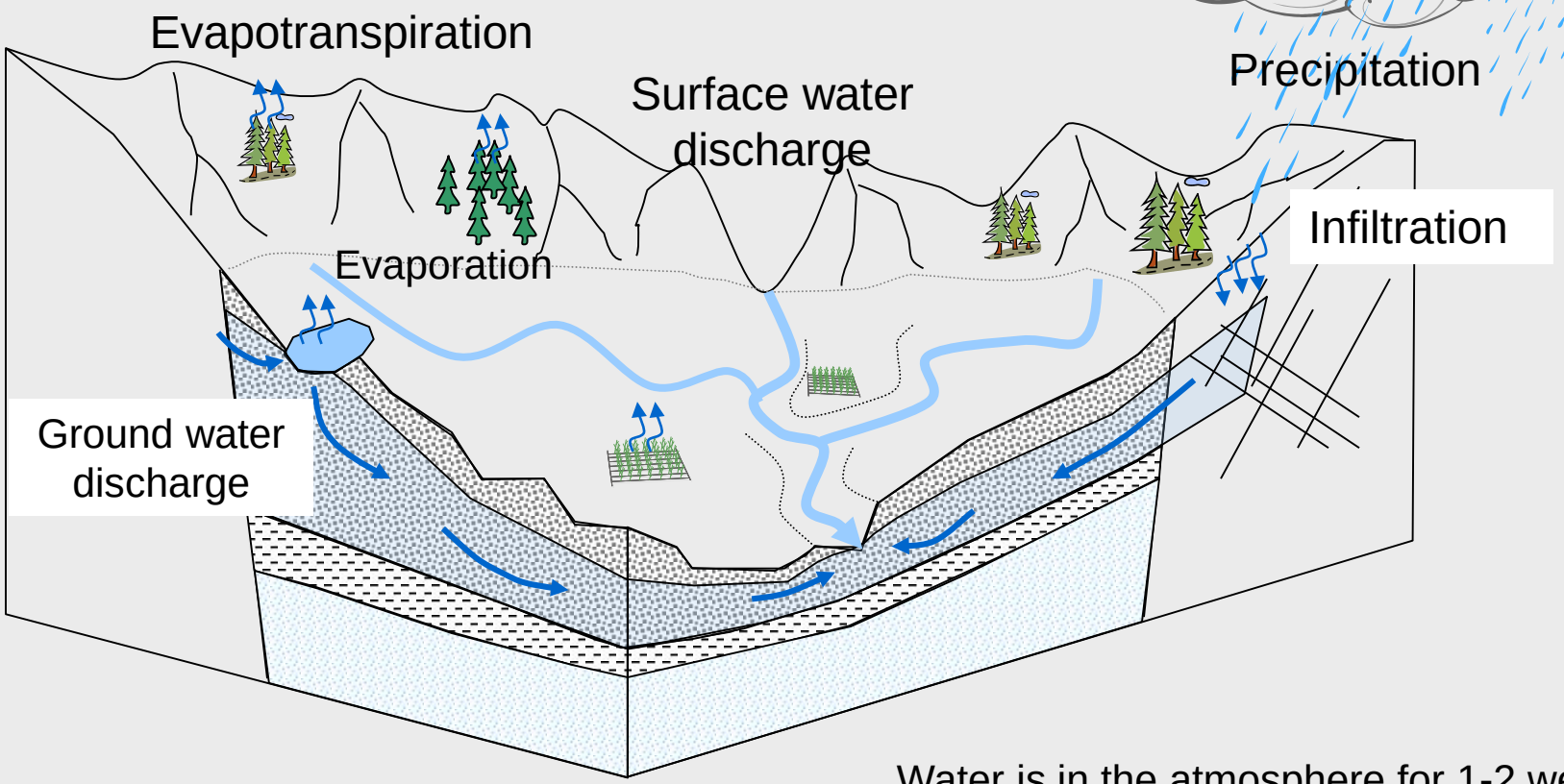
Available Fresh Water

95% is Groundwater!

MBMG Montana Bureau of Mines and Geology

Water Cycle: Basin Scale

Hydrologic cycle: the endless circulation of water between the atmosphere, the land surface and the ocean.



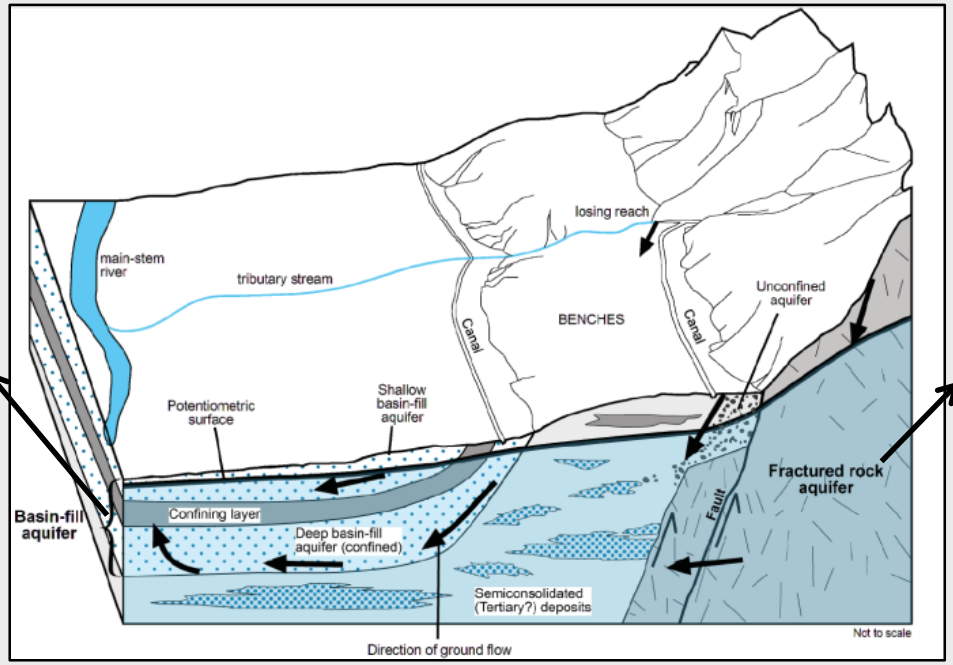
Water is in the atmosphere for 1-2 weeks, streams for ~ 2 weeks, the ground water system for 2 weeks to 10,000 years.

Ground Water:
Essential Definitions / Concepts

Aquifer:

A permeable geologic unit that can transmit and store water.

- alluvial (sand and gravel) or bedrock (sandstone, fractured rx)



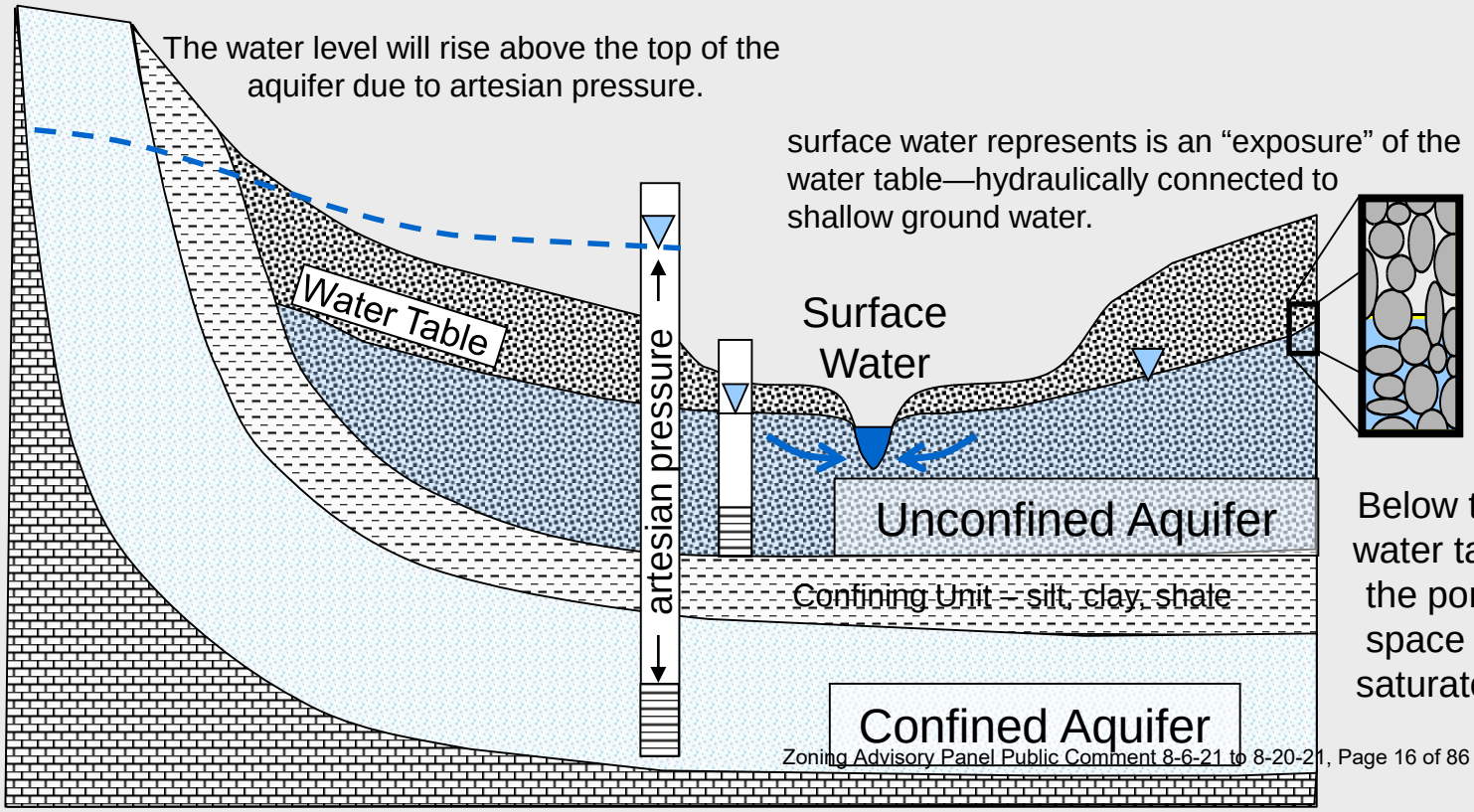
MBMG Montana Bureau of Mines and Geology

Ground Water:
Essential Definitions / Concepts

Aquifer:

A permeable geologic unit that can transmit and store water.

- alluvial (sand and gravel) or bedrock (sandstone/fractured rx)
- unconfined (water table) or confined (artesian)



Ground Water:
Essential Definitions / Concepts

Ground water is moving… but slowly

- 1ft/day – 1ft/yr Residence times: days - millennia

Recharge:

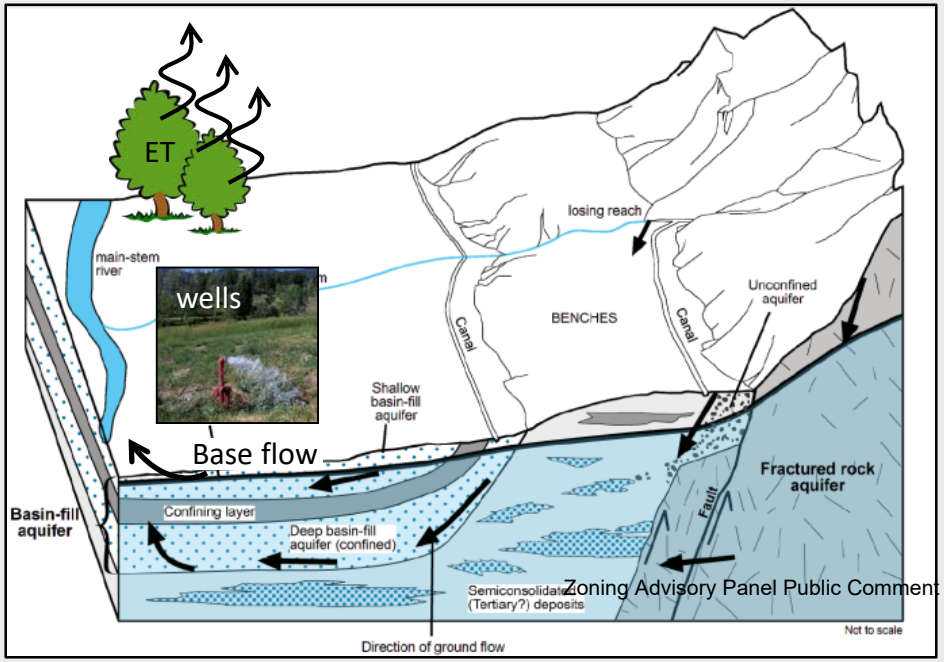
- Movement of water from the land surface to the aquifer

Discharge:

- Movement of water from the aquifer to the land surface

Discharge

- base flow
- ET
- well pumping



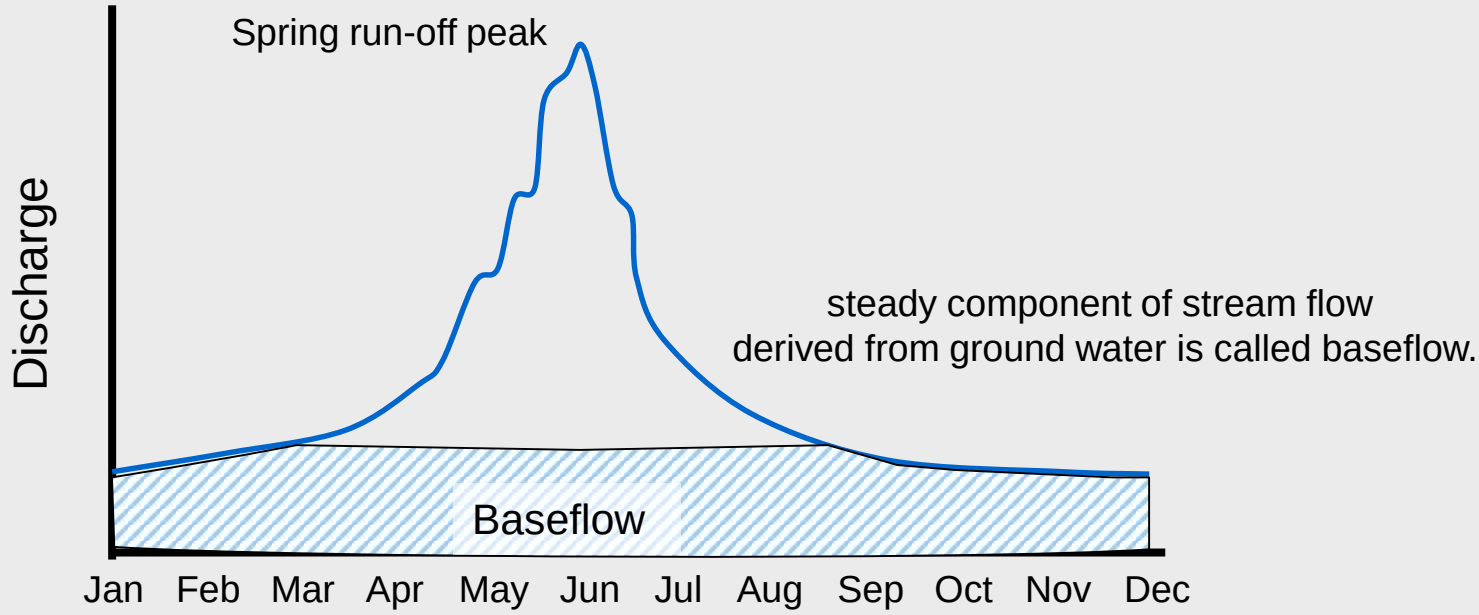
Recharge

- precipitation
- streams
- canals
- mountain front
- shallow to deep

Ground Water:
Essential Definitions / Concepts

Groundwater and surface water are connected

Stream hydrograph: measure of discharge as a function of time



Major portion of flow ultimately derived from baseflow

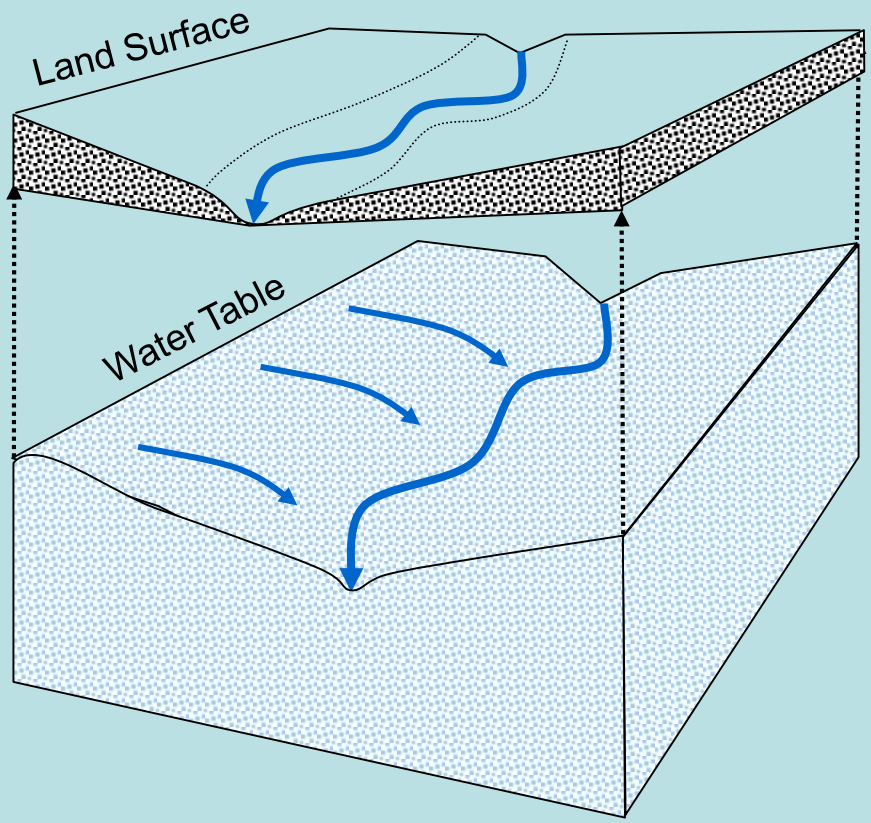
- On average, ground water accounts for 40 - 50 % of annual flow

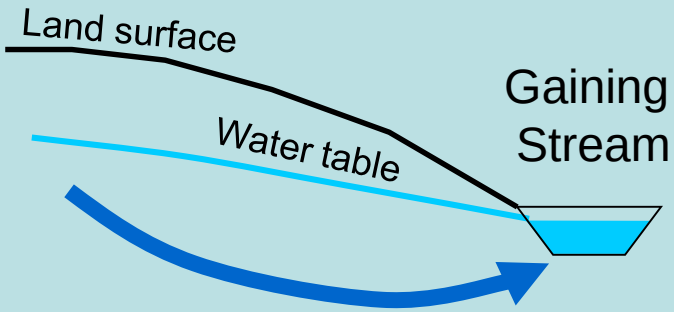
The water table

water table:
* subdued representation of land surface,
* depth to the water table variable,
  -near land surface in topographically low areas (near streams).

ground-water flows:
down the slope of the water table surface.

gaining stream:
*water table higher level than the stream,
*flow toward and feed the stream,
* discharge increases down stream.



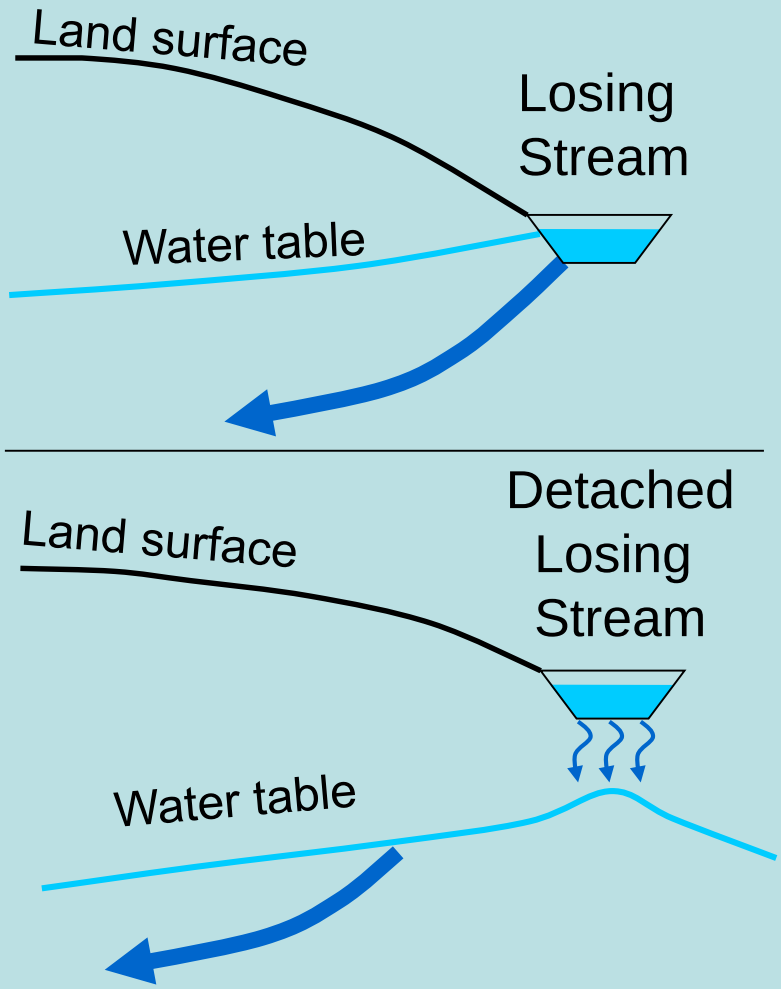


Ground-water flow associated with a losing stream

Not all streams are gaining

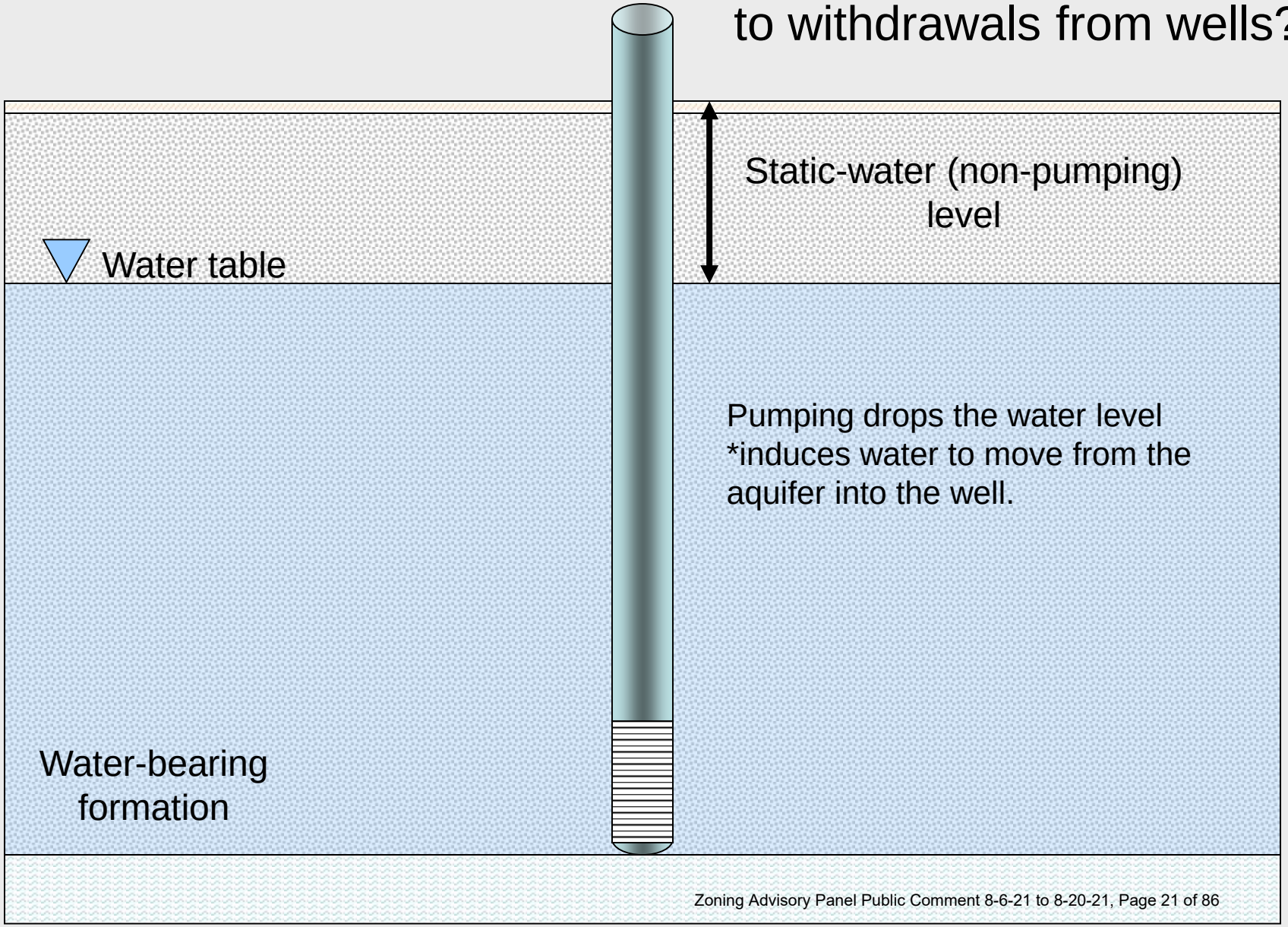
losing stream
* stream higher than the adjacent water table,

Losing streams can be directly connected to the water table or detached.

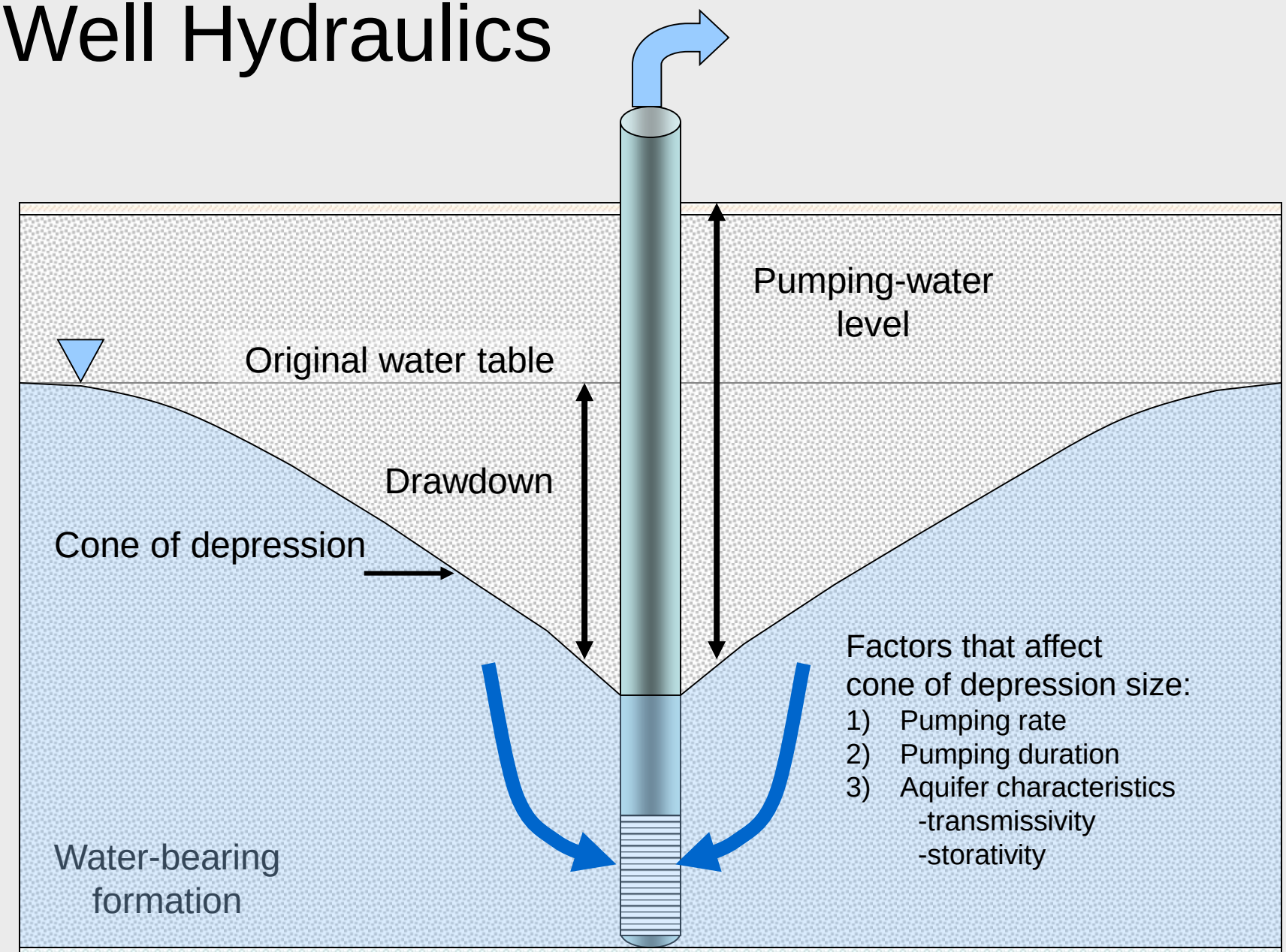


Well Hydraulics

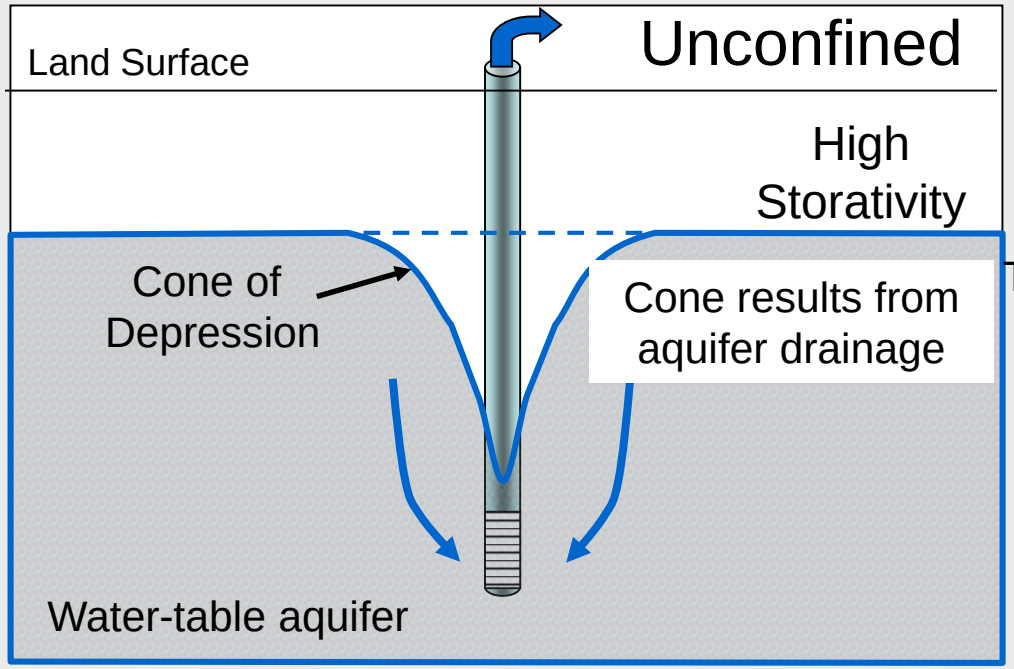
How do aquifers respond to withdrawals from wells?



Well Hydraulics

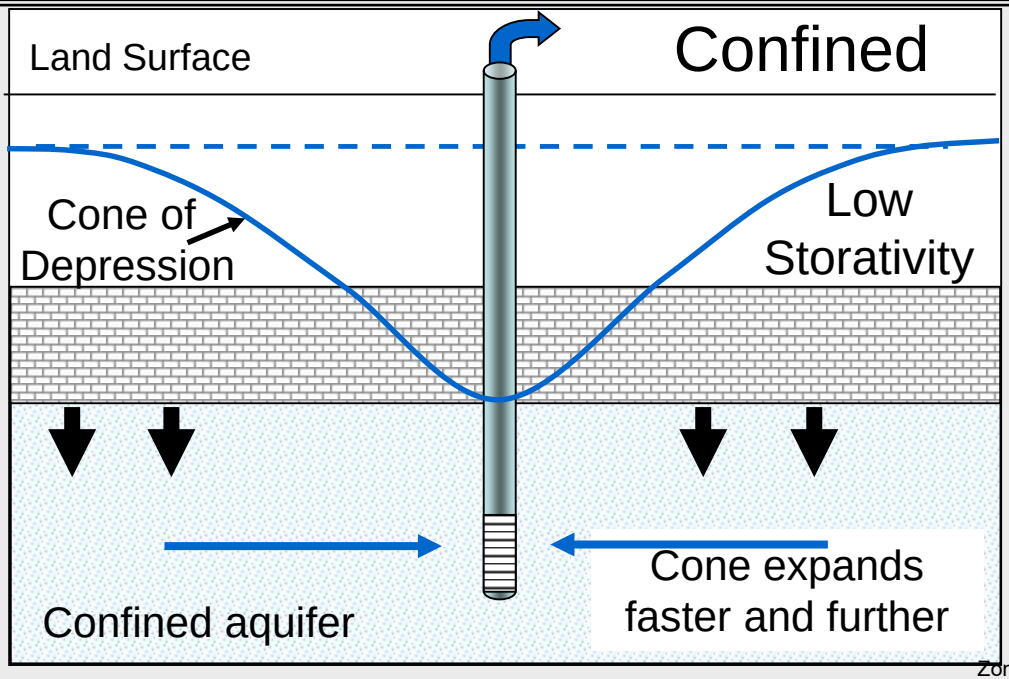


Aquifer Storage



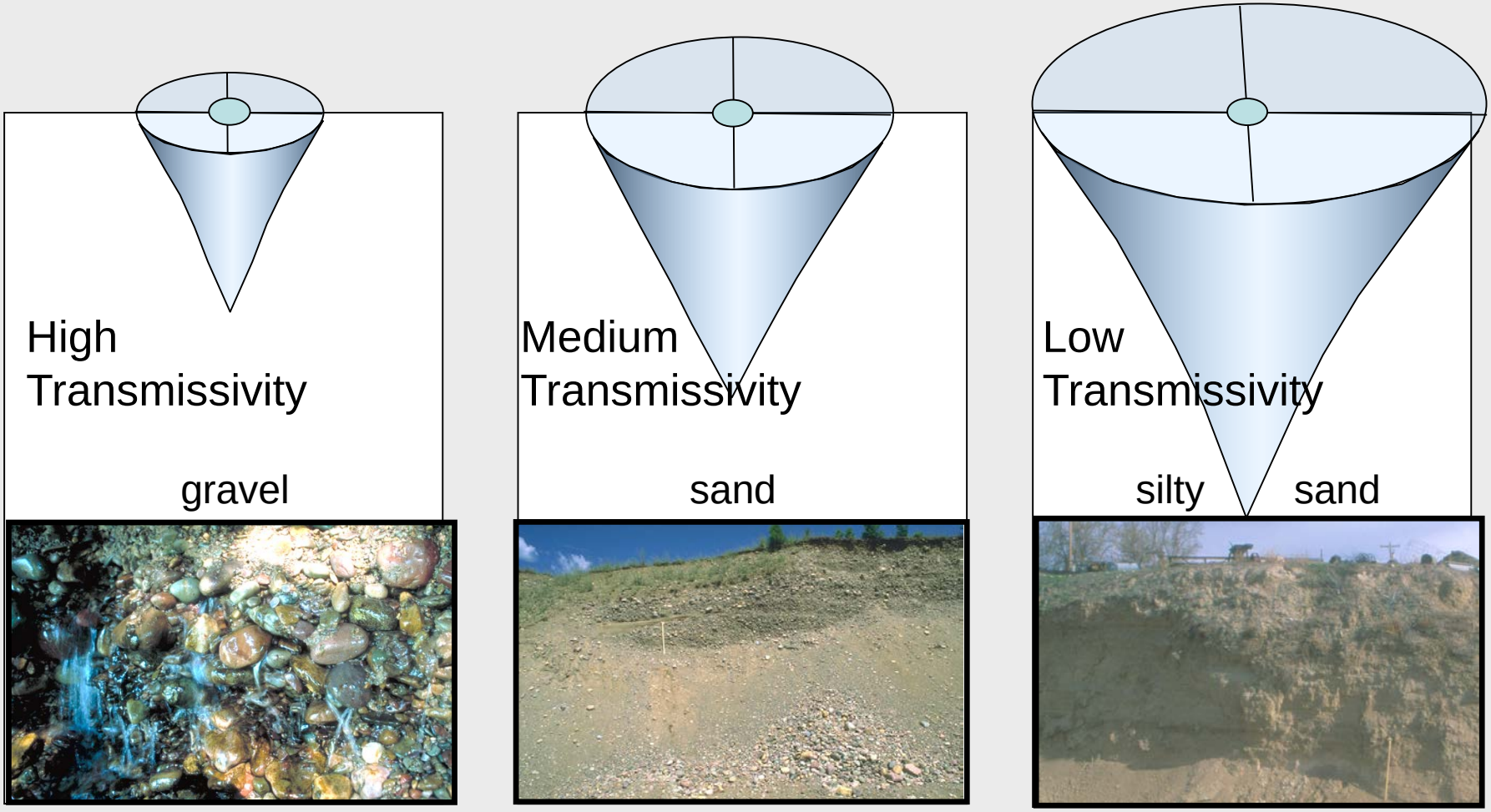
Storativity affects size and rate of cone development.
There is a big difference between unconfined (water table) and confined aquifers.

In unconfined aquifers water is released from storage by draining the aquifer;



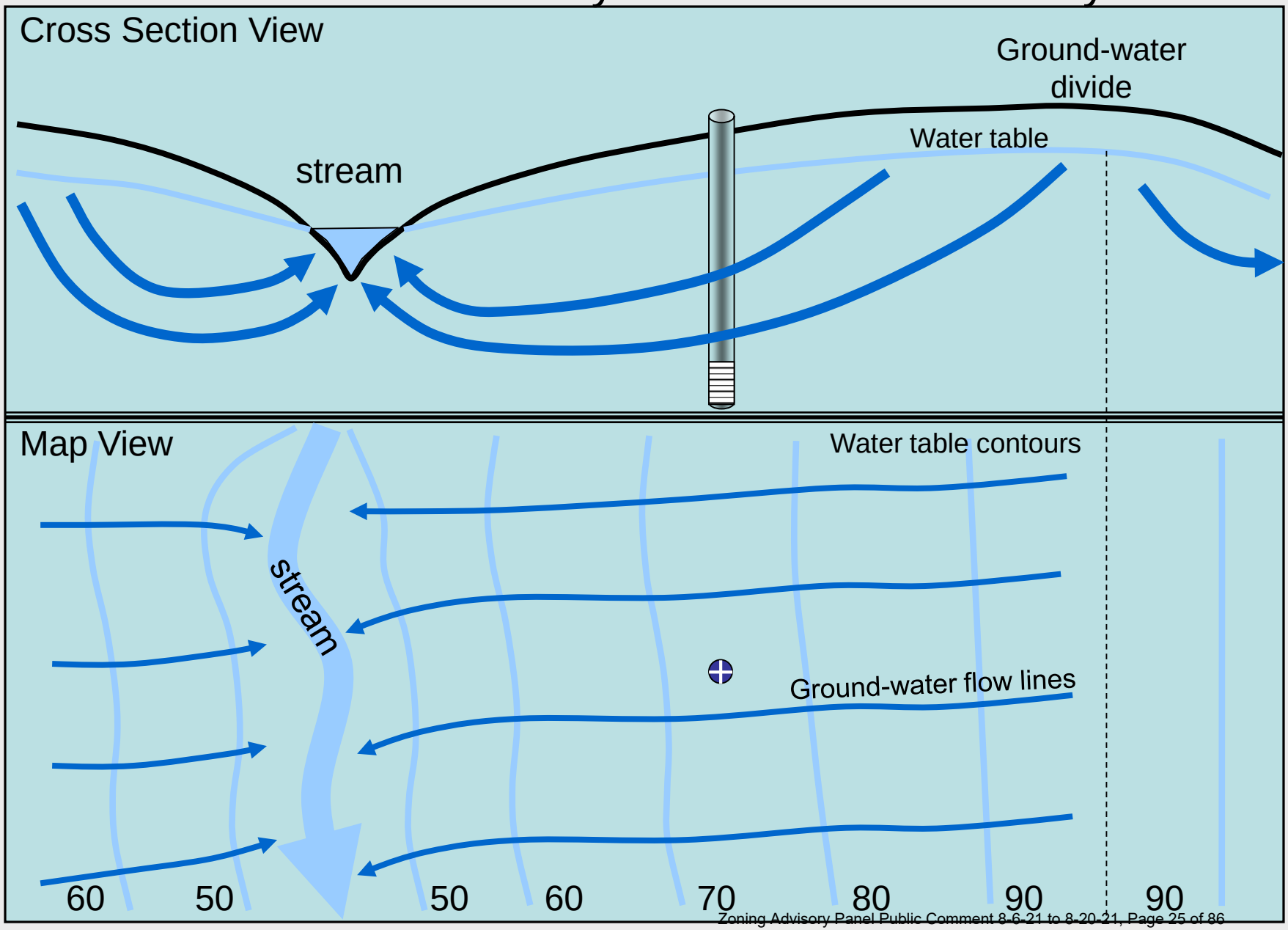
In confined aquifers, pumping decreases the artesian pressure. Water is released by compacting or squeezing the aquifer.

The geologic framework is a critical piece of information needed to assess the impact of a pumping well

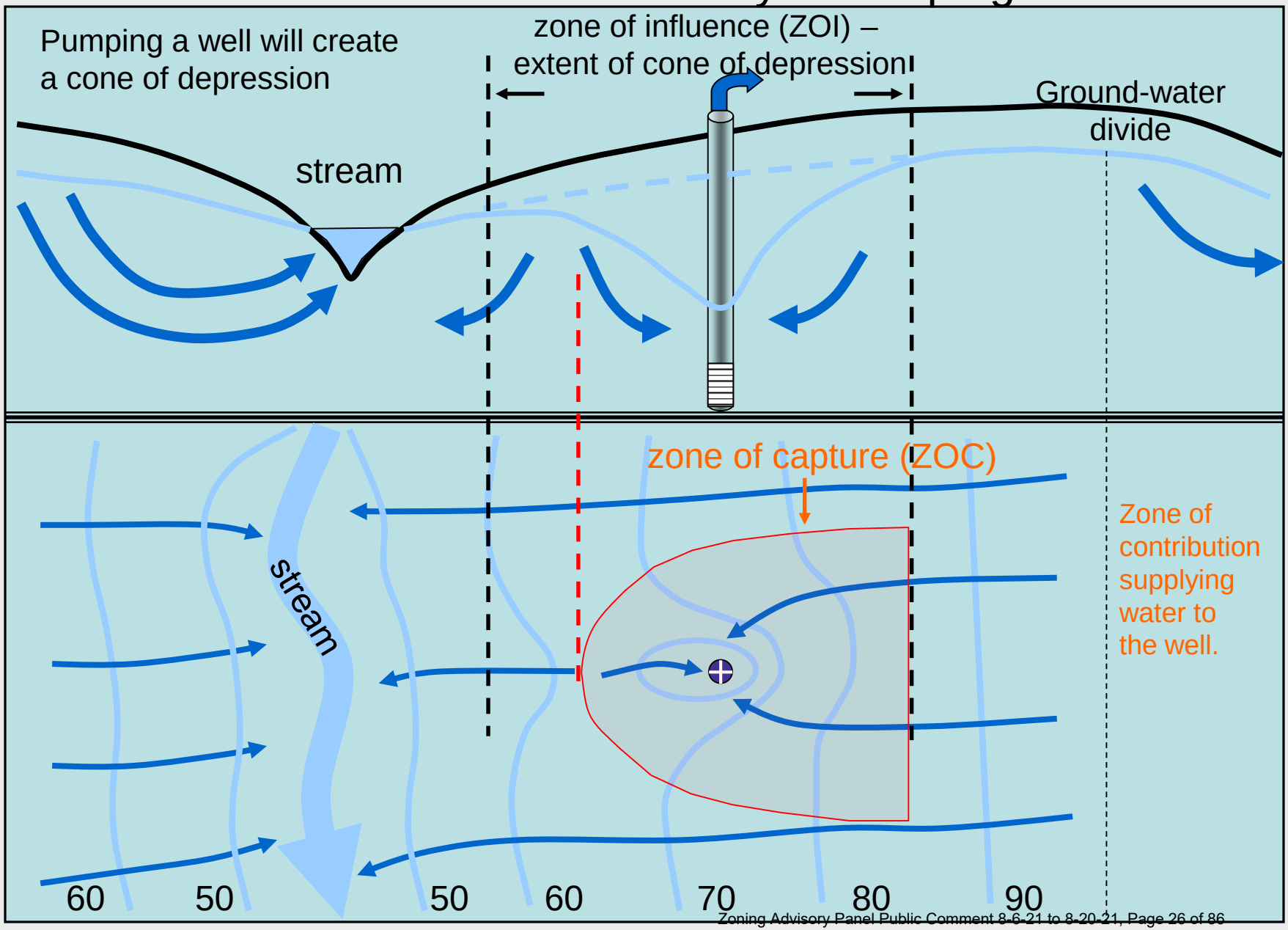


The more transmissive the aquifer, the smaller the cone of depression, all other things being equal. The size of the cone is a reflection of how much work it takes to move water to the well. It takes less work to push water through a coarse gravel than a silty sand.

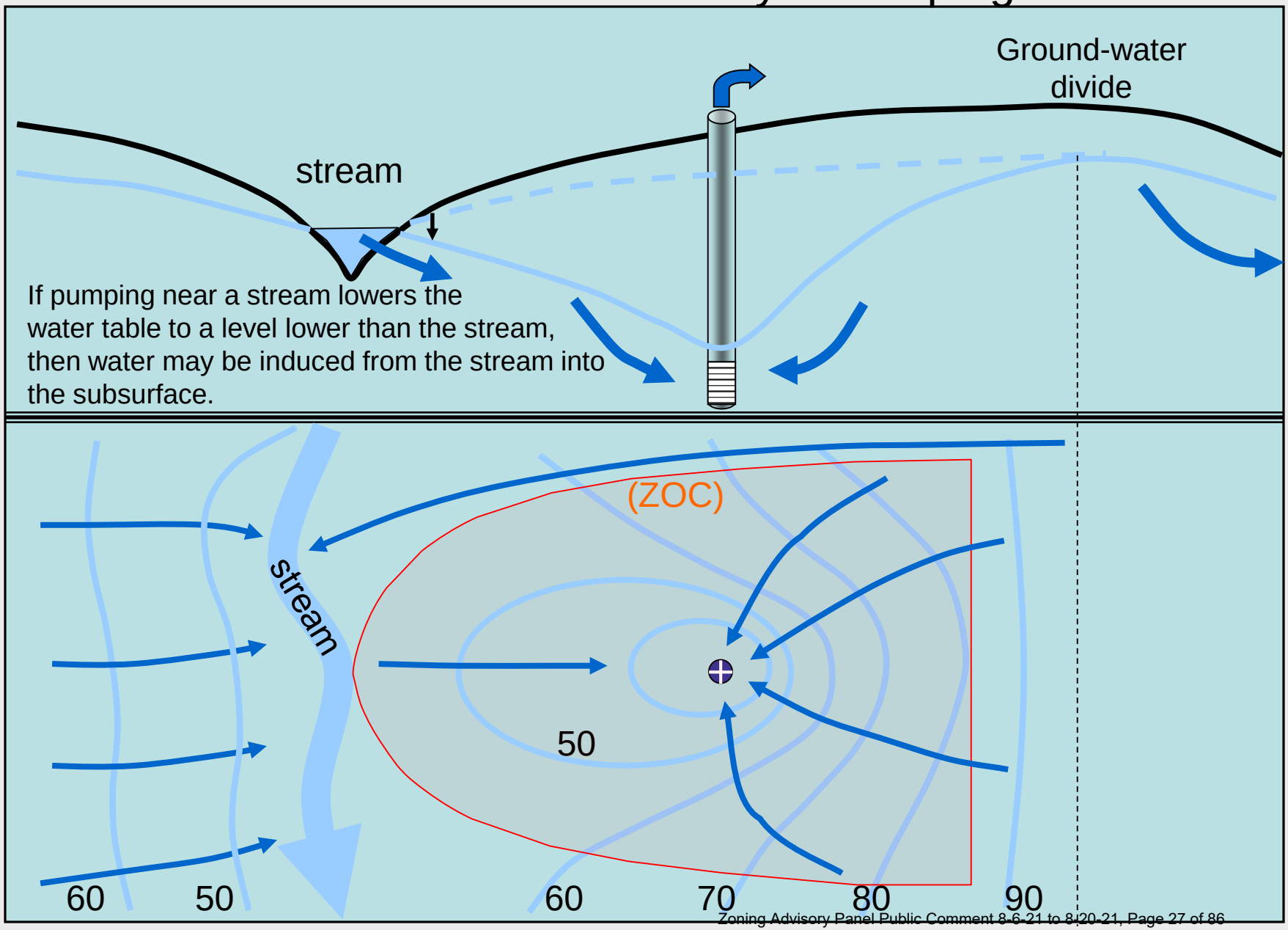
Ground-Water Flow System in a Stream Valley



Ground-Water Flow Affected by a Pumping Well

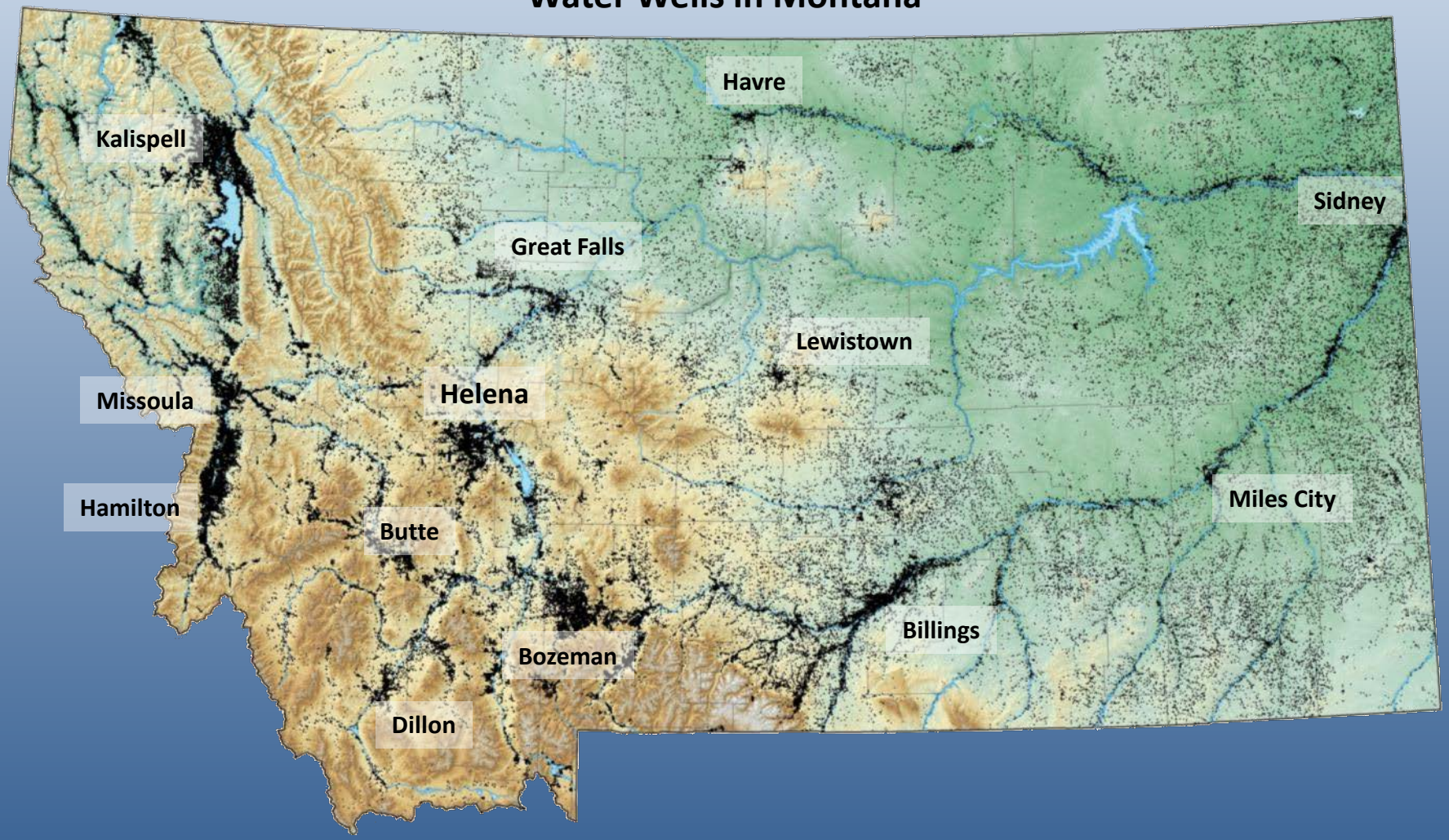


Ground-Water Flow Affected by a Pumping Well



Tracking Montana's Groundwater

Water Wells in Montana



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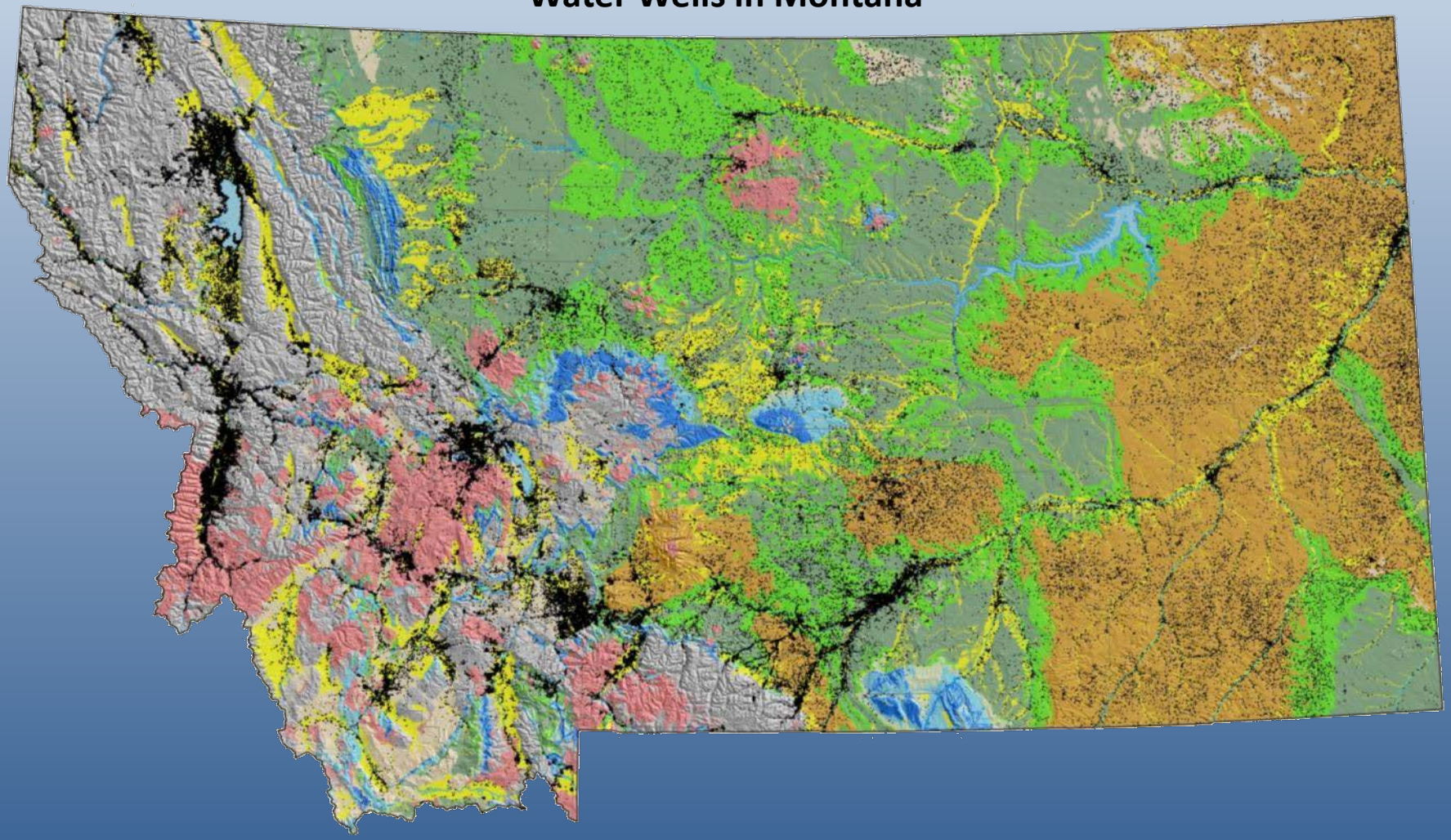
Tracking Montana's Groundwater

Water Wells in Montana



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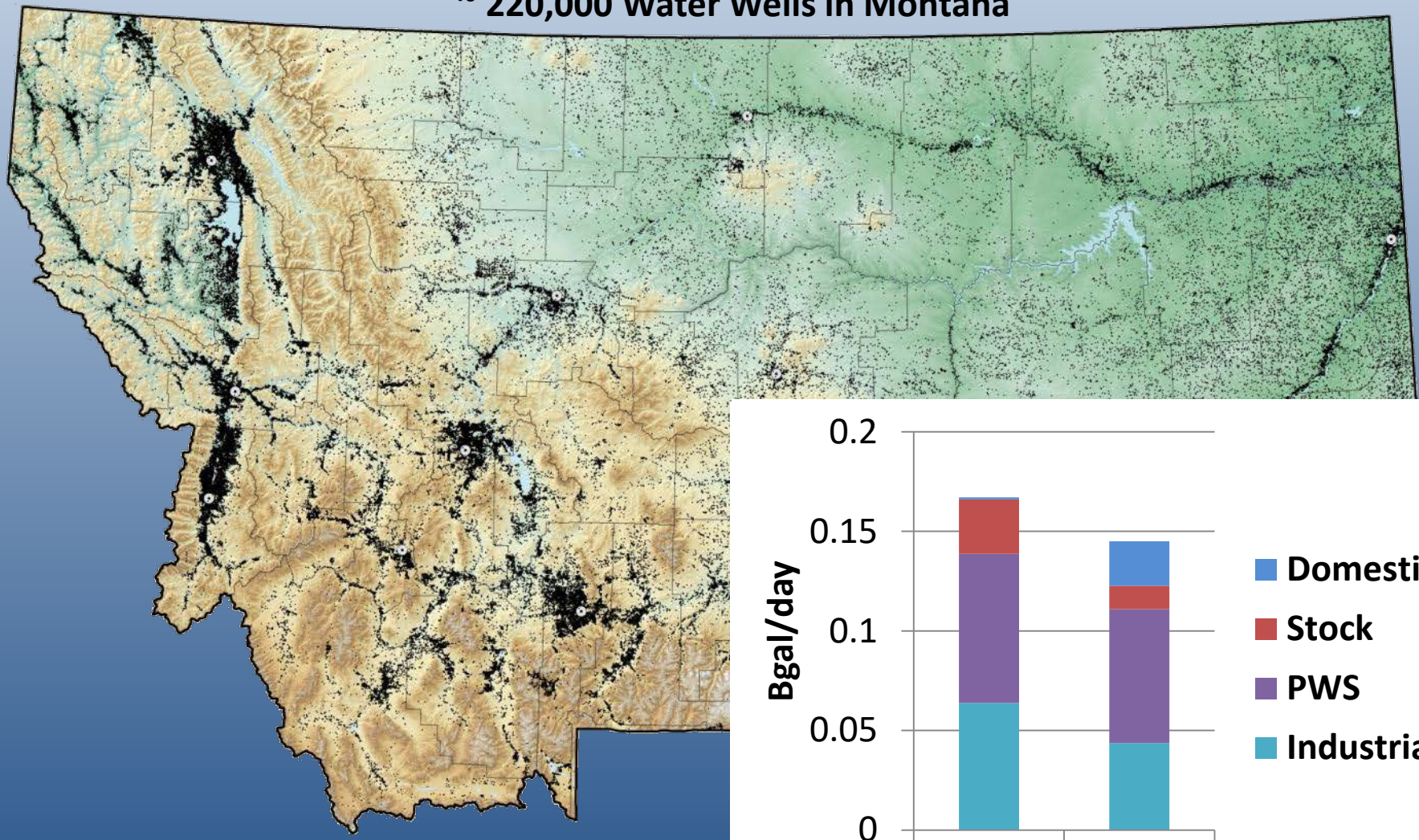
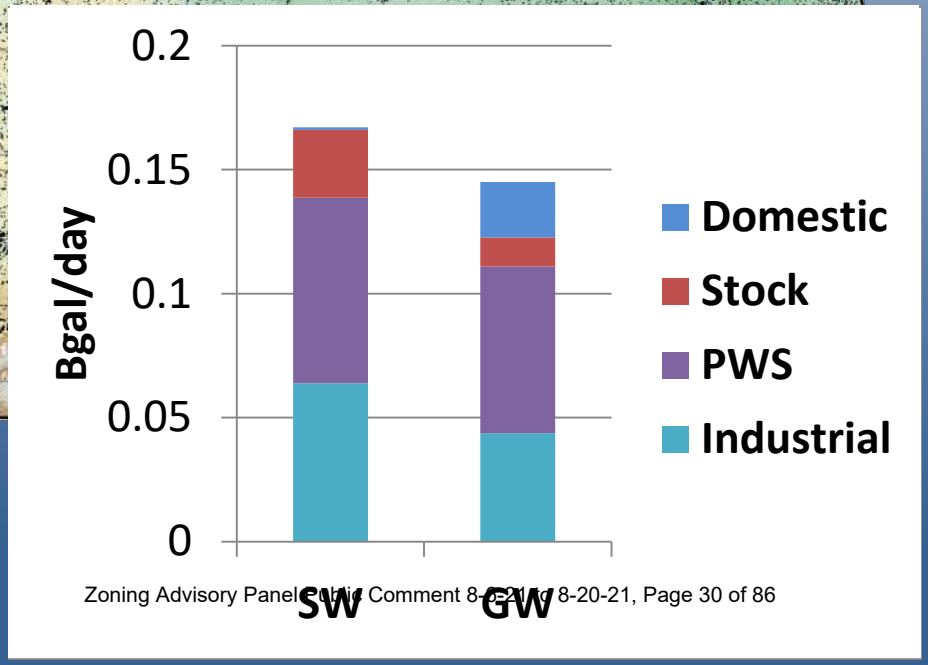
Water Wells in Montana

Domestic, Stock, Irrigation, PWS, Industrial

~ 220,000 Water Wells in Montana





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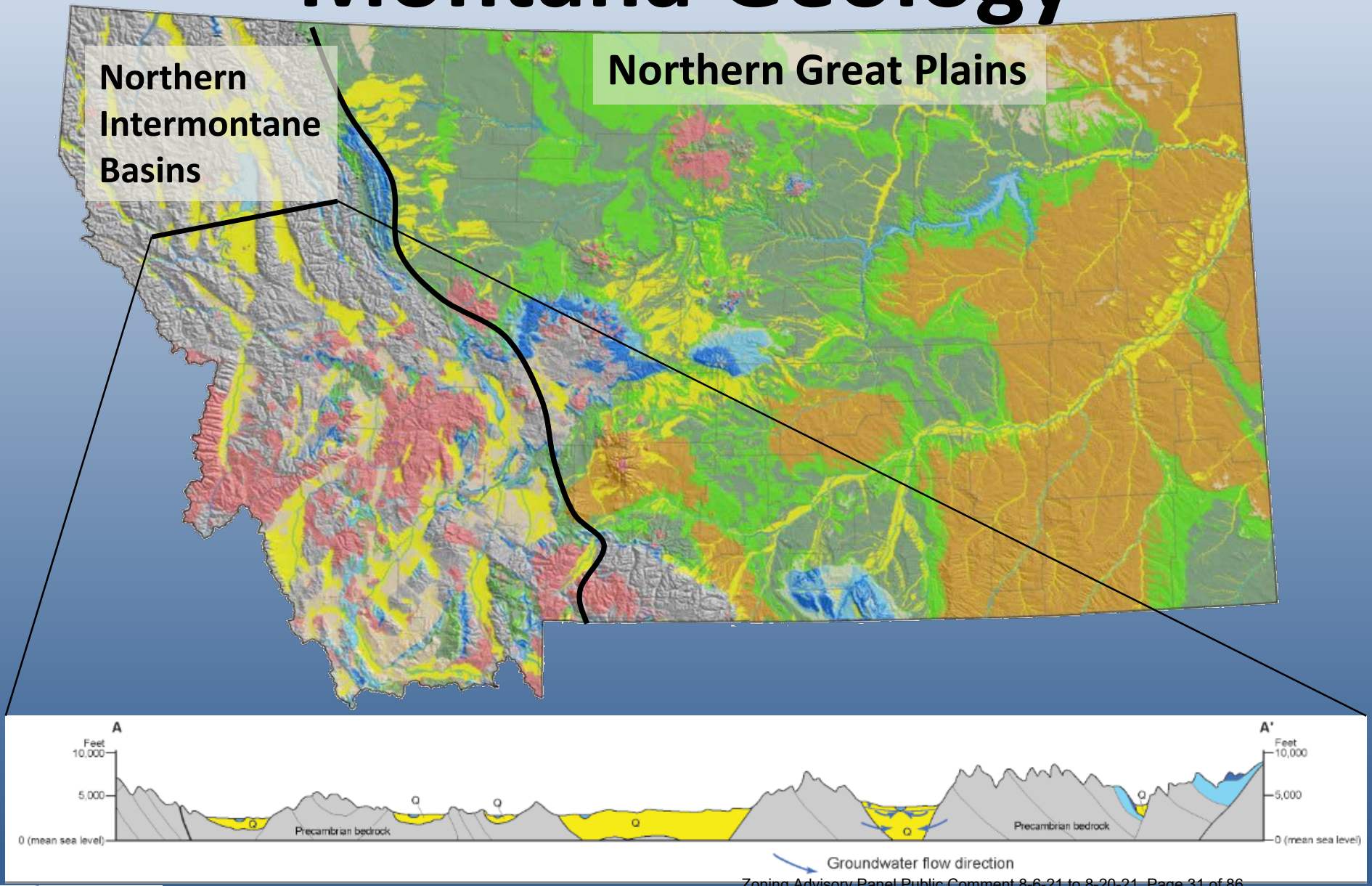

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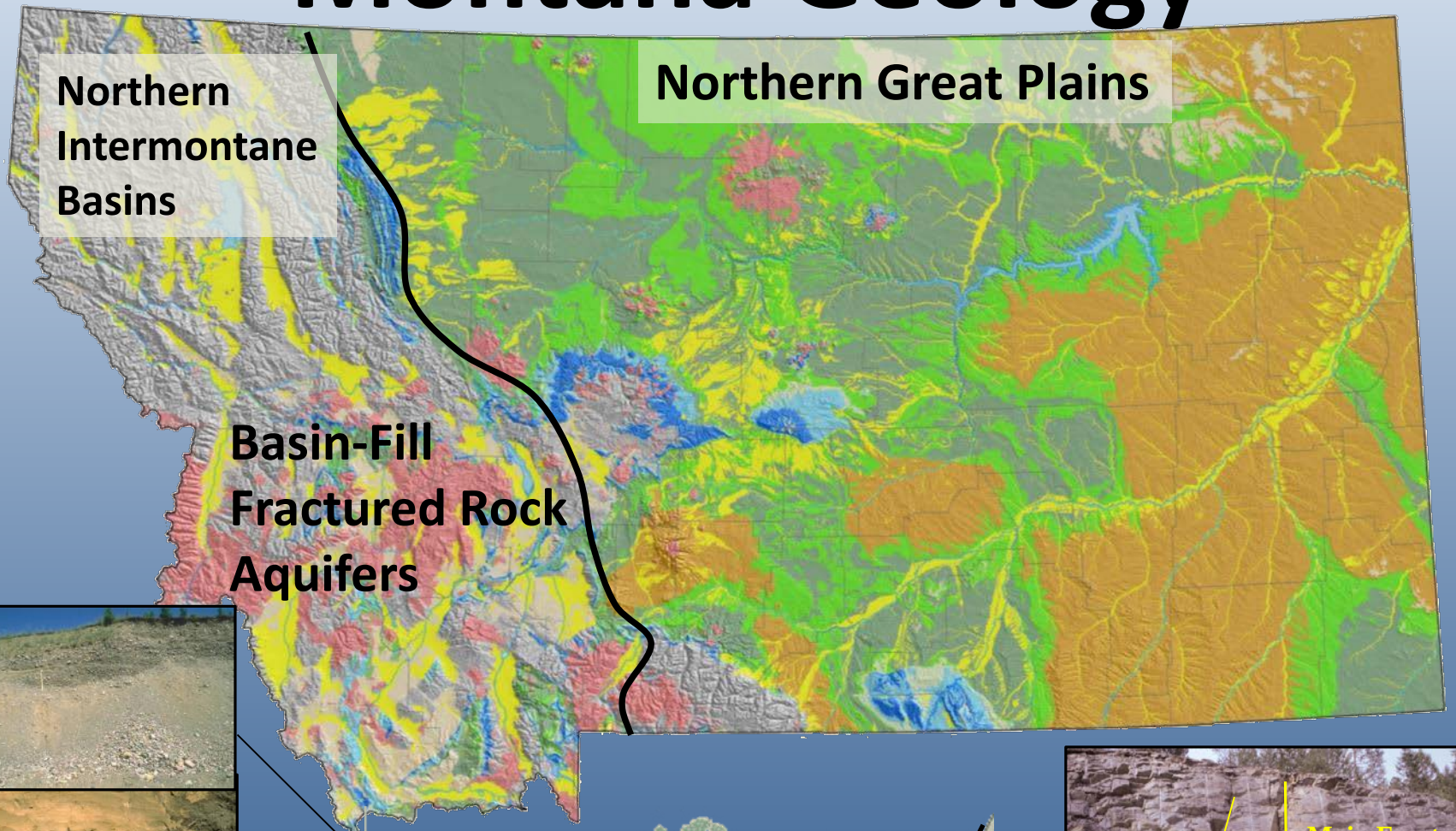
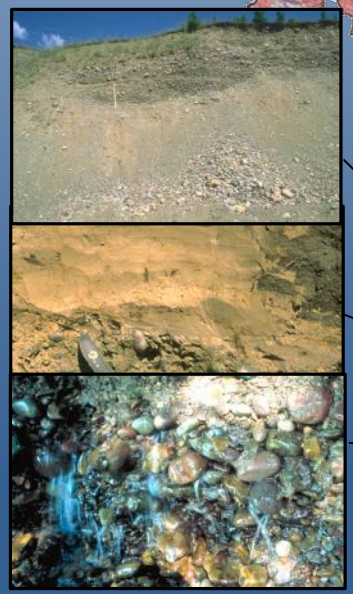
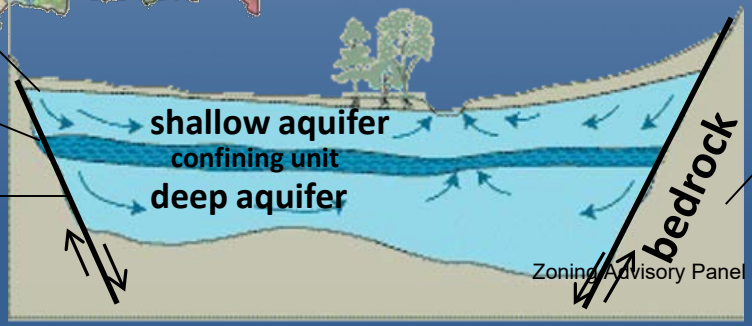
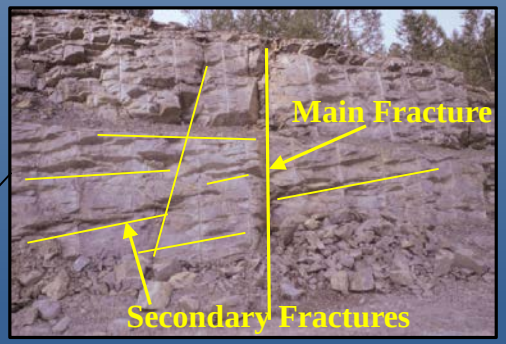
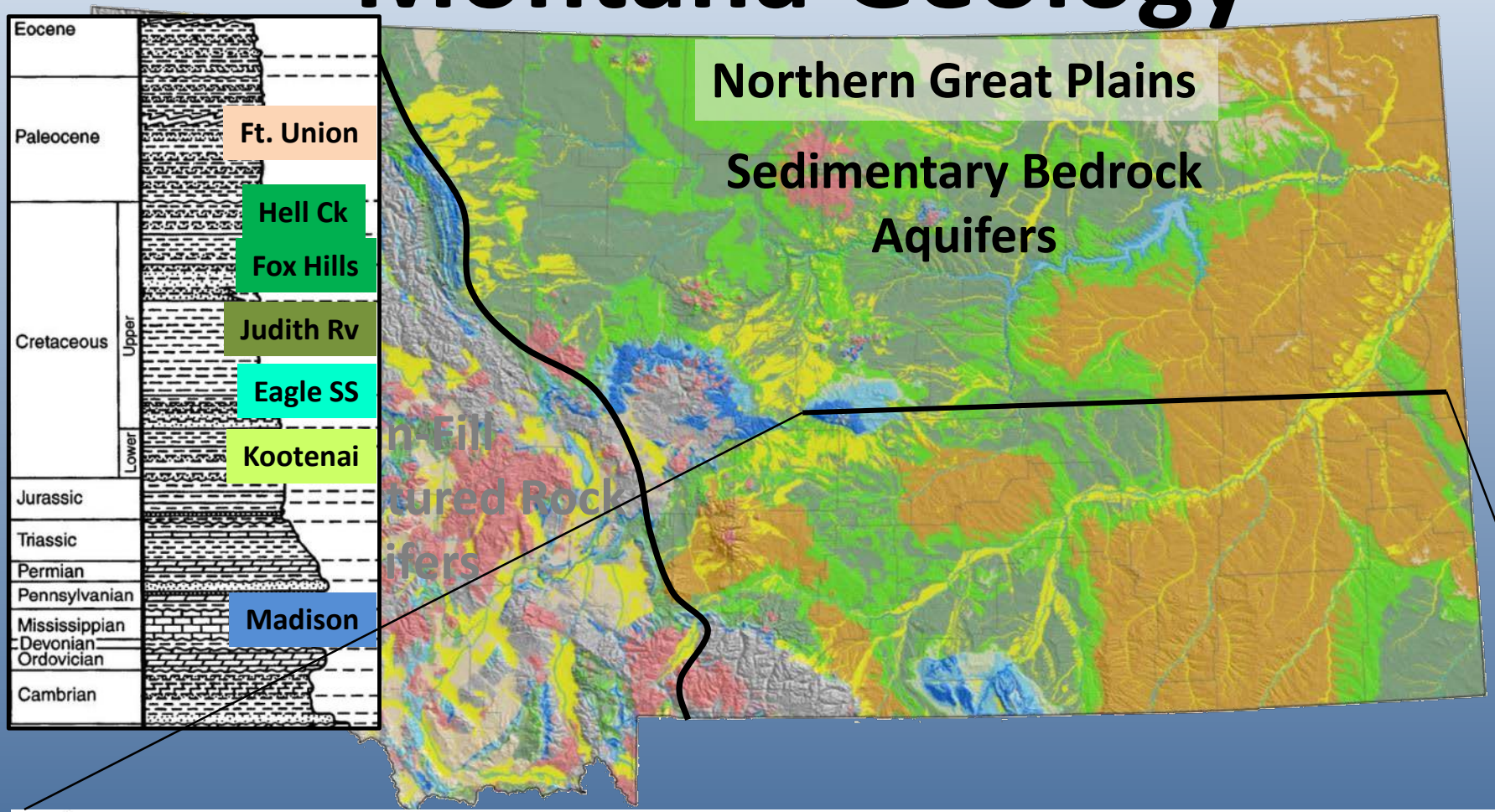


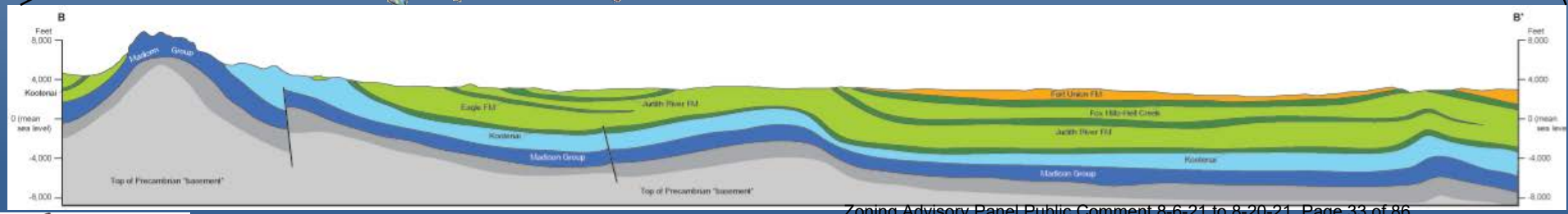






Montana Geology





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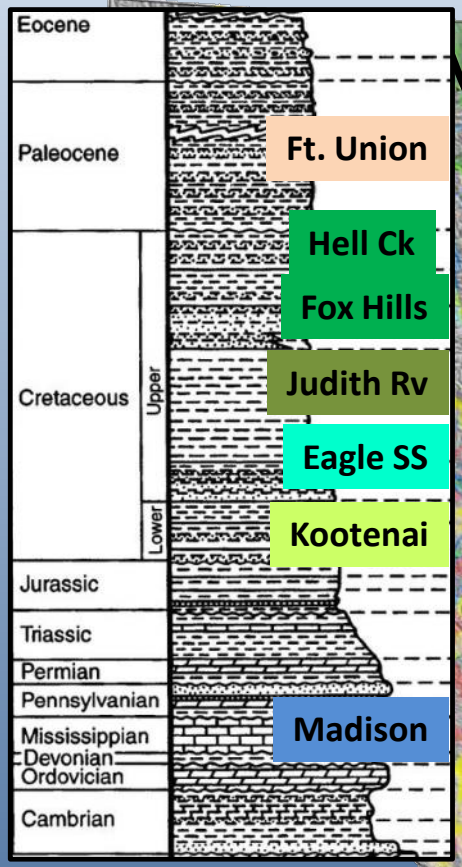
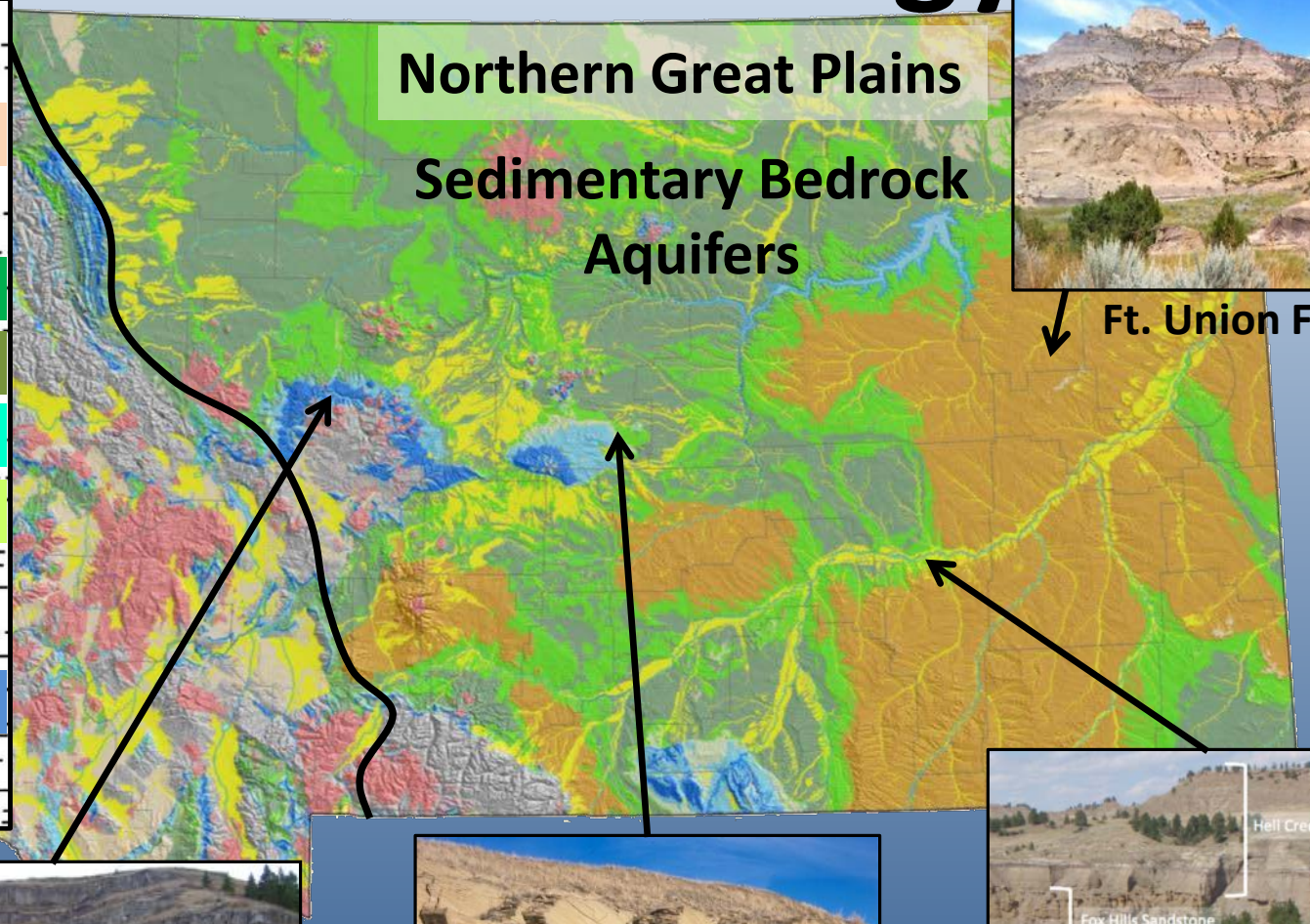
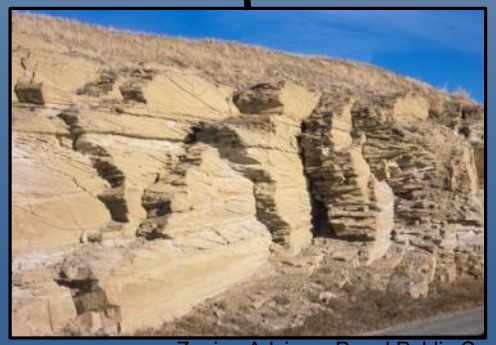




Ft. Union Fm

Madison Ls



Kootenai Fm

Fox Hills-Hell Ck

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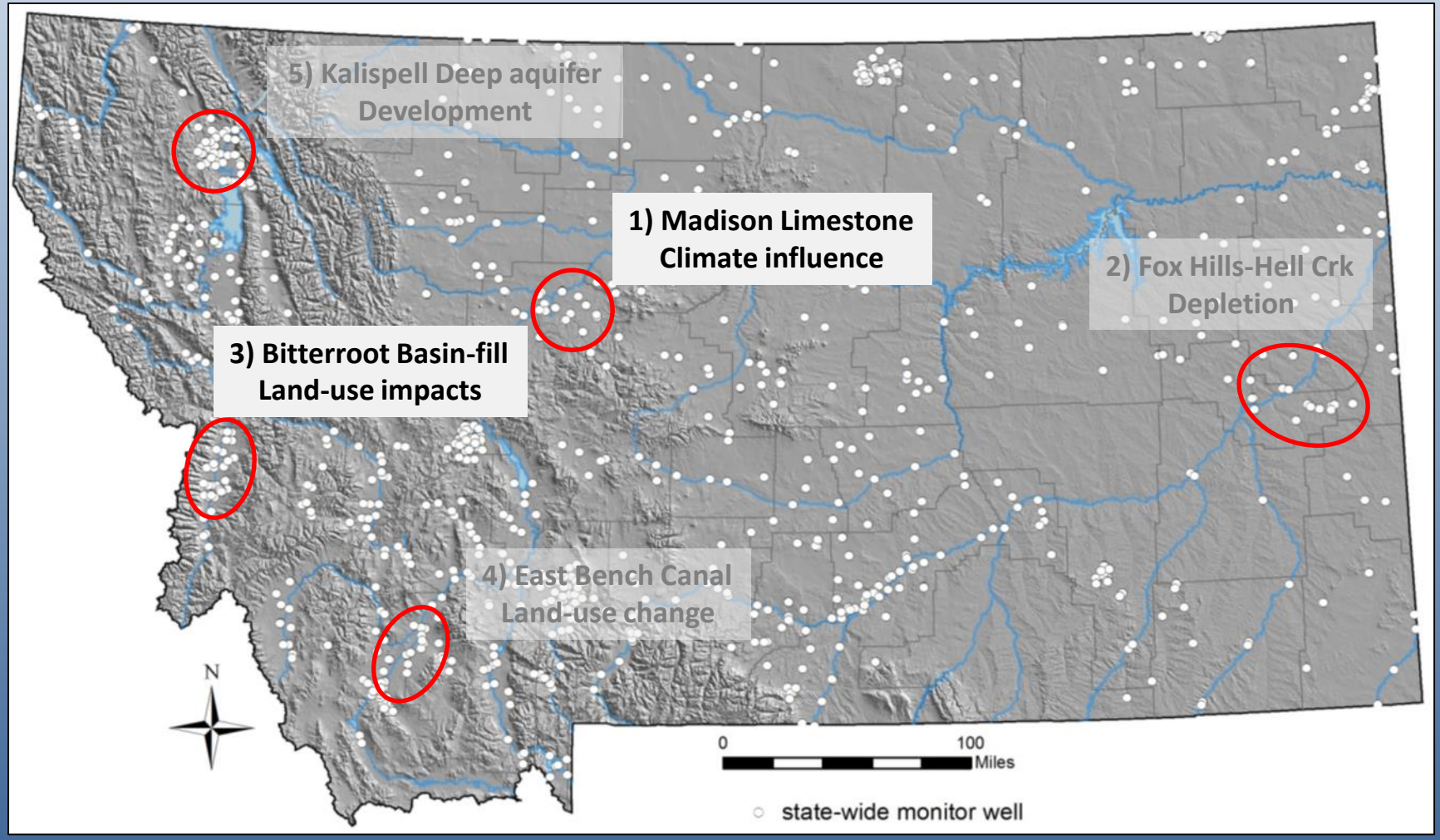
State-Wide Groundwater Monitoring



- 800 + wells
- 10 – 3,600 ft deep
- Alluvial, basin-fill, bedrock aquifers

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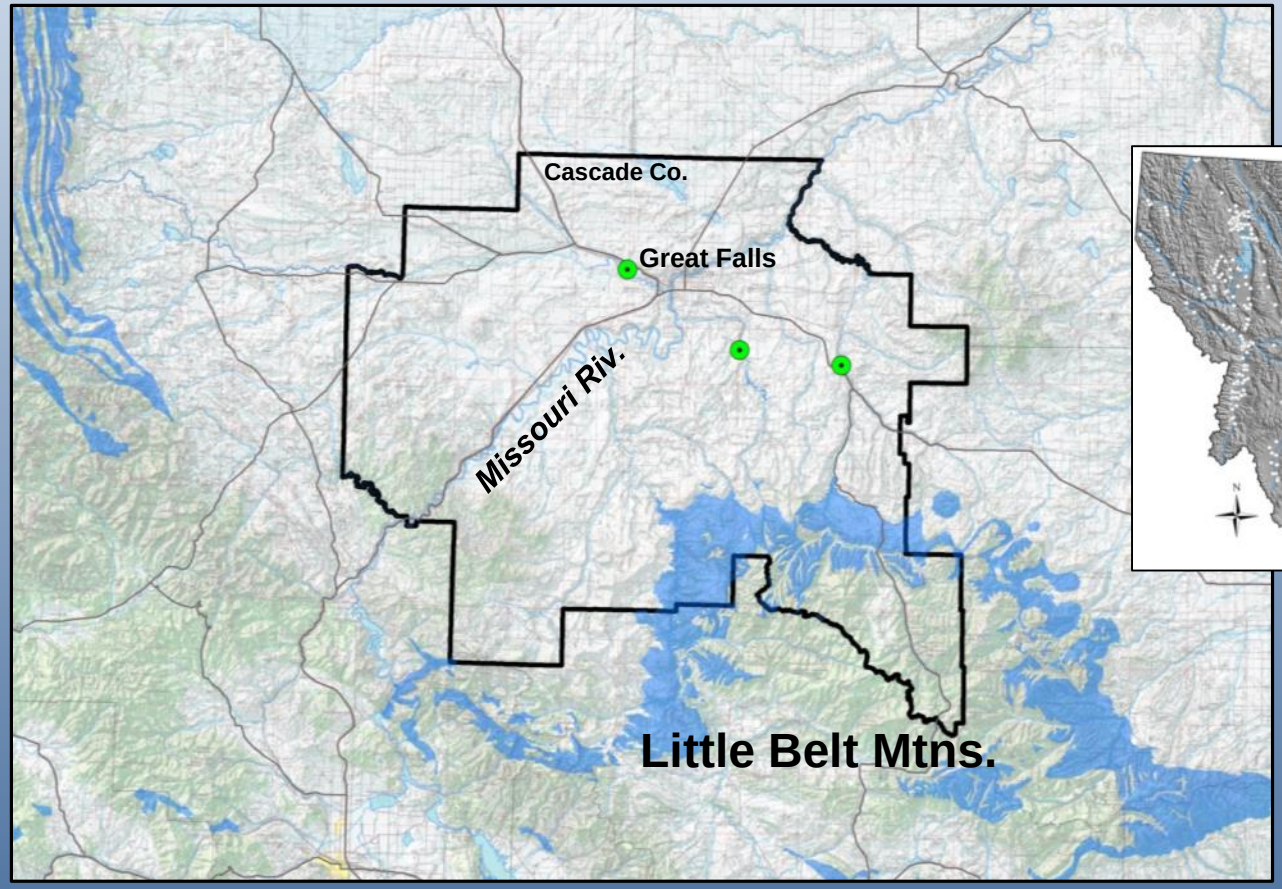
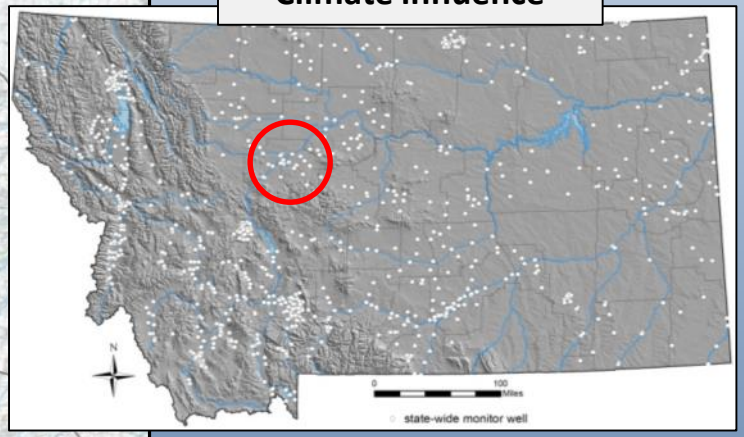
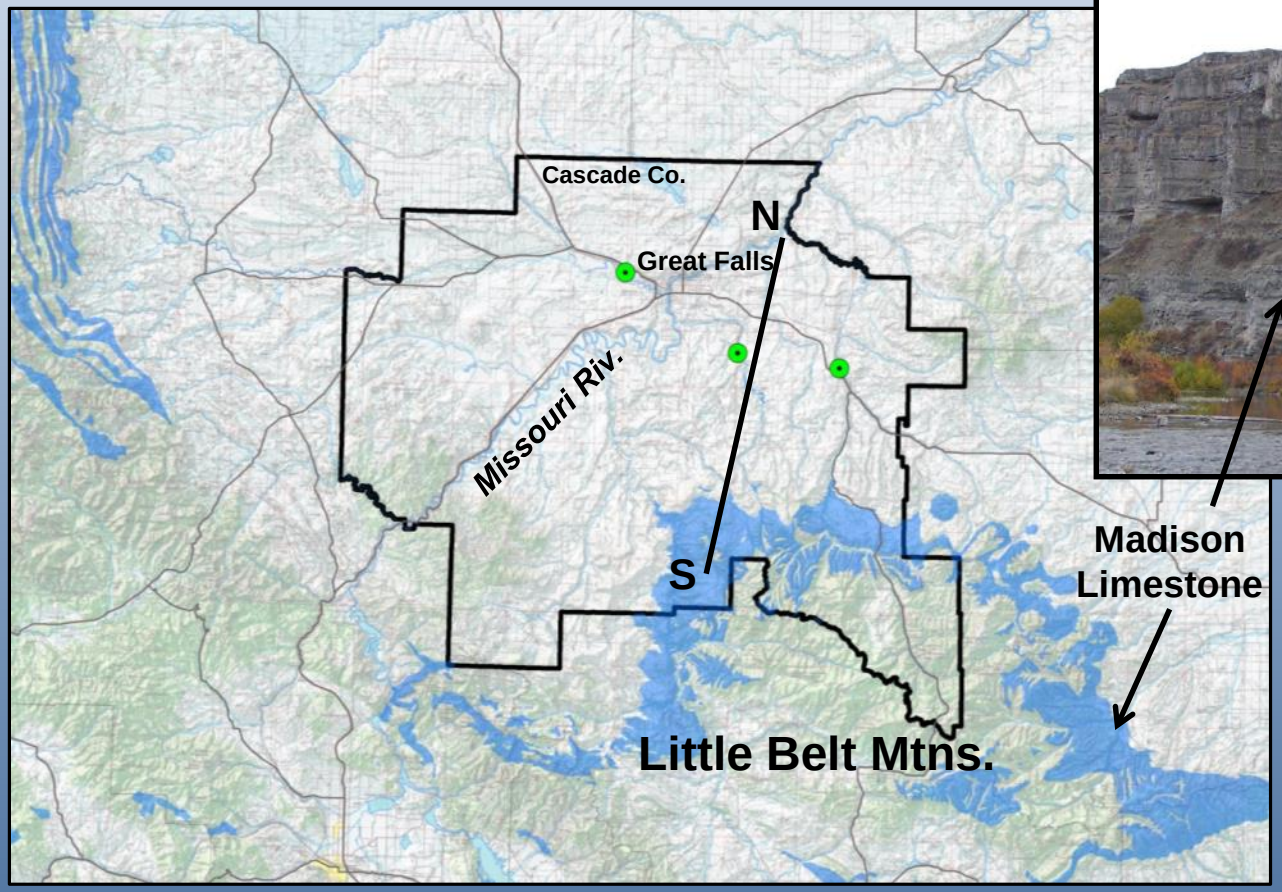
Madison Limestone: Cascade Co.

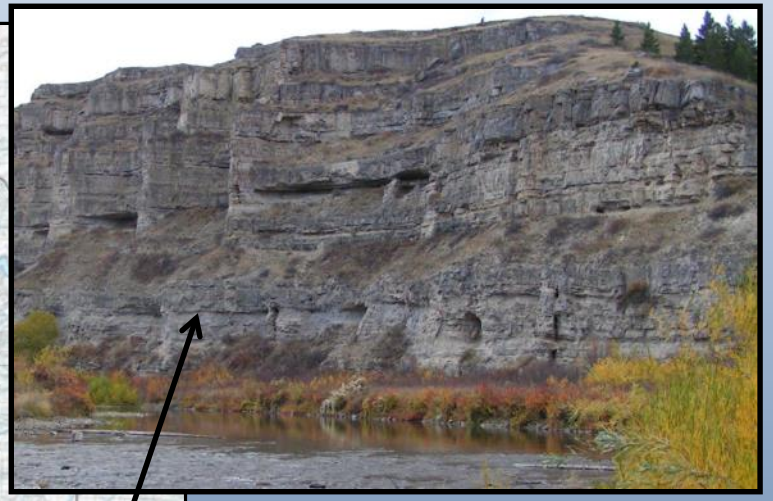


1) Madison Limestone
Climate influence

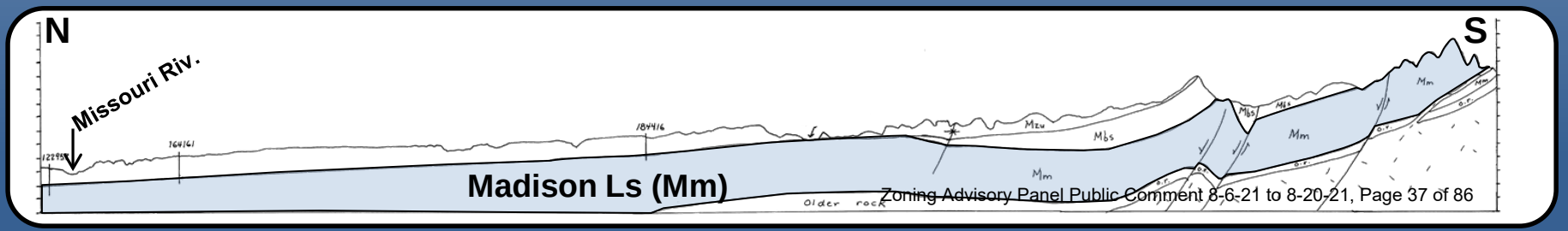


Madison Limestone: Cascade Co.



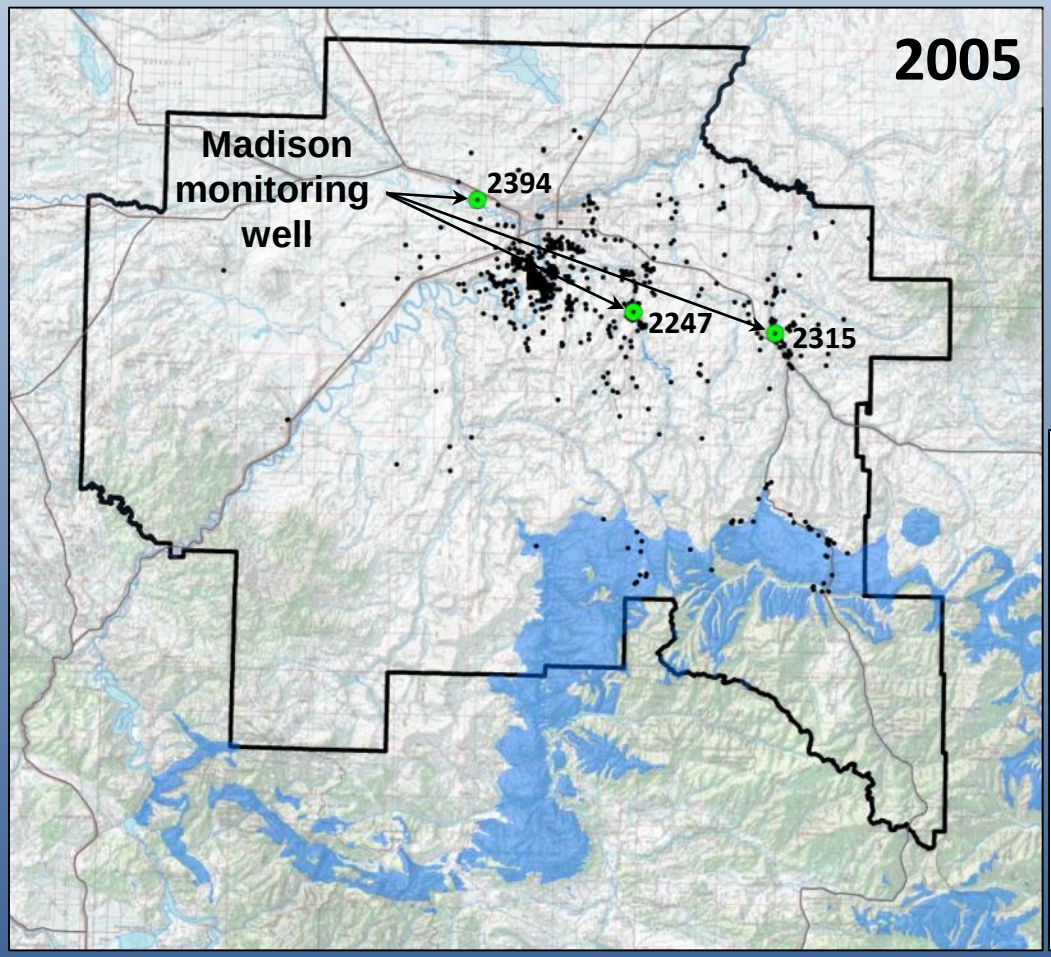


Madison Limestone

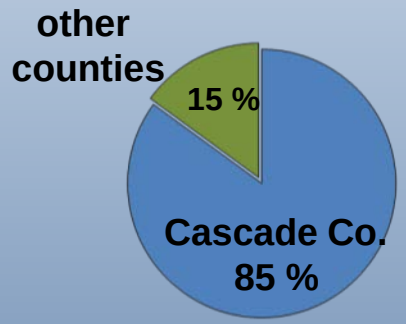


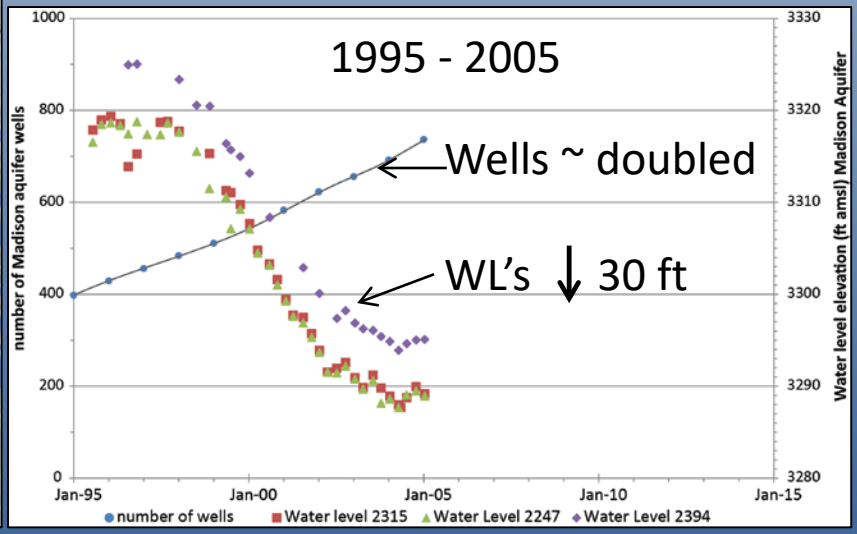
Madison Limestone: Cascade Co.

Development impacts!



Madison Limestone Wells





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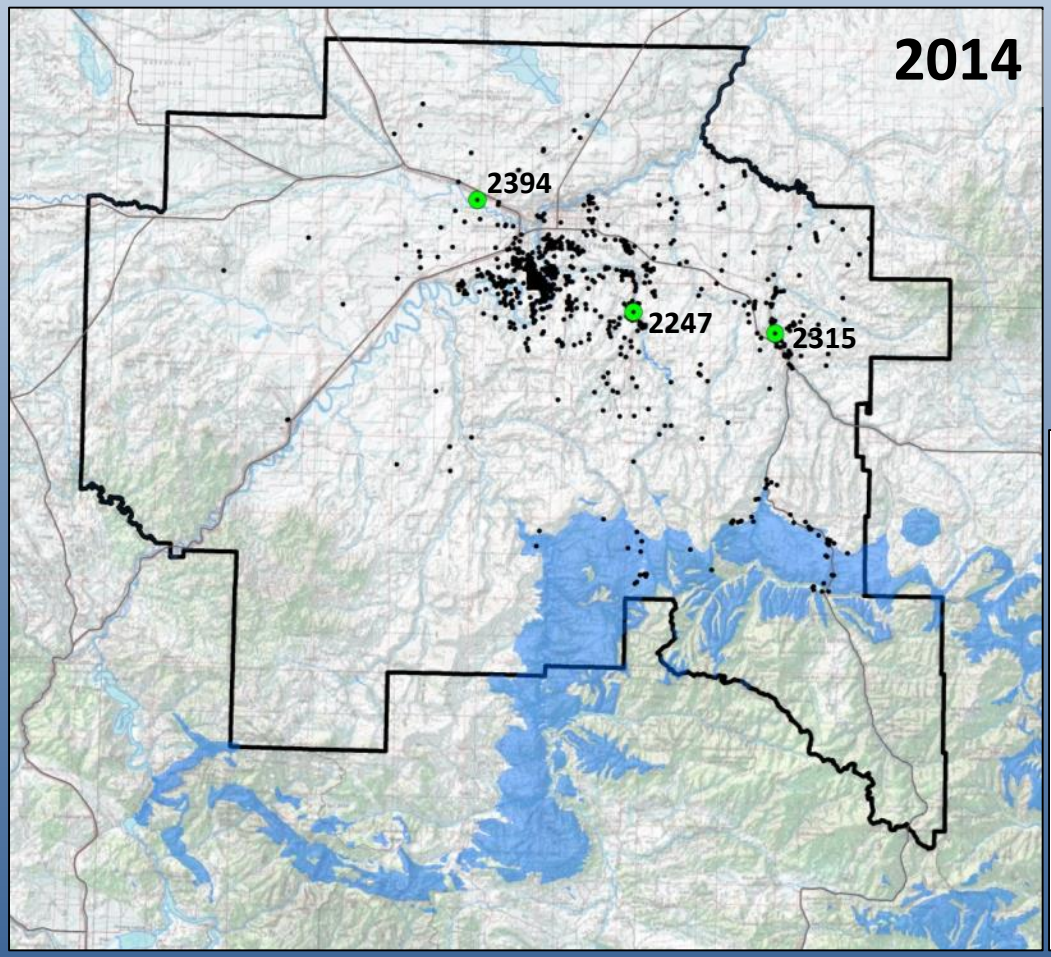
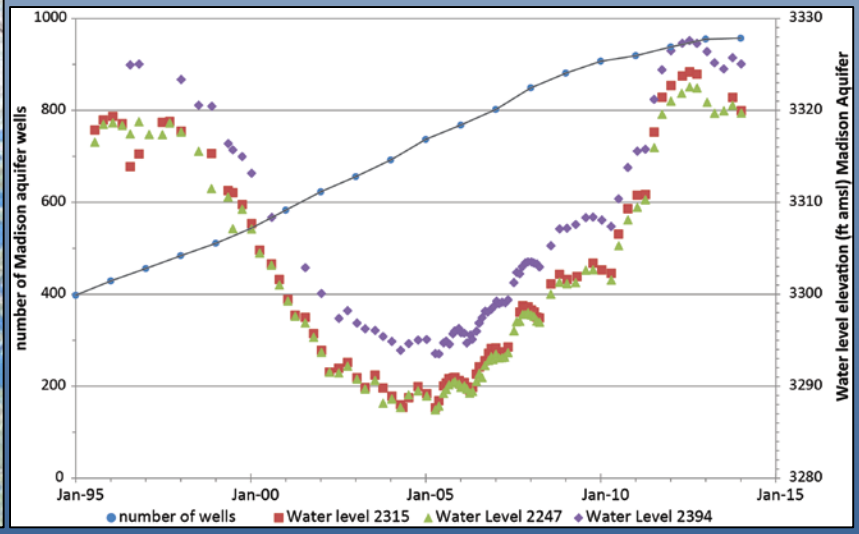
Madison Limestone: Cascade Co.

Development impacts?



Development not controlling water levels
Since 2005 water levels recovered

30+ feet



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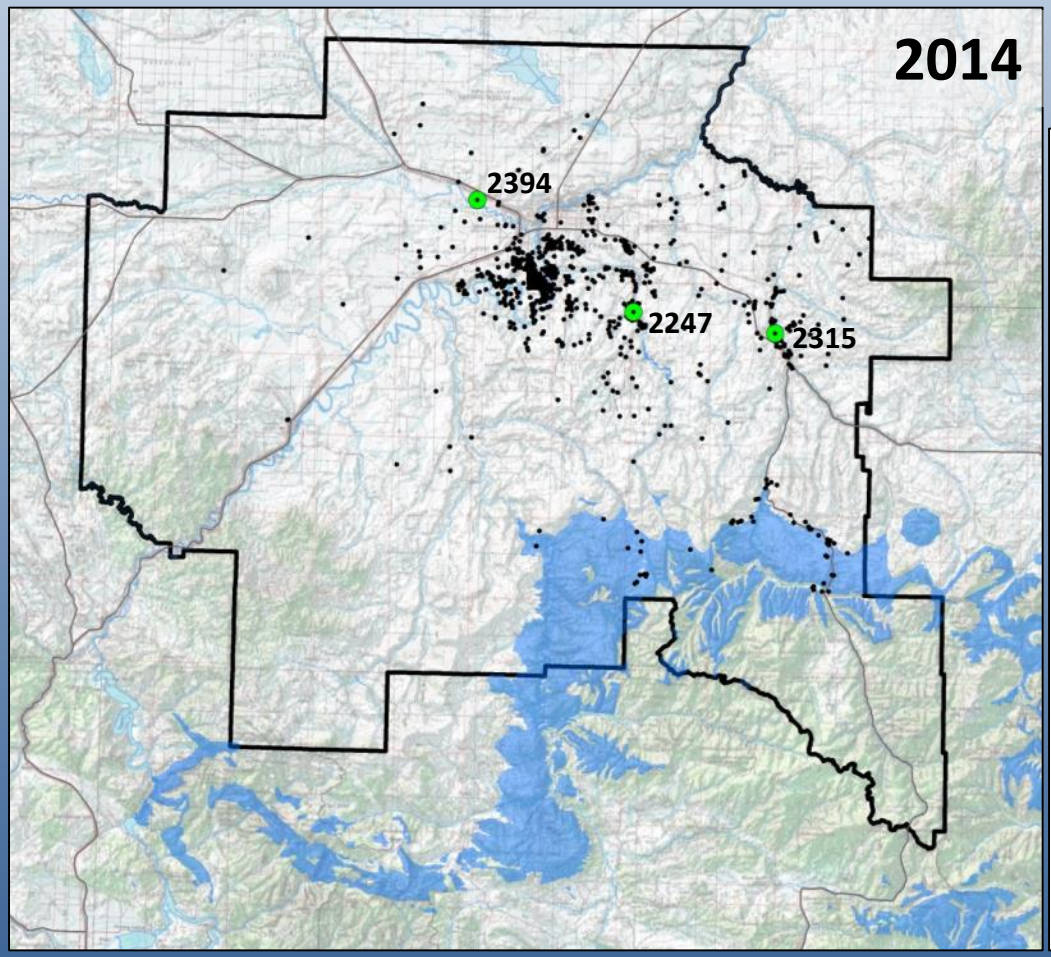
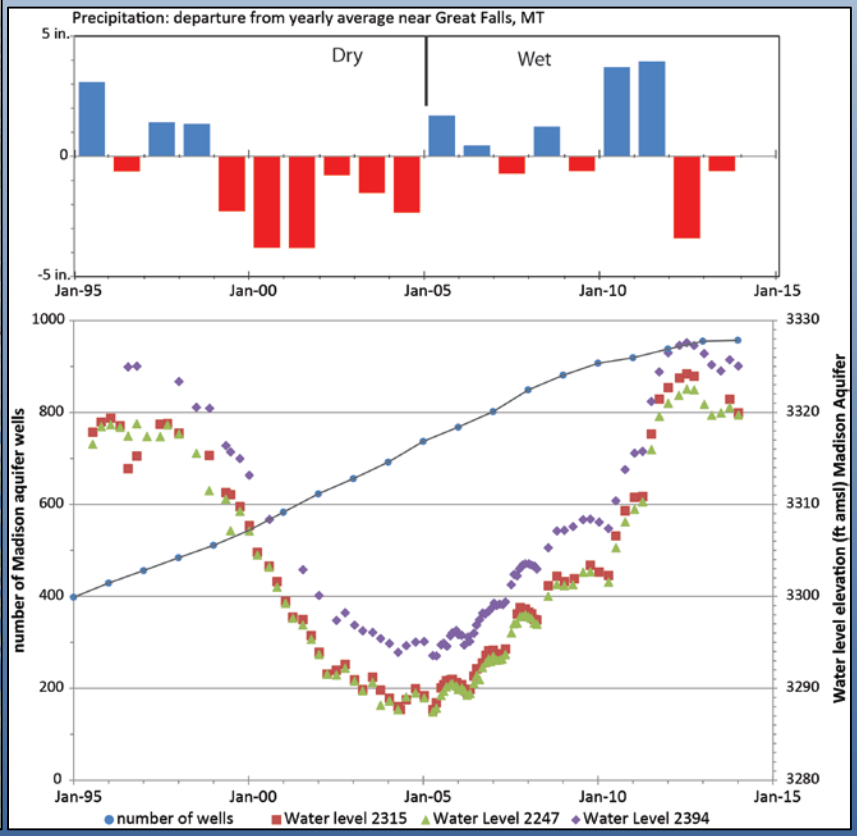
Madison Limestone: Cascade Co.



Climate (precipitation) controls water levels



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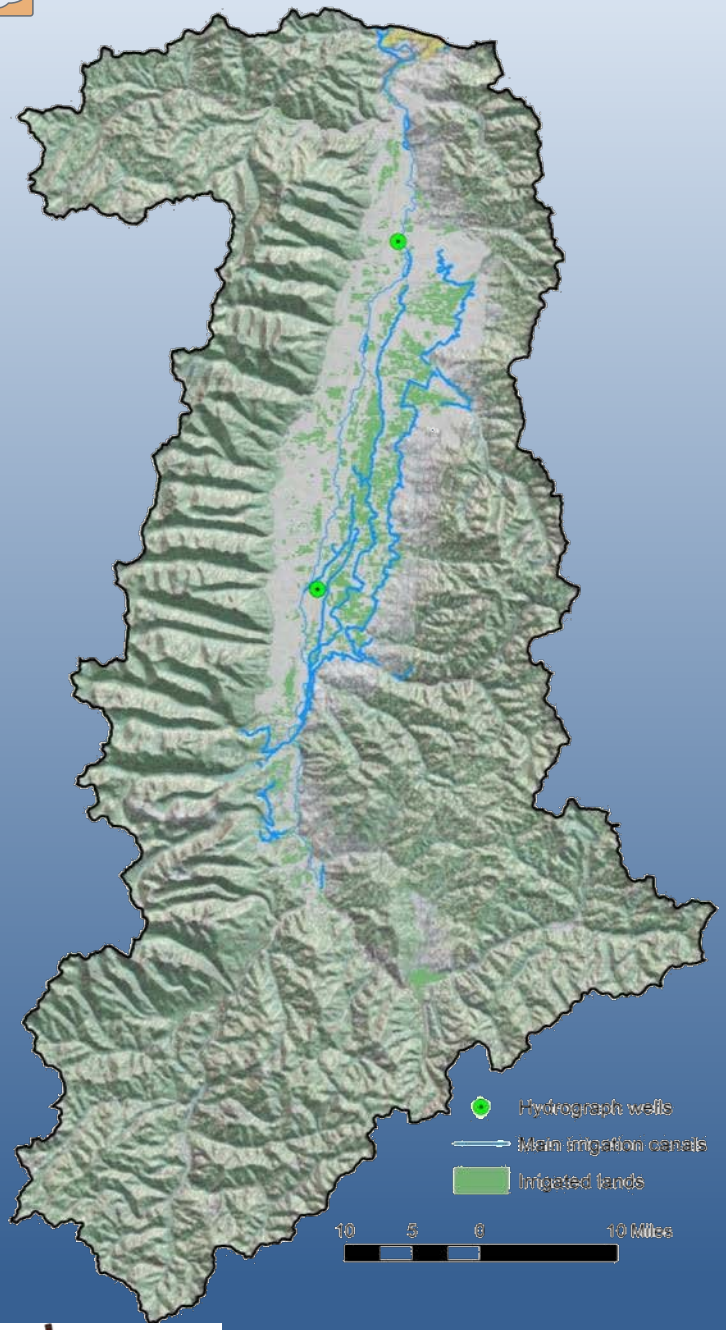
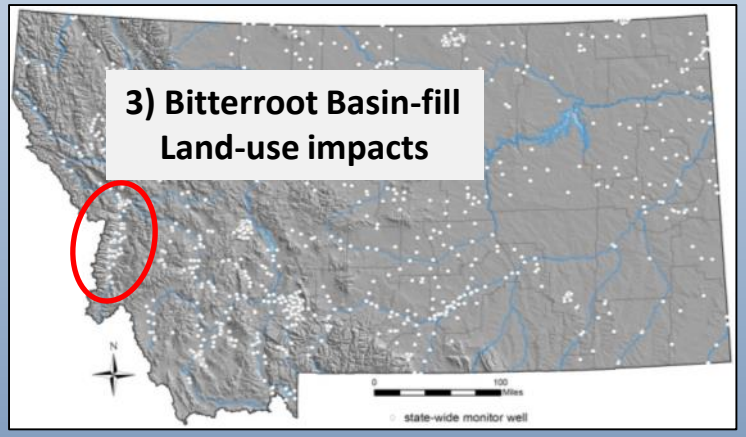
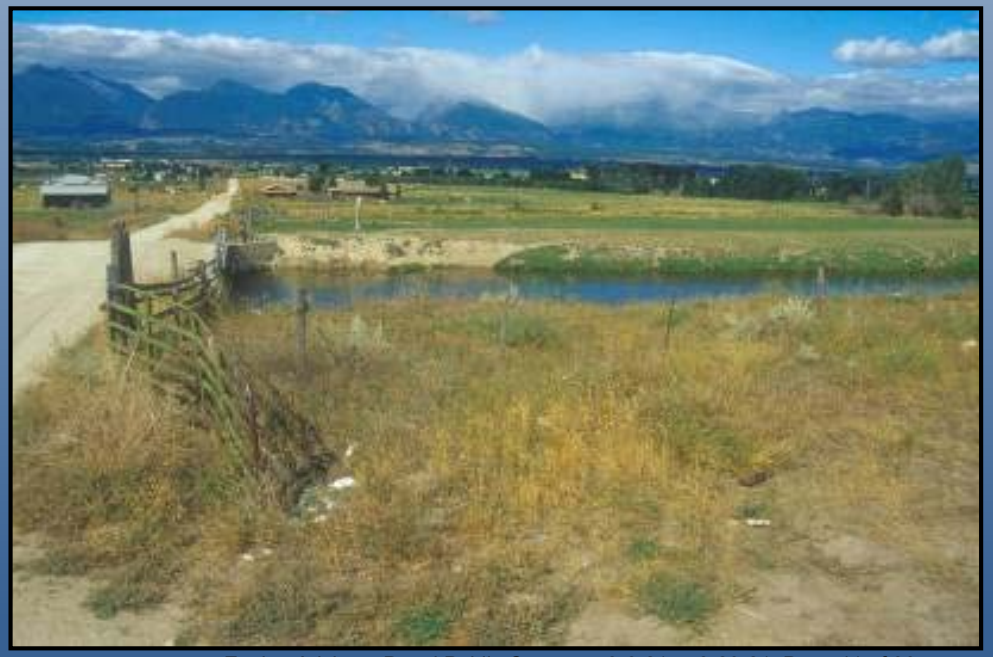
Bitterroot Valley: Basin-fill
Land-use impacts







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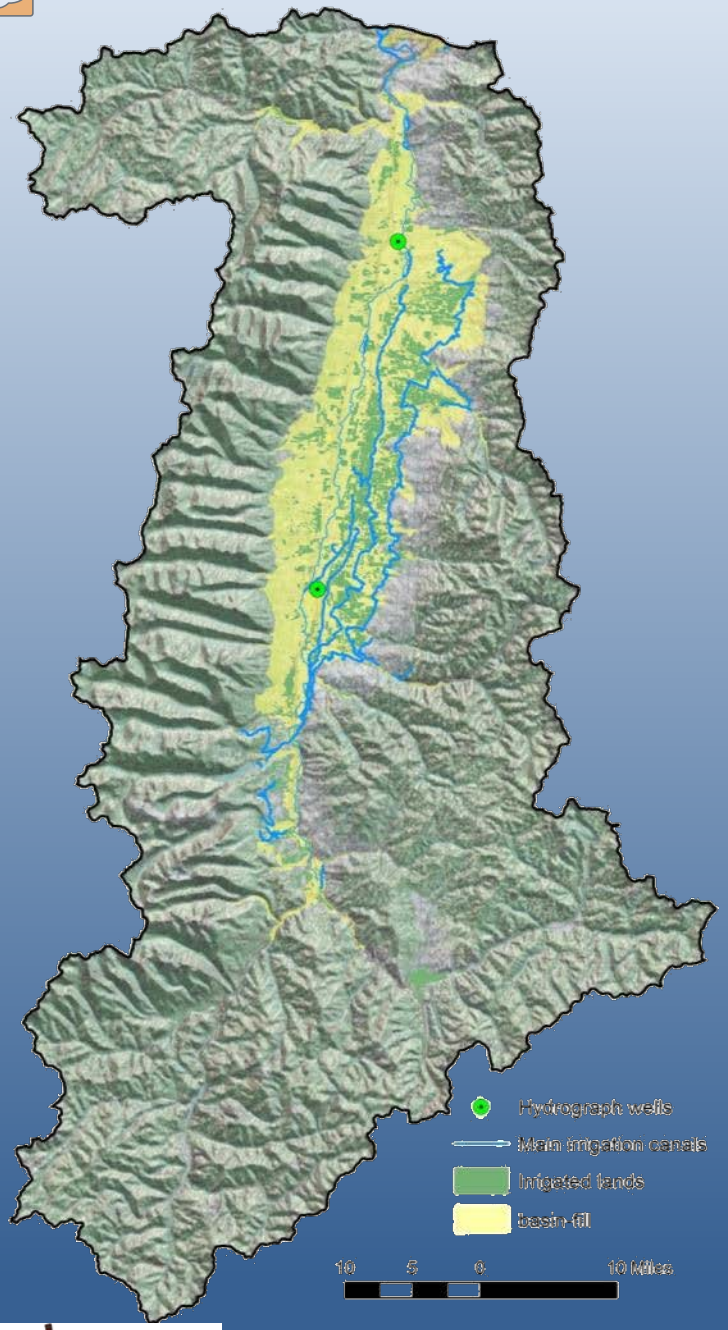
Bitterroot Valley: Basin-fill

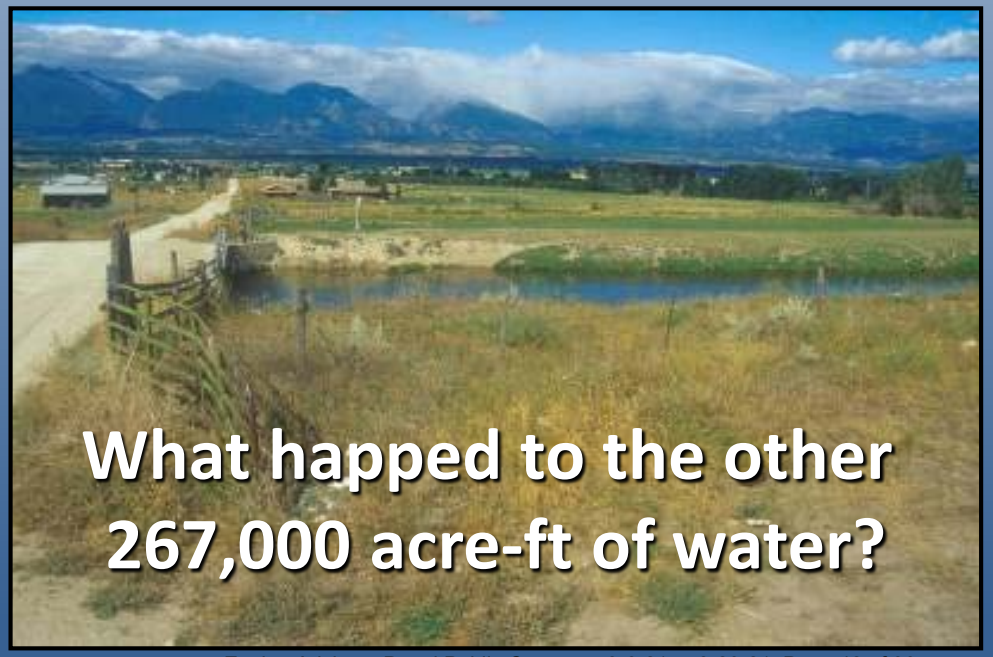
Land-use impacts

85,000 acres of irrigated land

374,000 acre-ft of water diverted
(~4.5 ft of water per acre)

107,000 acre-ft consumed
(~1.3 ft of water per irrigated acre)





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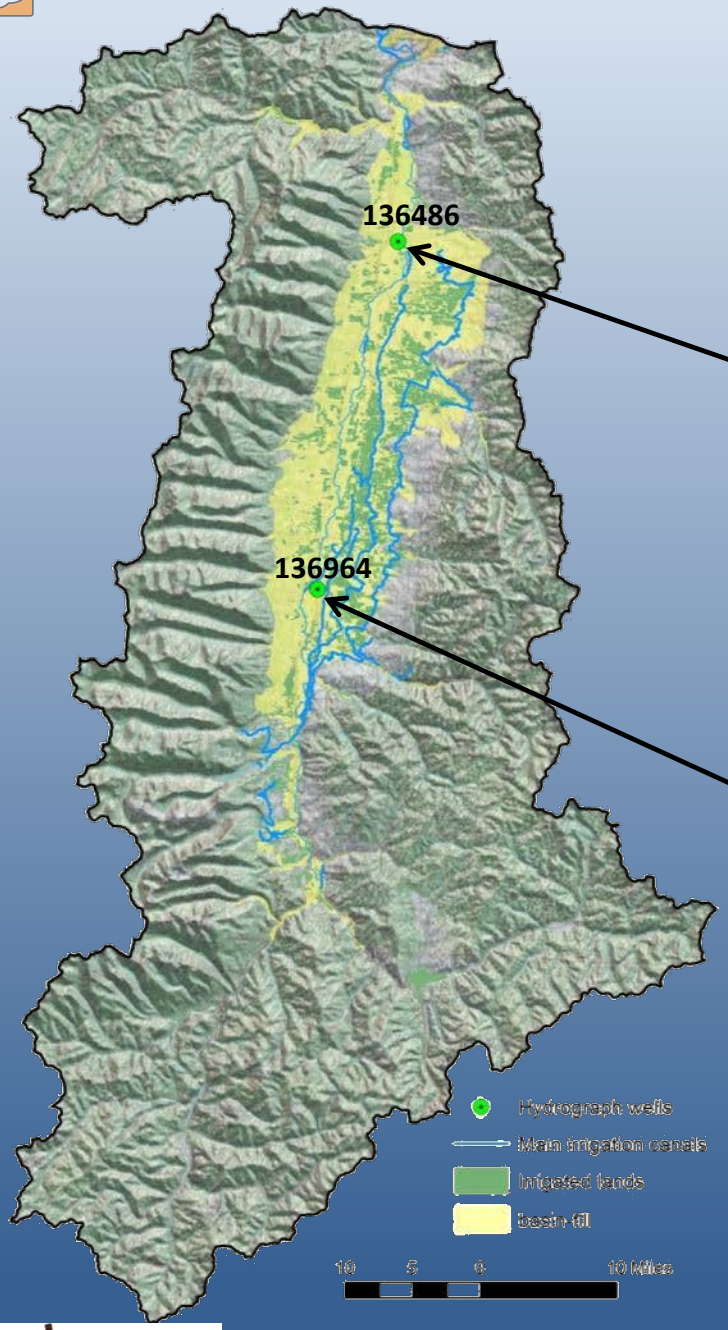
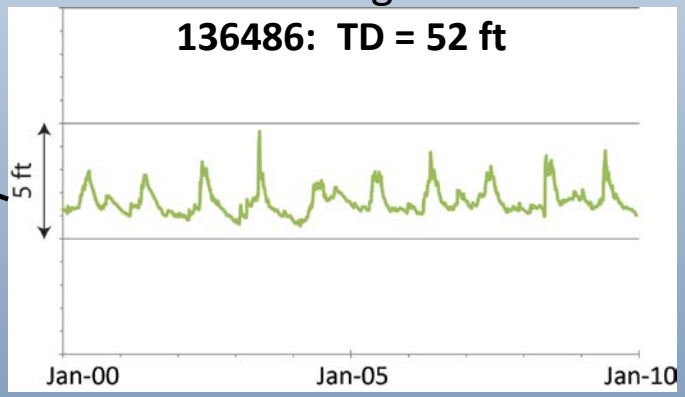
Bitterroot Valley: Basin-fill

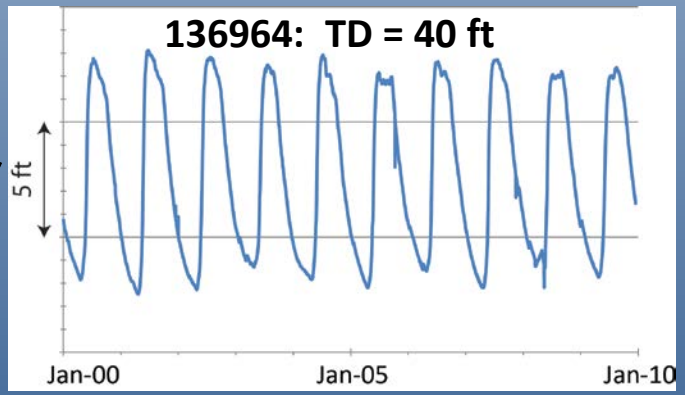
Land-use impacts



Outside of irrigated area



In irrigated area



Same Aquifer

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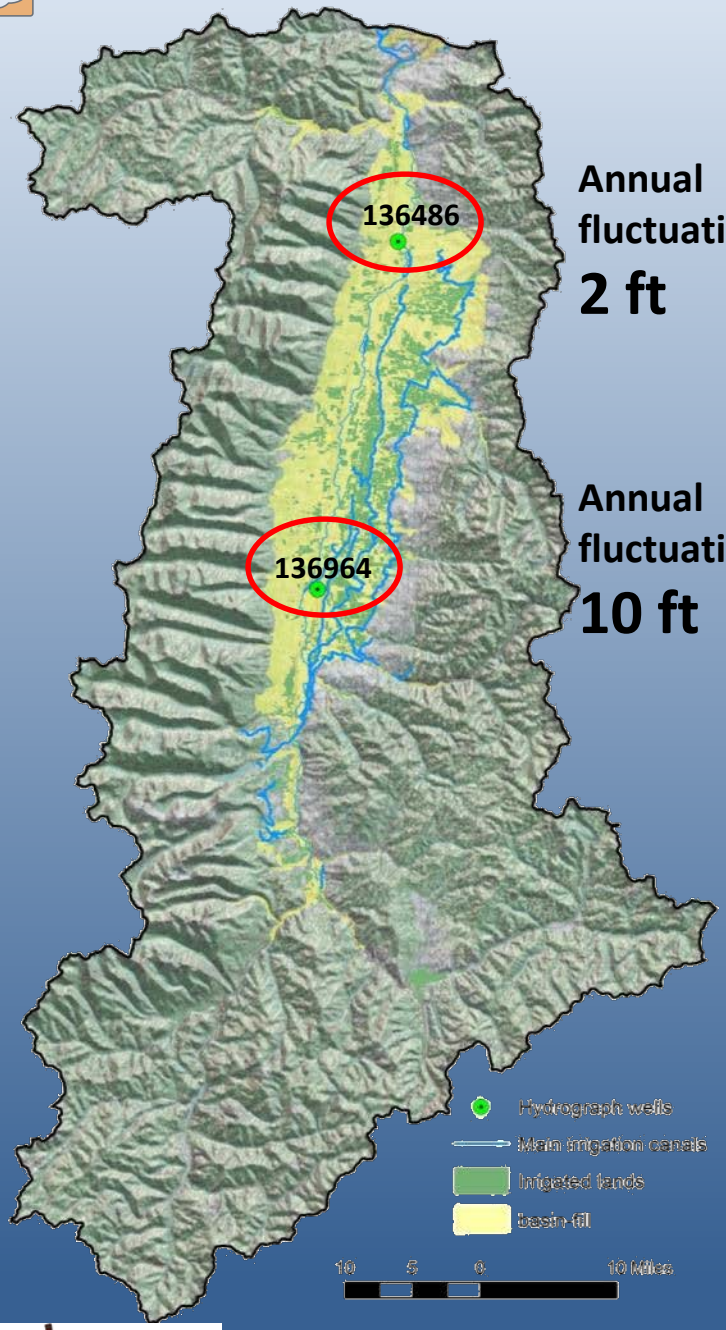
Bitterroot Valley: Basin-fill

Land-use impacts



Annual fluctuation:

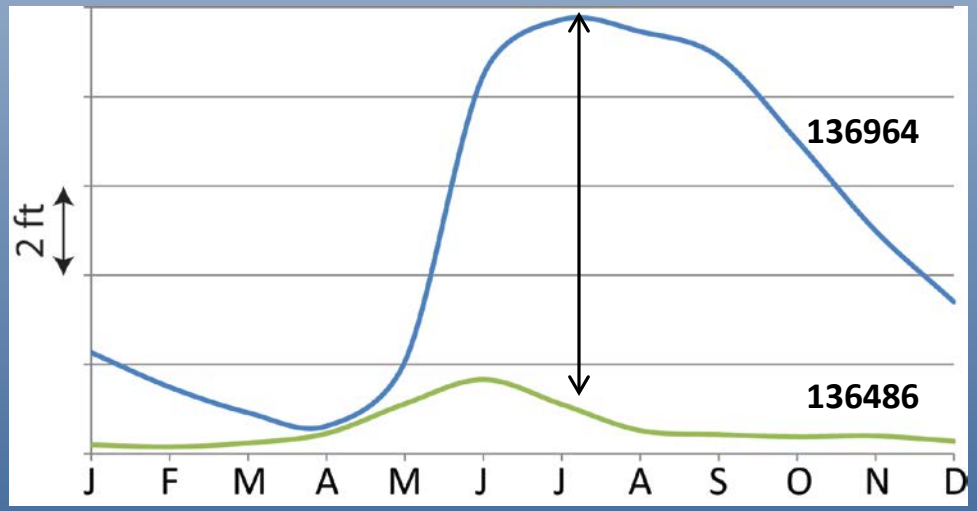
2 ft

Annual fluctuation:

10 ft

Irrigation returns provide significant groundwater recharge

Average monthly water levels



Same Aquifer

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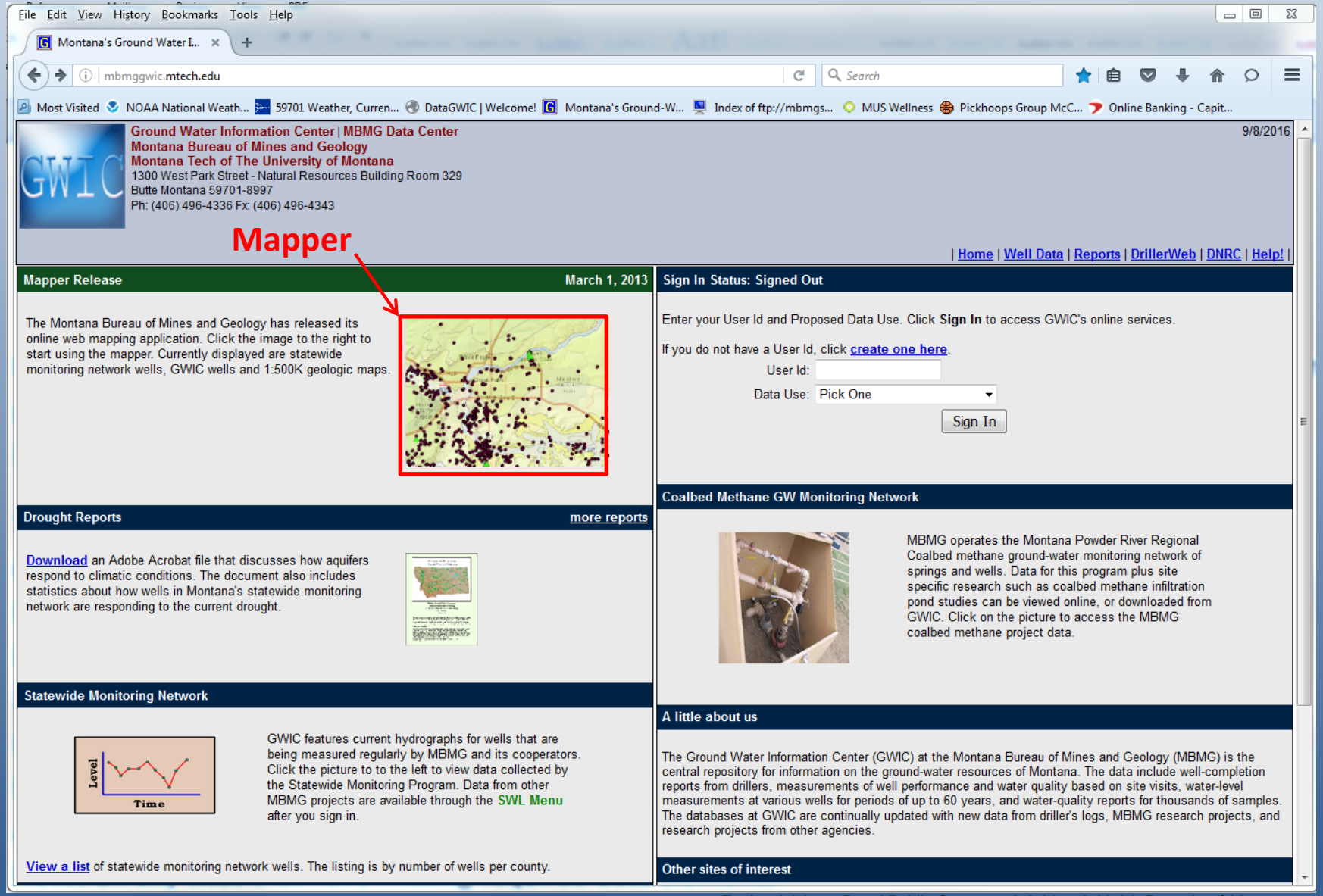
Ground Water Information Center



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Natural Resources Building
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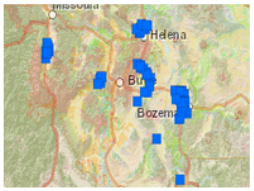
The following web mapping applications are provided by the Montana Bureau of Mines and Geology. Click any image to start.

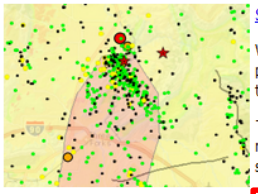


Surface Water Assessment and Monitoring Program:

The Surface Water Assessment and Monitoring Program data are available from the SWAMP Mapper. Surface water collected by DNRC (real-time and manually downloaded gages) and MBMG are available for display and download. All new data for the real-time gages are available at the top of every hour. The stream gages monitored and maintained by the USGS are also included for viewing.

Survey of Native Proppant:

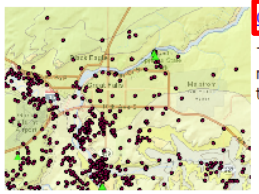
The SNaP/Proppant mapper is being developed as part of a joint project between the Montana Bureau of Mines and Geology and the Petroleum Engineering department at Montana Tech. The sites displayed in the application have been sampled for sands to determine their ability to serve as proppant in oil field processes.



Seismic Activity:

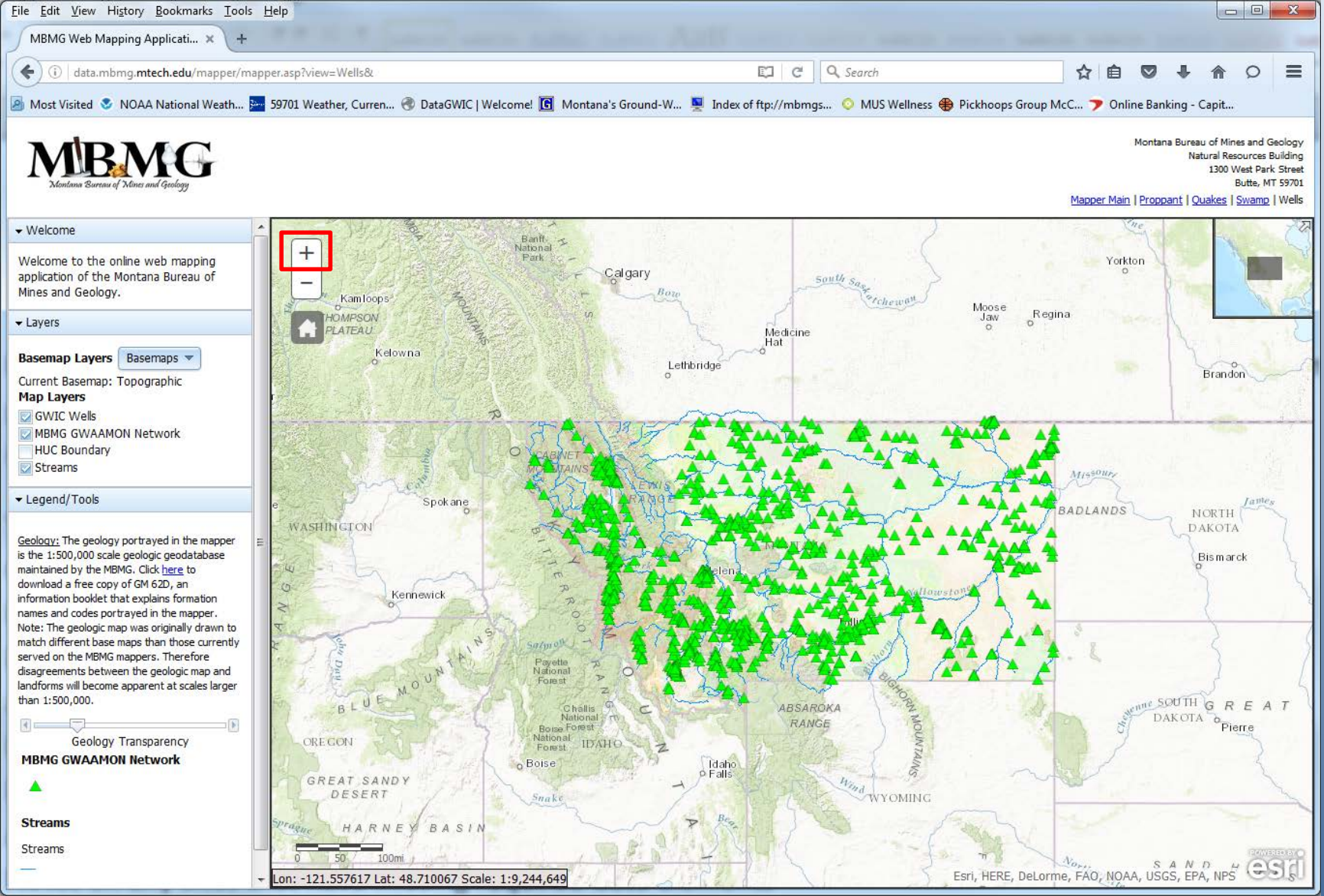
With funding assistance from the Federal Emergency Management Agency, the MBMG has developed this application to illustrate earthquake locations and magnitudes, significant historic earthquakes, potentially active faults, and seismic hazard levels. The MBMG's purpose is to improve people's understanding of where Montana is seismically active and make it easy for viewers to compare where they live to seismic activity.

The earthquake locations are derived from seismic data recorded by the Montana regional seismograph network since January 1, 1982. This earthquake database is currently updated at the end of each month so the most recent activity is not portrayed. You can view locations and other data for earthquakes that are less than one month old by visiting the United States Geological Survey (link leaves our site).



GWIC Wells:

The GWIC wells mapper portrays current locations of Ground Water Information Center (GWIC) water wells and boreholes (at scales larger than 1:288,895). It also shows locations of statewide long-term monitoring network wells at all scales. Clicking on a well point will produce a popup window that contains information about the site and links to additional information. Complete, but non-graphical, access to the full suite of GWIC data is available through the main GWIC website at http://mbmggwic.mtech.edu/.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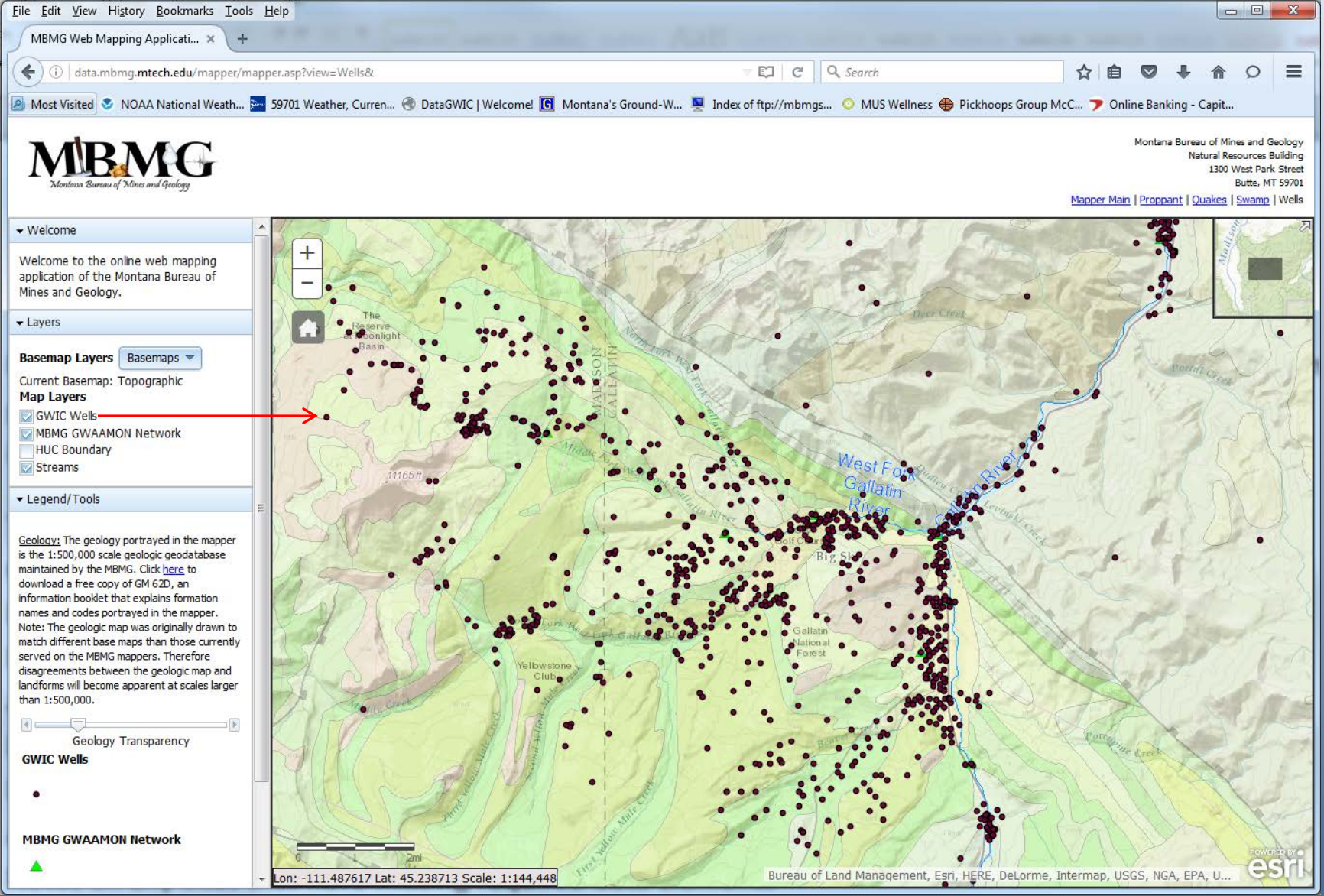
Current Basemap: Topographic
Map Layers
GWIC Wells
MBMG GWAAMON Network
HUC Boundary
Streams
Legend/Tools
Geology: The geology portrayed in the mapper is the 1:500,000 scale geologic geodatabase maintained by the MBMG. Click here to download a free copy of GM 62D, an information booklet that explains formation names and codes portrayed in the mapper. Note: The geologic map was originally drawn to match different base maps than those currently served on the MBMG mappers. Therefore disagreements between the geologic map and landforms will become apparent at scales larger than 1:500,000.
Geology Transparency
MBMG GWAAMON Network
Streams
Streams
Calgary
Yorkton
Kamloops
THOMPSON PLATEAU
Kelowna
Medicine Hat
Moose Jaw
Regina
Lethbridge
Brandon
Spokane
WASHINGTON
BADLANDS
NORTH DAKOTA
Bismarck
Kennewick
Payette National Forest
Challis National Forest
Boise National Forest
IDAHO
Boise
Idaho Falls
ABSAROKA RANGE
BIGHORN MOUNTAINS
SOUTH DAKOTA
Pierre
OREGON
GREAT SANDY DESERT
HARNEY BASIN
WYOMING
Lon: -121.557617 Lat: 48.710067 Scale: 1:9,244,649
Esri, HERE, DeLorme, FAO, NOAA, USGS, EPA, NPS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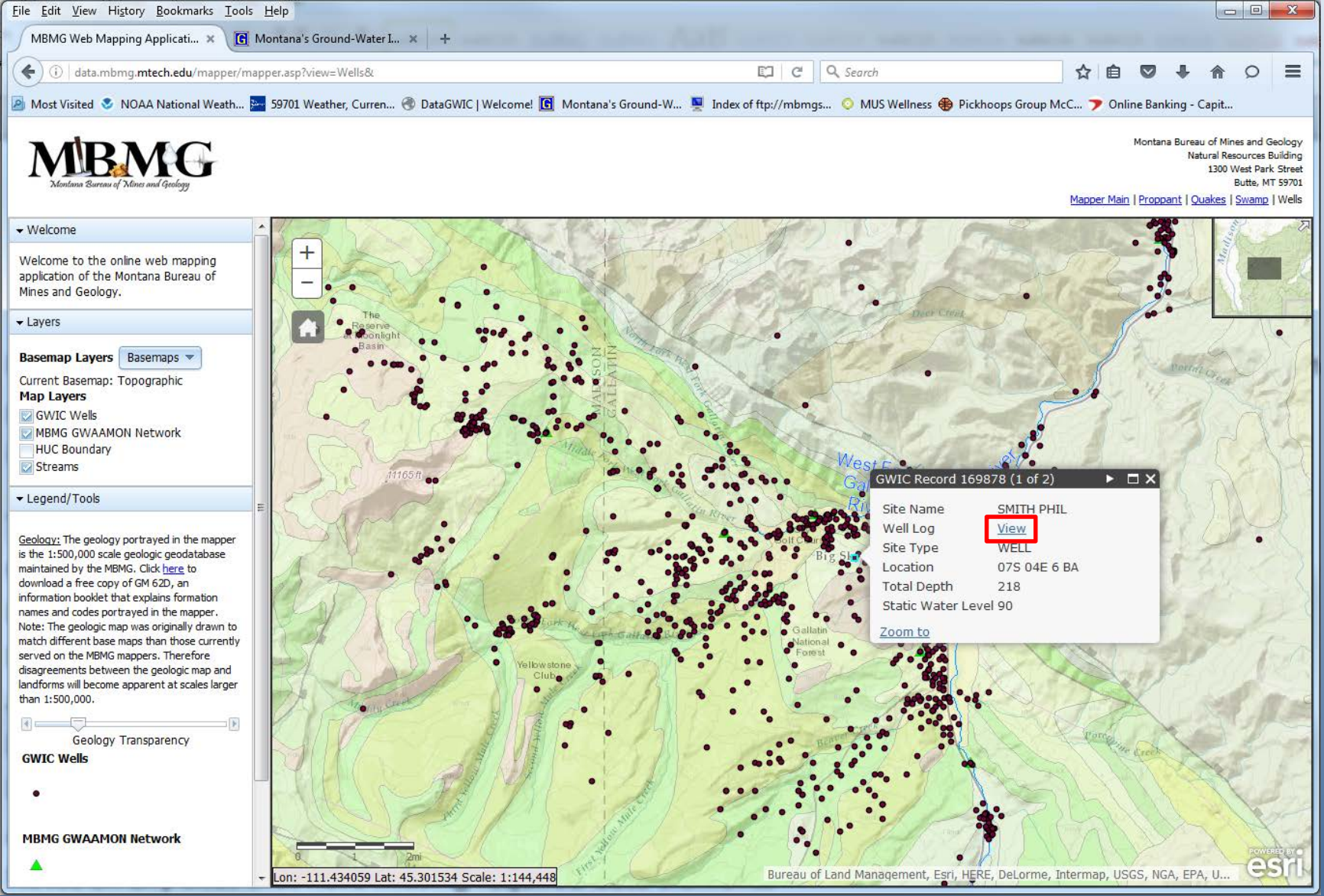
GWIC Wells
MBMG GWAAMON Network
West Fork Gallatin River
Gallatin River
Big Sky
Gallatin National Forest
Yellowstone Club
Lon: -111.487617 Lat: 45.238713 Scale: 1:144,448
Bureau of Land Management, Esri, HERE, DeLorme, Intermap, USGS, NGA, EPA, U...
esri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Map Layers
GWIC Wells
MBMG GWAAMON Network
HUC Boundary
Streams
Legend/Tools
Geology: The geology portrayed in the mapper is the 1:500,000 scale geologic geodatabase maintained by the MBMG. Click here to download a free copy of GM 62D, an information booklet that explains formation names and codes portrayed in the mapper. Note: The geologic map was originally drawn to match different base maps than those currently served on the MBMG mappers. Therefore disagreements between the geologic map and landforms will become apparent at scales larger than 1:500,000.
Geology Transparency
GWIC Wells
MBMG GWAAMON Network
GWIC Record 169878 (1 of 2)
Site Name SMITH PHIL
Well Log View
Site Type WELL
Location 07S 04E 6 BA
Total Depth 218
Static Water Level 90
Zoom to
Lon: -111.434059 Lat: 45.301534 Scale: 1:144,448
Bureau of Land Management, Esri, HERE, DeLorme, Intermap, USGS, NGA, EPA, U...
esri

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MBMG Web Mapping Applicati... | Montana's Ground-Water I...

mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=169878&agency=mbmg&reqby=M&

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MONTANA WELL LOG REPORT

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.

Other Options

Go to GWIC website
Plot this site in State Library Digital Atlas
Plot this site in Google Maps
View scanned well log (2/25/2008 2:25:24 PM)

Site Name: SMITH PHIL
GWIC Id: 169878

Section 1: Well Owner(s)
1) SMITH, PHIL (MAIL)
PO 160488
BIG SKY MT 59716 [08/03/1994]

Section 2: Location

Township	Range	Section	Quarter Sections
07S	04E	6	NE¼ NW¼

County	Geocode
GALLATIN	

Latitude	Longitude	Geomethod	Datum
45.259095	-111.283656	TRS-SEC	NAD83

Ground Surface Altitude	Ground Surface Method	Datum	Date

Addition	Block	Lot
BIGSKY		10

Section 3: Proposed Use of Water
DOMESTIC (1)

Section 4: Type of Work
Drilling Method: ROTARY
Status: NEW WELL

Section 5: Well Completion Date
Date well completed: Wednesday, August 03, 1994

Section 6: Well Construction Details
Borehole dimensions

From	To	Diameter
0	158	6

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
-2	140	6	0.250		WELDED	STEEL
120	158	4		160.00		PLASTIC

Completion (Perf/Screen)

Section 7: Well Test Data
Total Depth: 218
Static Water Level: 90
Water Temperature:

Air Test *

15 gpm with drill stem set at _ feet
Time of recovery 0 hours.
Recovery water level _ feet.
Pumping water level 155 feet.

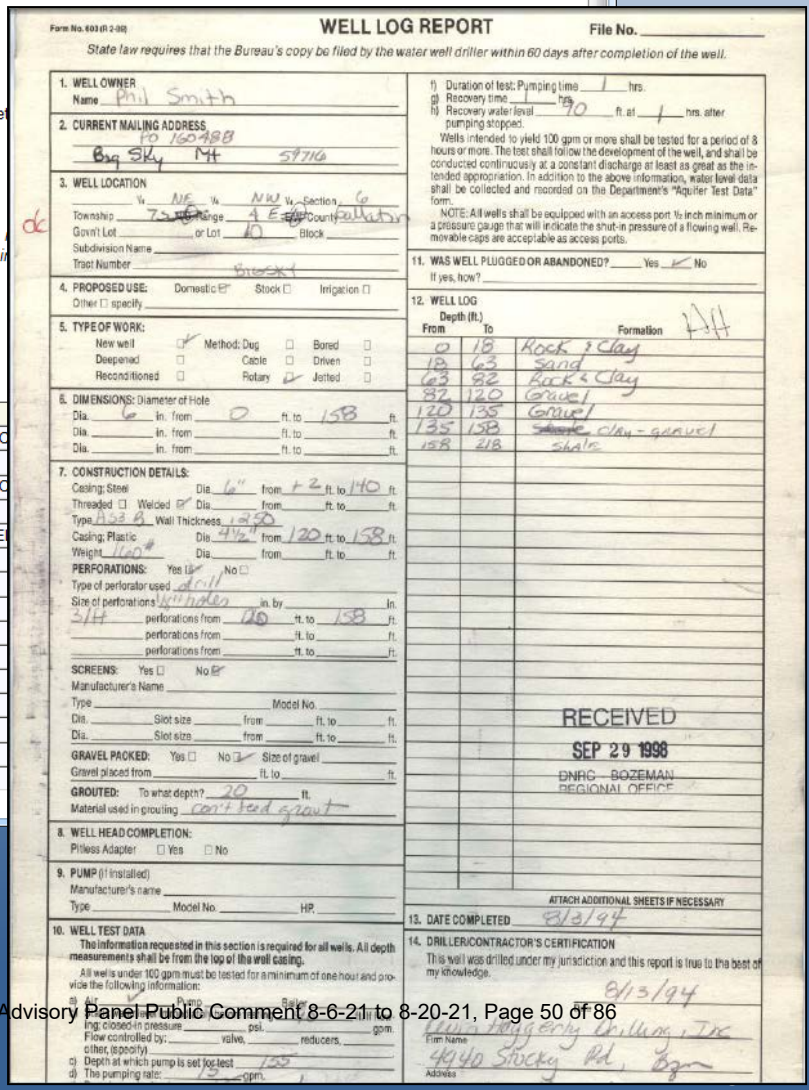
* During the well test the discharge ... sustainable yield of the well. Sustain...

Section 8: Remarks

Section 9: Well Log
Geologic Source
Unassigned

From	To	Description
0	18	ROCK AND C
18	63	SAND
63	82	ROCK AND C
82	135	GRAVEL
135	158	CLAY-GRAVE
158	218	SHALE

Driller Certification



WELL LOG REPORT

File No.

State law requires that the Bureau's copy be filed by the water well driller within 60 days after completion of the well.

1. WELL OWNER
Name Phil Smith

2. CURRENT MAILING ADDRESS
PO 160488
Big Sky MT 59716

3. WELL LOCATION
NE ¼ NW ¼ Section 6
Township 7S Range 4 E County Gallatin
Govt Lot or Lot 10 Block
Subdivision Name
Tract Number
BIGSKY

4. PROPOSED USE: Domestic ☑ Stock ☐ Irrigation ☐
Other ☐ specify

5. TYPE OF WORK:
New well ☑ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☑ Jetted ☐

6. DIMENSIONS: Diameter of Hole
Dia. 6 in. from 0 ft. to 158 ft.
Dia. in. from ft. to ft.
Dia. in. from ft. to ft.

7. CONSTRUCTION DETAILS:
Casing: Steel Dia. 6" from +2 ft. to 140 ft.
Threaded ☐ Welded ☑ Dia. from ft. to ft.
Type A53 B Wall Thickness .250
Casing: Plastic Dia. 4½" from 120 ft. to 158 ft.
Weight 160# Dia. from ft. to ft.
PERFORATIONS: Yes ☑ No ☐
Type of perforator used drill
Size of perforations Windows in. by in.
S/H perforations from 120 ft. to 158 ft.
perforations from ft. to ft.
perforations from ft. to ft.
SCREENS: Yes ☐ No ☑
Manufacturer's Name
Type Model No.
Dia. Slot size from ft. to ft.
Dia. Slot size from ft. to ft.
GRAVEL PACKED: Yes ☐ No ☑ Size of gravel
Gravel placed from ft. to ft.
GROUTED: To what depth? 20 ft.
Material used in grouting can't feed grout

8. WELL HEAD COMPLETION:
Pitless Adapter ☐ Yes ☐ No

9. PUMP (if installed)
Manufacturer's name
Type Model No. HP

10. WELL TEST DATA
The information requested in this section is required for all wells. All depth measurements shall be from the top of the well casing.
All wells under 100 gpm must be tested for a minimum of one hour and provide the following information:
a) Air ☑ Bailer ☐
b) Flowing: closed-in pressure psi. gpm.
Flow controlled by: valve, reducers,
other, (specify)
c) Depth at which pump is set for test 155
d) The pumping rate: 15 gpm.

f) Duration of test: Pumping time 1 hrs.
g) Recovery time hrs.
h) Recovery water level 90 ft. at 1 hrs. after pumping stopped.
Wells intended to yield 100 gpm or more shall be tested for a period of 8 hours or more. The test shall follow the development of the well, and shall be conducted continuously at a constant discharge at least as great as the intended appropriation. In addition to the above information, water level data shall be collected and recorded on the Department's "Aquifer Test Data" form.
NOTE: All wells shall be equipped with an access port ½ inch minimum or a pressure gauge that will indicate the shut-in pressure of a flowing well. Removable caps are acceptable as access ports.

11. WAS WELL PLUGGED OR ABANDONED? Yes ☐ No ☑
If yes, how?

12. WELL LOG

Depth (ft.) From	To	Formation
0	18	Rock & Clay
18	63	Sand
63	82	Rock & Clay
82	120	Gravel
120	135	Gravel
135	158	clay - gravel
158	218	shale

ATTACH ADDITIONAL SHEETS IF NECESSARY

13. DATE COMPLETED 8/3/94

14. DRILLER/CONTRACTOR'S CERTIFICATION
This well was drilled under my jurisdiction and this report is true to the best of my knowledge.
8/13/94
Firm Name Montgomery Drilling, Inc.
Address 4940 Stucky Rd, Bzm

RECEIVED
SEP 29 1998
DNRC BOZEMAN
REGIONAL OFFICE

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Mapper Release — March 1, 2013

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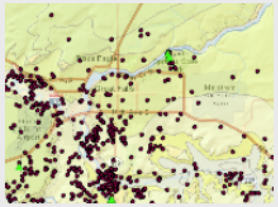

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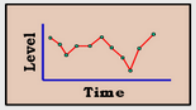
Statewide Monitoring Network



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View a list of statewide monitoring network wells. The listing is by number of wells per county.

Sign In Status: Signed Out

Enter your User Id and Proposed Data Use. Click **Sign In** to access GWIC's online services.

If you do not have a User Id, click create one here.

User Id:

Data Use: Pick One

Sign In

Coalbed Methane GW Monitoring Network

MBMG operates the Montana Powder River Regional Coalbed methane ground-water monitoring network of springs and wells. Data for this program plus site specific research such as coalbed methane infiltration pond studies can be viewed online, or downloaded from GWIC. Click on the picture to access the MBMG coalbed methane project data.

A little about us

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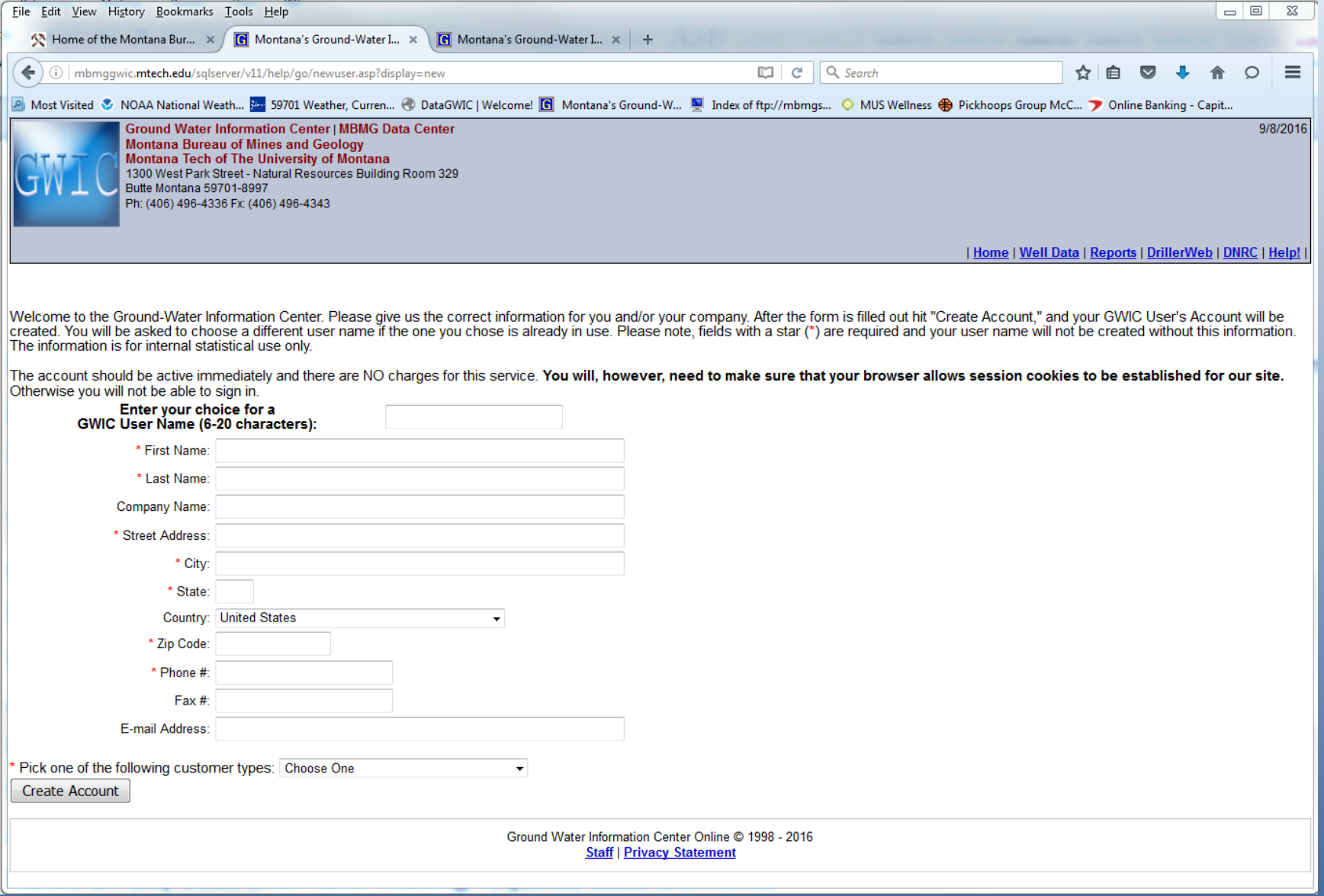
Other sites of interest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The account should be active immediately and there are NO charges for this service. You will, however, need to make sure that your browser allows session cookies to be established for our site. Otherwise you will not be able to sign in.
Enter your choice for a GWIC User Name (6-20 characters):
* First Name:
* Last Name:
Company Name:
* Street Address:
* City:
* State:
Country: United States
* Zip Code:
* Phone #:
Fax #:
E-mail Address:
* Pick one of the following customer types: Choose One
Create Account
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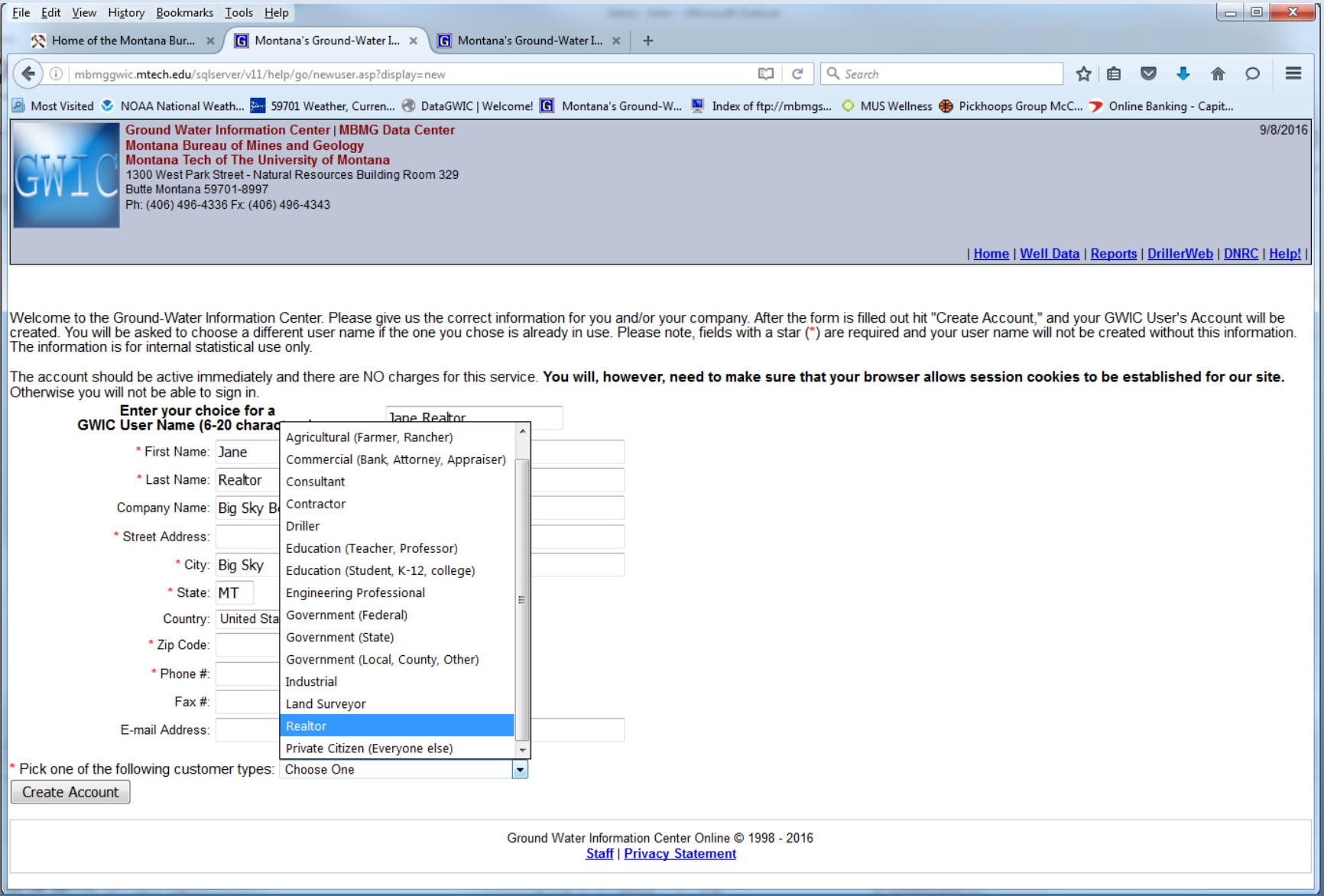
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The account should be active immediately and there are NO charges for this service. You will, however, need to make sure that your browser allows session cookies to be established for our site. Otherwise you will not be able to sign in.
Enter your choice for a
GWIC User Name (6-20 charac
Jane Realtor
* First Name: Jane
* Last Name: Realtor
Company Name: Big Sky B
* Street Address:
* City: Big Sky
* State: MT
Country: United Sta
* Zip Code:
* Phone #:
Fax #:
E-mail Address:
Agricultural (Farmer, Rancher)
Commercial (Bank, Attorney, Appraiser)
Consultant
Contractor
Driller
Education (Teacher, Professor)
Education (Student, K-12, college)
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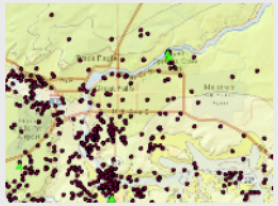

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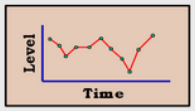

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Sign In Status: Signed Out

Enter your User Id and Proposed Data Use. Click **Sign In** to access GWIC's online services.

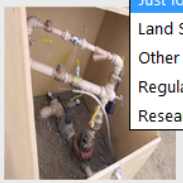
If you do not have a User Id, click create one here.

User Id: Jane Realtor

Data Use: Pick One

- Pick One
- Determine Drilling Depths
- Environmental Assessment
- File for Water Rights
- Ground-Water Research
- Just looking for a well log
- Land Subdivision
- Other
- Regulatory Decisions
- Research for Property Sales

Coalbed Methane GW M



the Montana Powder River Regional
ground-water monitoring network of
. Data for this program plus site
such as coalbed methane infiltration
be viewed online, or downloaded from
he picture to access the MBMG
coalbed methane project data.

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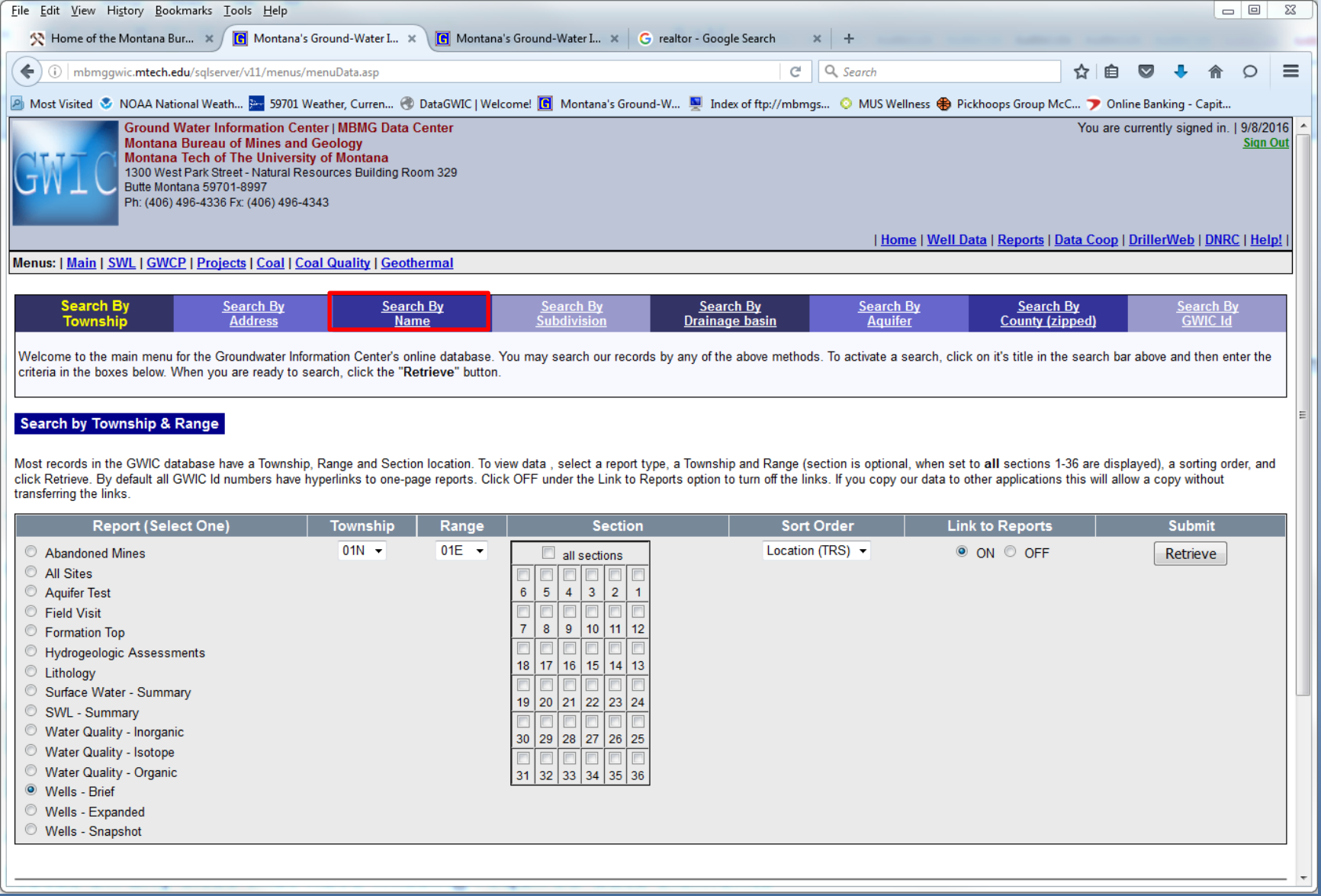
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Search By County (zipped)
Search By GWIC Id
Welcome to the main menu for the Groundwater Information Center's online database. You may search our records by any of the above methods. To activate a search, click on it's title in the search bar above and then enter the criteria in the boxes below. When you are ready to search, click the "Retrieve" button.
Search by Township & Range
Most records in the GWIC database have a Township, Range and Section location. To view data , select a report type, a Township and Range (section is optional, when set to all sections 1-36 are displayed), a sorting order, and click Retrieve. By default all GWIC Id numbers have hyperlinks to one-page reports. Click OFF under the Link to Reports option to turn off the links. If you copy our data to other applications this will allow a copy without transferring the links.
Report (Select One)
Township
Range
Section
Sort Order
Link to Reports
Submit
Abandoned Mines
All Sites
Aquifer Test
Field Visit
Formation Top
Hydrogeologic Assessments
Lithology
Surface Water - Summary
SWL - Summary
Water Quality - Inorganic
Water Quality - Isotope
Water Quality - Organic
Wells - Brief
Wells - Expanded
Wells - Snapshot
01N
01E
all sections
6 5 4 3 2 1
7 8 9 10 11 12
18 17 16 15 14 13
19 20 21 22 23 24
30 29 28 27 26 25
31 32 33 34 35 36
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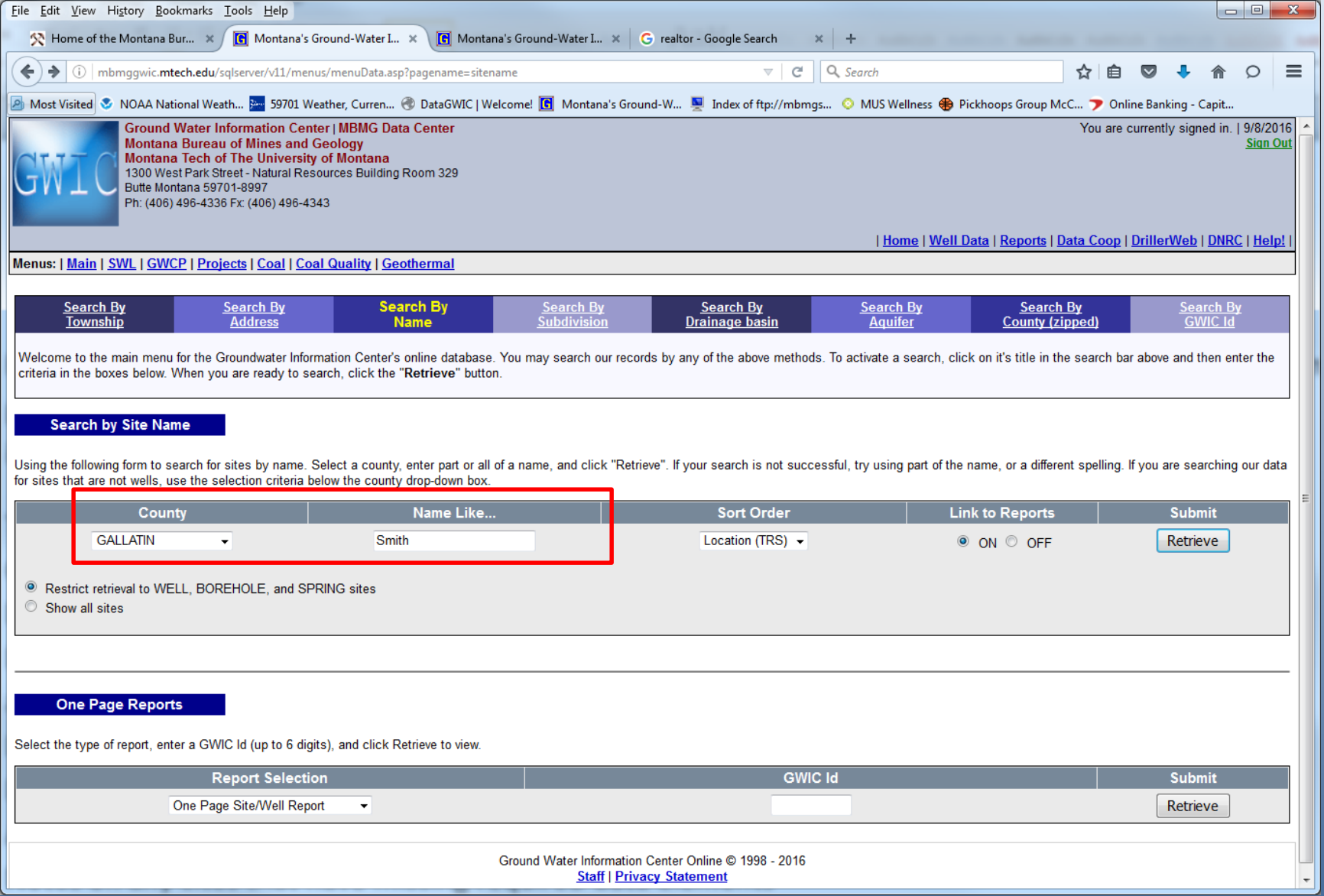
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Search by Site Name
Using the following form to search for sites by name. Select a county, enter part or all of a name, and click "Retrieve". If your search is not successful, try using part of the name, or a different spelling. If you are searching our data for sites that are not wells, use the selection criteria below the county drop-down box.
County
Name Like...
Sort Order
Link to Reports
Submit
GALLATIN
Smith
Location (TRS)
ON
OFF
Retrieve
Restrict retrieval to WELL, BOREHOLE, and SPRING sites
Show all sites
One Page Reports
Select the type of report, enter a GWIC Id (up to 6 digits), and click Retrieve to view.
Report Selection
GWIC Id
Submit
One Page Site/Well Report
Retrieve
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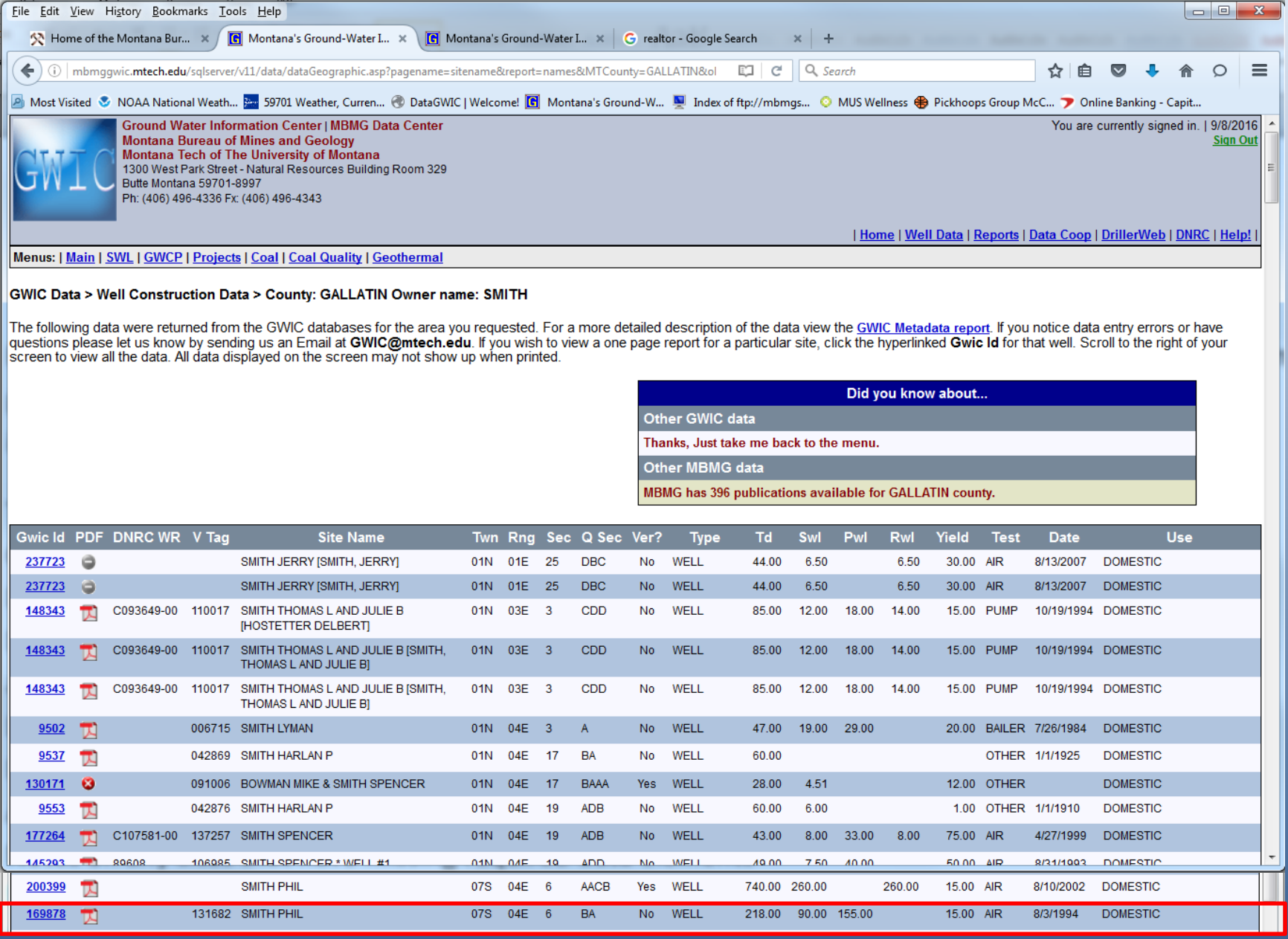

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GWIC Data > Well Construction Data > County: GALLATIN Owner name: SMITH

The following data were returned from the GWIC databases for the area you requested. For a more detailed description of the data view the GWIC Metadata report. If you notice data entry errors or have questions please let us know by sending us an Email at **GWIC@mtech.edu**. If you wish to view a one page report for a particular site, click the hyperlinked **Gwic Id** for that well. Scroll to the right of your screen to view all the data. All data displayed on the screen may not show up when printed.

Did you know about...
Other GWIC data
Thanks, Just take me back to the menu.
Other MBMG data
MBMG has 396 publications available for GALLATIN county.

Gwic Id	PDF	DNRC WR	V Tag	Site Name	Twn	Rng	Sec	Q Sec	Ver?	Type	Td	Swl	Pwl	Rwl	Yield	Test	Date	Use
237723				SMITH JERRY [SMITH, JERRY]	01N	01E	25	DBC	No	WELL	44.00	6.50		6.50	30.00	AIR	8/13/2007	DOMESTIC
237723				SMITH JERRY [SMITH, JERRY]	01N	01E	25	DBC	No	WELL	44.00	6.50		6.50	30.00	AIR	8/13/2007	DOMESTIC
148343		C093649-00	110017	SMITH THOMAS L AND JULIE B [HOSTETTER DELBERT]	01N	03E	3	CDD	No	WELL	85.00	12.00	18.00	14.00	15.00	PUMP	10/19/1994	DOMESTIC
148343		C093649-00	110017	SMITH THOMAS L AND JULIE B [SMITH, THOMAS L AND JULIE B]	01N	03E	3	CDD	No	WELL	85.00	12.00	18.00	14.00	15.00	PUMP	10/19/1994	DOMESTIC
148343		C093649-00	110017	SMITH THOMAS L AND JULIE B [SMITH, THOMAS L AND JULIE B]	01N	03E	3	CDD	No	WELL	85.00	12.00	18.00	14.00	15.00	PUMP	10/19/1994	DOMESTIC
9502			006715	SMITH LYMAN	01N	04E	3	A	No	WELL	47.00	19.00	29.00		20.00	BAILER	7/26/1984	DOMESTIC
9537			042869	SMITH HARLAN P	01N	04E	17	BA	No	WELL	60.00					OTHER	1/1/1925	DOMESTIC
130171			091006	BOWMAN MIKE & SMITH SPENCER	01N	04E	17	BAAA	Yes	WELL	28.00	4.51			12.00	OTHER		DOMESTIC
9553			042876	SMITH HARLAN P	01N	04E	19	ADB	No	WELL	60.00	6.00			1.00	OTHER	1/1/1910	DOMESTIC
177264		C107581-00	137257	SMITH SPENCER	01N	04E	19	ADB	No	WELL	43.00	8.00	33.00	8.00	75.00	AIR	4/27/1999	DOMESTIC
145293		89608	106985	SMITH SPENCER * WELL #1	01N	04E	19	ADD	No	WELL	49.00	7.50	40.00		50.00	AIR	8/31/1993	DOMESTIC
200399				SMITH PHIL	07S	04E	6	AACB	Yes	WELL	740.00	260.00		260.00	15.00	AIR	8/10/2002	DOMESTIC
169878			131682	SMITH PHIL	07S	04E	6	BA	No	WELL	218.00	90.00	155.00		15.00	AIR	8/3/1994	DOMESTIC

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mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=169878&agency=mbmg&reqby=M&

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MONTANA WELL LOG REPORT

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Other Options

Go to GWIC website
Plot this site in State Library Digital Atlas
Plot this site in Google Maps
View scanned well log (2/25/2008 2:25:24 PM)

Site Name: SMITH PHIL
GWIC Id: 169878

Section 1: Well Owner(s)

1) SMITH, PHIL (MAIL)
PO 160488
BIG SKY MT 59716 [08/03/1994]

Section 2: Location

Township	Range	Section	Quarter Sections
07S	04E	6	NE¼ NW¼

County	Geocode
GALLATIN	

Latitude	Longitude	Geomethod	Datum
45.259095	-111.283656	TRS-SEC	NAD83

Ground Surface Altitude	Ground Surface Method	Datum	Date

Addition	Block	Lot
BIGSKY		10

Section 3: Proposed Use of Water

DOMESTIC (1)

Section 4: Type of Work

Drilling Method: ROTARY
Status: NEW WELL

Section 5: Well Completion Date

Date well completed: Wednesday, August 03, 1994

Section 6: Well Construction Details

Borehole dimensions

From	To	Diameter
0	158	6

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
-2	140	6	0.250		WELDED	STEEL
120	158	4		160.00		PLASTIC

Completion (Perf/Screen)

Section 7: Well Test Data

Total Depth: 218
Static Water Level: 90
Water Temperature:

Air Test *

15 gpm with drill stem set at _ feet for 1 hours.
Time of recovery 0 hours.
Recovery water level _ feet.
Pumping water level 155 feet.

** 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

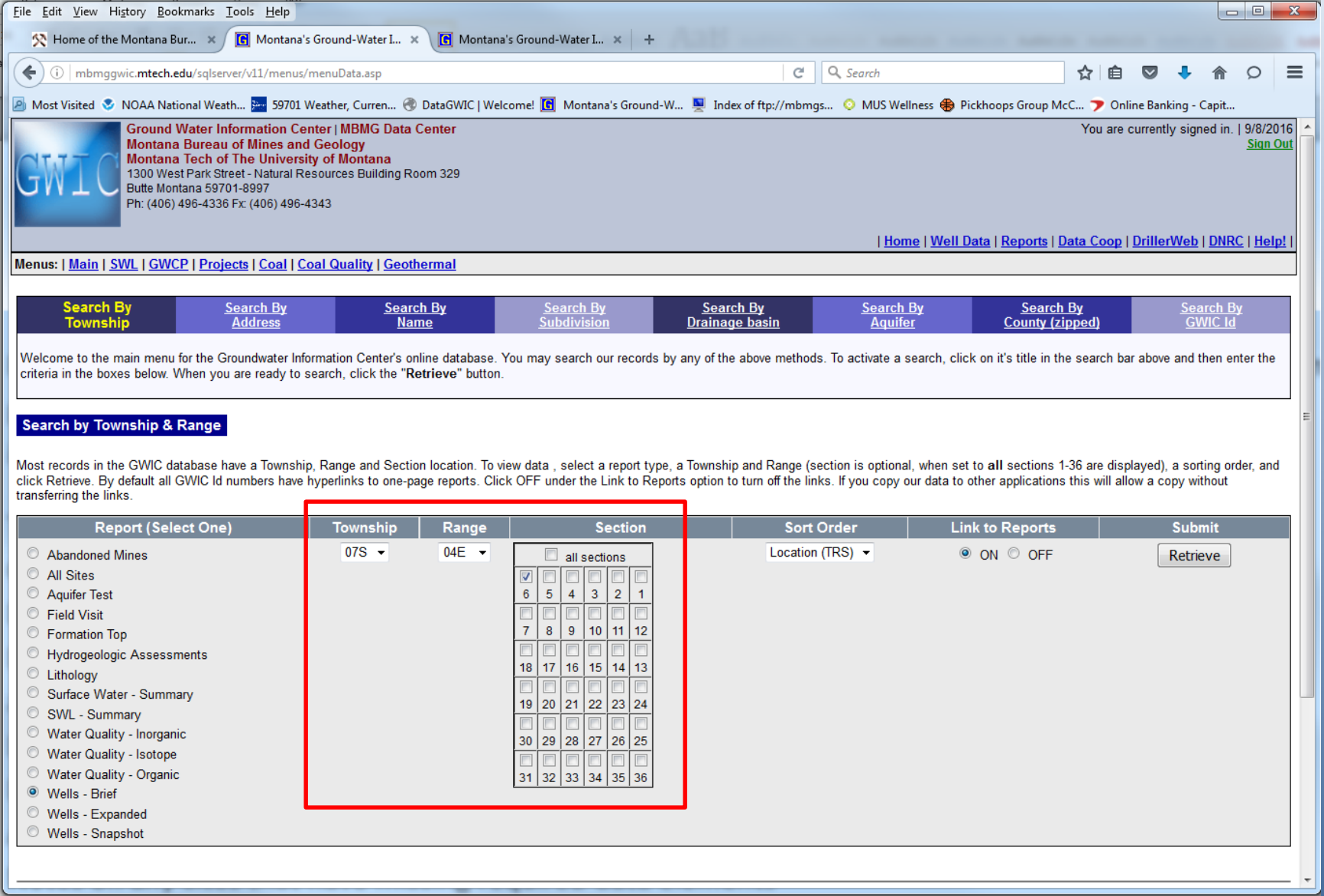
Section 9: Well Log

Geologic Source

Unassigned

From	To	Description
0	18	ROCK AND CLAY
18	63	SAND
63	82	ROCK AND CLAY
82	135	GRAVEL
135	158	CLAY-GRAVEL
158	218	SHALE

Driller Certification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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 59701-8997
Ph: (406) 496-4336 Fx: (406) 496-4343
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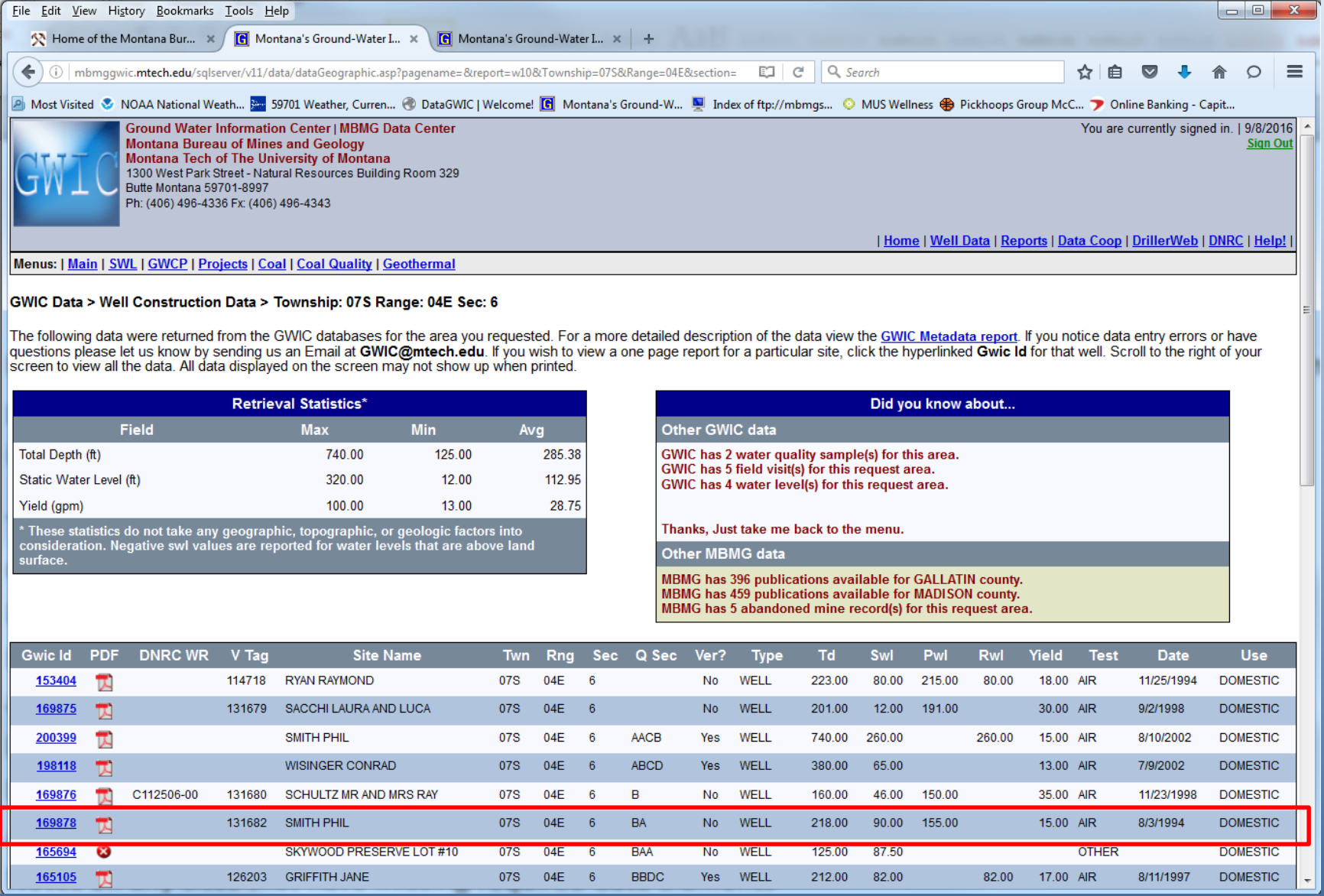
| Home | Well Data | Reports | Data Coop | DrillerWeb | DNRC | Help! |
Menus: | Main | SWL | GWCP | Projects | Coal | Coal Quality | Geothermal
Search By Township
Search By Address
Search By Name
Search By Subdivision
Search By Drainage basin
Search By Aquifer
Search By County (zipped)
Search By GWIC Id
Welcome to the main menu for the Groundwater Information Center's online database. You may search our records by any of the above methods. To activate a search, click on it's title in the search bar above and then enter the criteria in the boxes below. When you are ready to search, click the "Retrieve" button.
Search by Township & Range
Most records in the GWIC database have a Township, Range and Section location. To view data , select a report type, a Township and Range (section is optional, when set to all sections 1-36 are displayed), a sorting order, and click Retrieve. By default all GWIC Id numbers have hyperlinks to one-page reports. Click OFF under the Link to Reports option to turn off the links. If you copy our data to other applications this will allow a copy without transferring the links.
Report (Select One)
Abandoned Mines
All Sites
Aquifer Test
Field Visit
Formation Top
Hydrogeologic Assessments
Lithology
Surface Water - Summary
SWL - Summary
Water Quality - Inorganic
Water Quality - Isotope
Water Quality - Organic
Wells - Brief
Wells - Expanded
Wells - Snapshot
Township
07S
Range
04E
Section
all sections
6 5 4 3 2 1
7 8 9 10 11 12
18 17 16 15 14 13
19 20 21 22 23 24
30 29 28 27 26 25
31 32 33 34 35 36
Sort Order
Location (TRS)
Link to Reports
ON
OFF
Submit
Retrieve



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Most Visited | NOAA National Weath... | 59701 Weather, Curren... | DataGWIC | Welcome! | Montana's Ground-W... | Index of ftp://mbmgs... | MUS Wellness | Pickhoops Group McC... | Online Banking - Capit...

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Sign Out

| Home | Well Data | Reports | Data Coop | DrillerWeb | DNRC | Help! |

Menus: | Main | SWL | GWCP | Projects | Coal | Coal Quality | Geothermal

GWIC Data > Well Construction Data > Township: 07S Range: 04E Sec: 6

The following data were returned from the GWIC databases for the area you requested. For a more detailed description of the data view the GWIC Metadata report. If you notice data entry errors or have questions please let us know by sending us an Email at **GWIC@mtech.edu**. If you wish to view a one page report for a particular site, click the hyperlinked **Gwic Id** for that well. Scroll to the right of your screen to view all the data. All data displayed on the screen may not show up when printed.

Retrieval Statistics*

Field	Max	Min	Avg
Total Depth (ft)	740.00	125.00	285.38
Static Water Level (ft)	320.00	12.00	112.95
Yield (gpm)	100.00	13.00	28.75

* These statistics do not take any geographic, topographic, or geologic factors into consideration. Negative swl values are reported for water levels that are above land surface.

Did you know about...

Other GWIC data

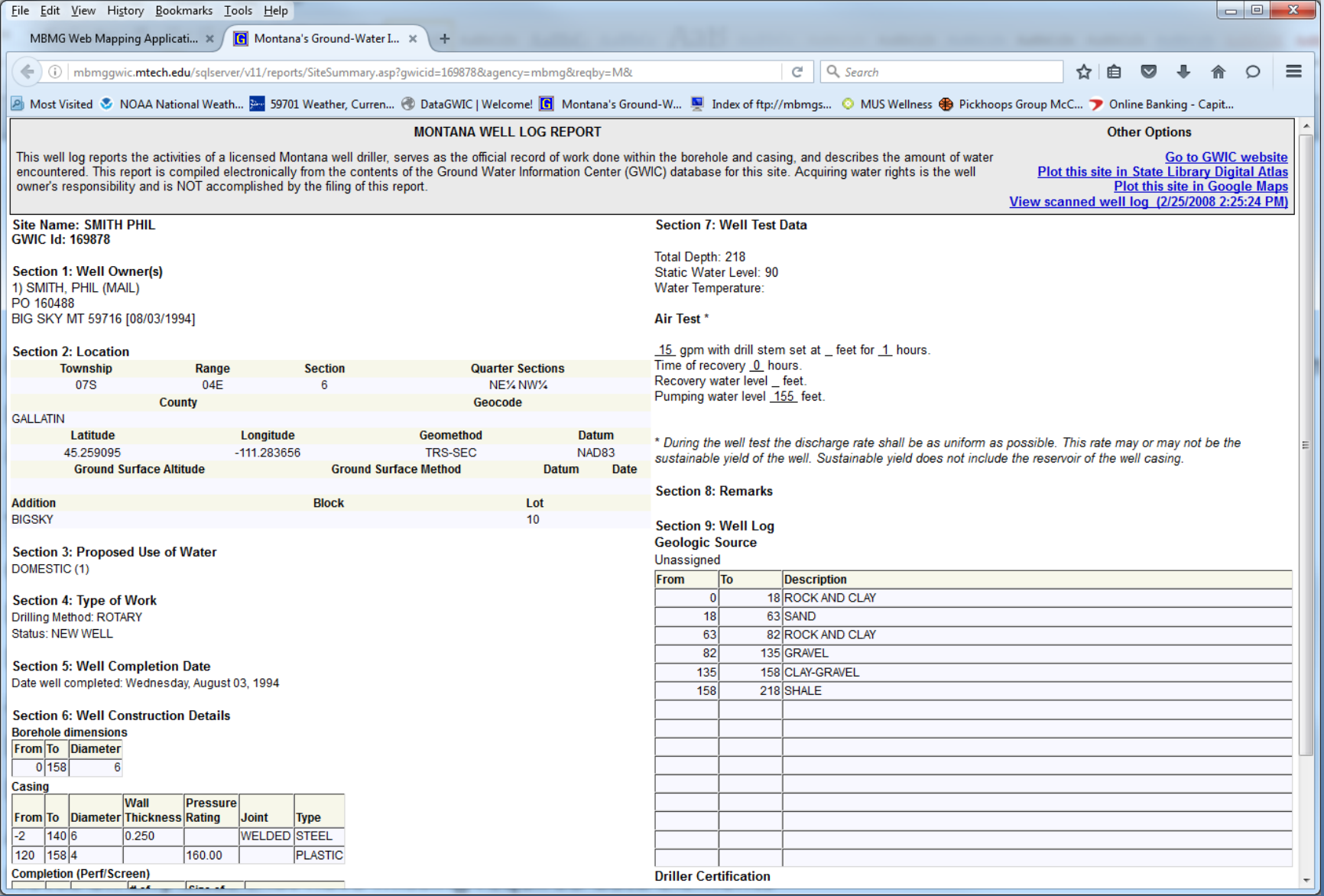
GWIC has 2 water quality sample(s) for this area.
GWIC has 5 field visit(s) for this request area.
GWIC has 4 water level(s) for this request area.

Thanks, Just take me back to the menu.

Other MBMG data

MBMG has 396 publications available for GALLATIN county.
MBMG has 459 publications available for MADISON county.
MBMG has 5 abandoned mine record(s) for this request area.

Gwic Id	PDF	DNRC WR	V Tag	Site Name	Twn	Rng	Sec	Q Sec	Ver?	Type	Td	Swl	Pwl	Rwl	Yield	Test	Date	Use
153404			114718	RYAN RAYMOND	07S	04E	6		No	WELL	223.00	80.00	215.00	80.00	18.00	AIR	11/25/1994	DOMESTIC
169875			131679	SACCHI LAURA AND LUCA	07S	04E	6		No	WELL	201.00	12.00	191.00		30.00	AIR	9/2/1998	DOMESTIC
200399				SMITH PHIL	07S	04E	6	AACB	Yes	WELL	740.00	260.00		260.00	15.00	AIR	8/10/2002	DOMESTIC
198118				WISINGER CONRAD	07S	04E	6	ABCD	Yes	WELL	380.00	65.00			13.00	AIR	7/9/2002	DOMESTIC
169876		C112506-00	131680	SCHULTZ MR AND MRS RAY	07S	04E	6	B	No	WELL	160.00	46.00	150.00		35.00	AIR	11/23/1998	DOMESTIC
169878			131682	SMITH PHIL	07S	04E	6	BA	No	WELL	218.00	90.00	155.00		15.00	AIR	8/3/1994	DOMESTIC
165694				SKYWOOD PRESERVE LOT #10	07S	04E	6	BAA	No	WELL	125.00	87.50				OTHER		DOMESTIC
165105			126203	GRIFFITH JANE	07S	04E	6	BBDC	Yes	WELL	212.00	82.00		82.00	17.00	AIR	8/11/1997	DOMESTIC



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GWIC Id: 169878

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GALLATIN	

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Ground Surface Altitude	Ground Surface Method	Datum	Date

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Section 3: Proposed Use of Water

DOMESTIC (1)

Section 4: Type of Work

Drilling Method: ROTARY
Status: NEW WELL

Section 5: Well Completion Date

Date well completed: Wednesday, August 03, 1994

Section 6: Well Construction Details

Borehole dimensions

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Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
-2	140	6	0.250		WELDED	STEEL
120	158	4		160.00		PLASTIC

Completion (Perf/Screen)

Section 7: Well Test Data

Total Depth: 218
Static Water Level: 90
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Section 8: Remarks

Section 9: Well Log

Geologic Source

Unassigned

From	To	Description
0	18	ROCK AND CLAY
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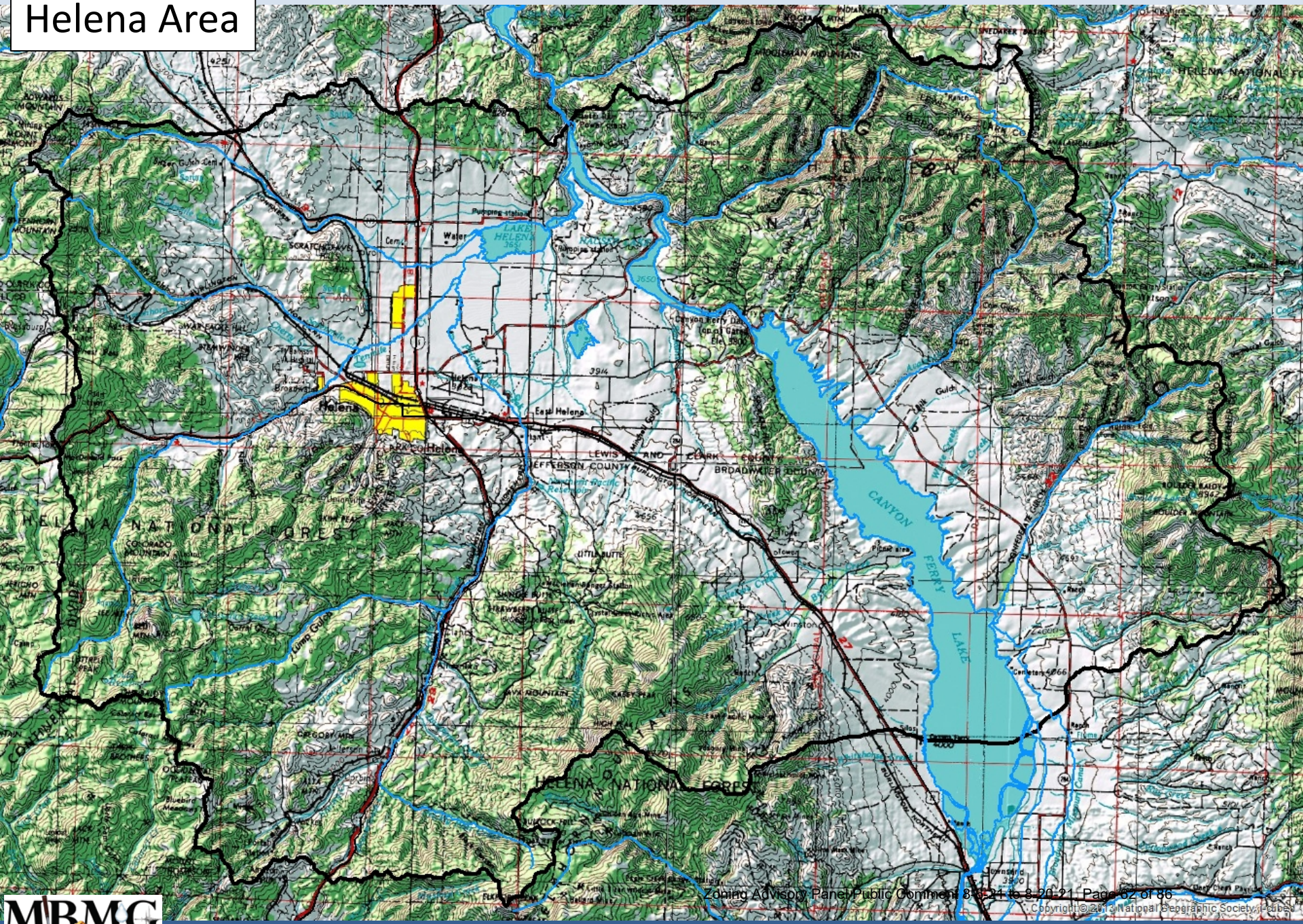
63	82	ROCK AND CLAY
82	135	GRAVEL
135	158	CLAY-GRAVEL
158	218	SHALE

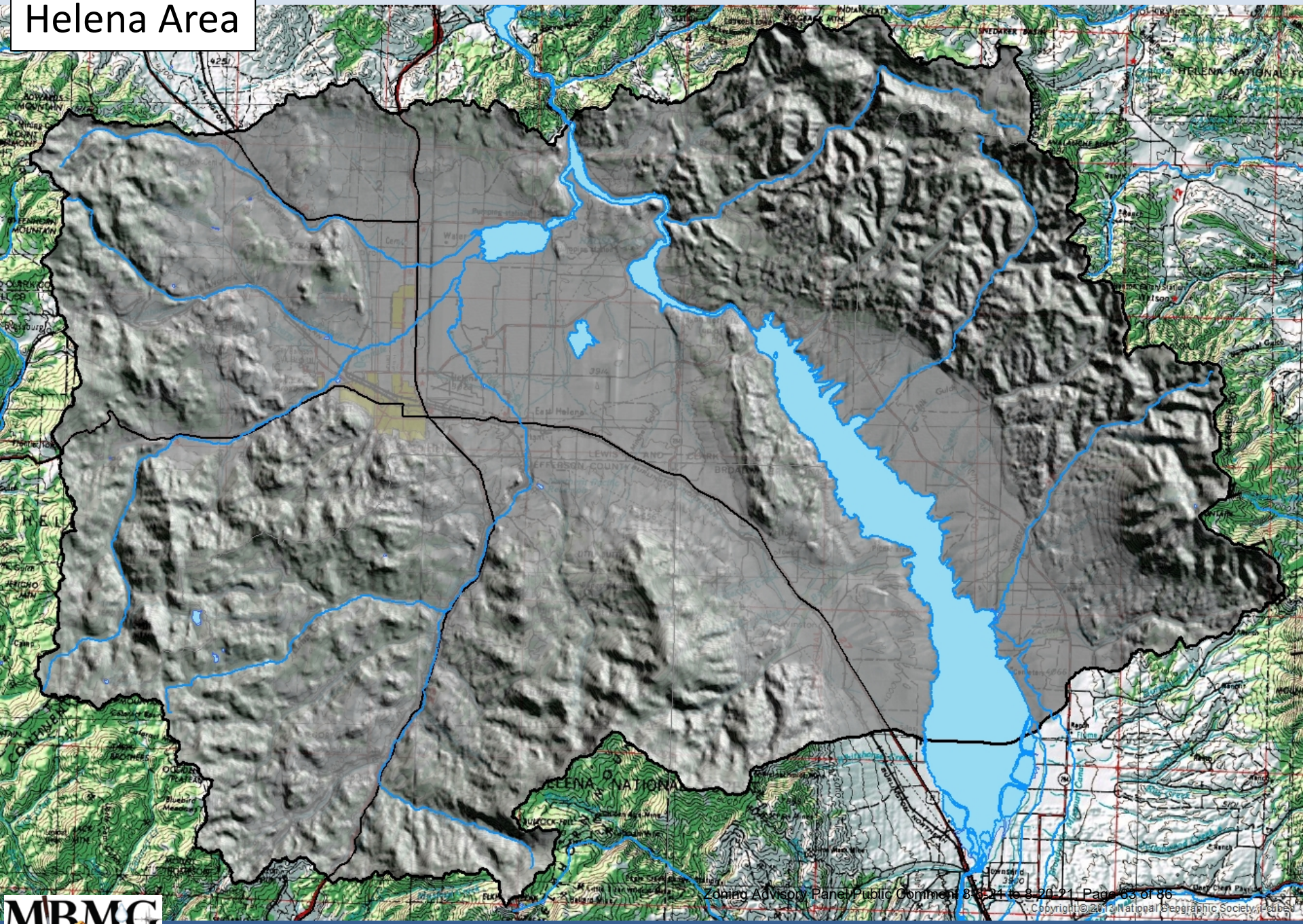
Driller Certification

Helena Area



MBMG
Montana Bureau of Mines and Geology

Helena Area



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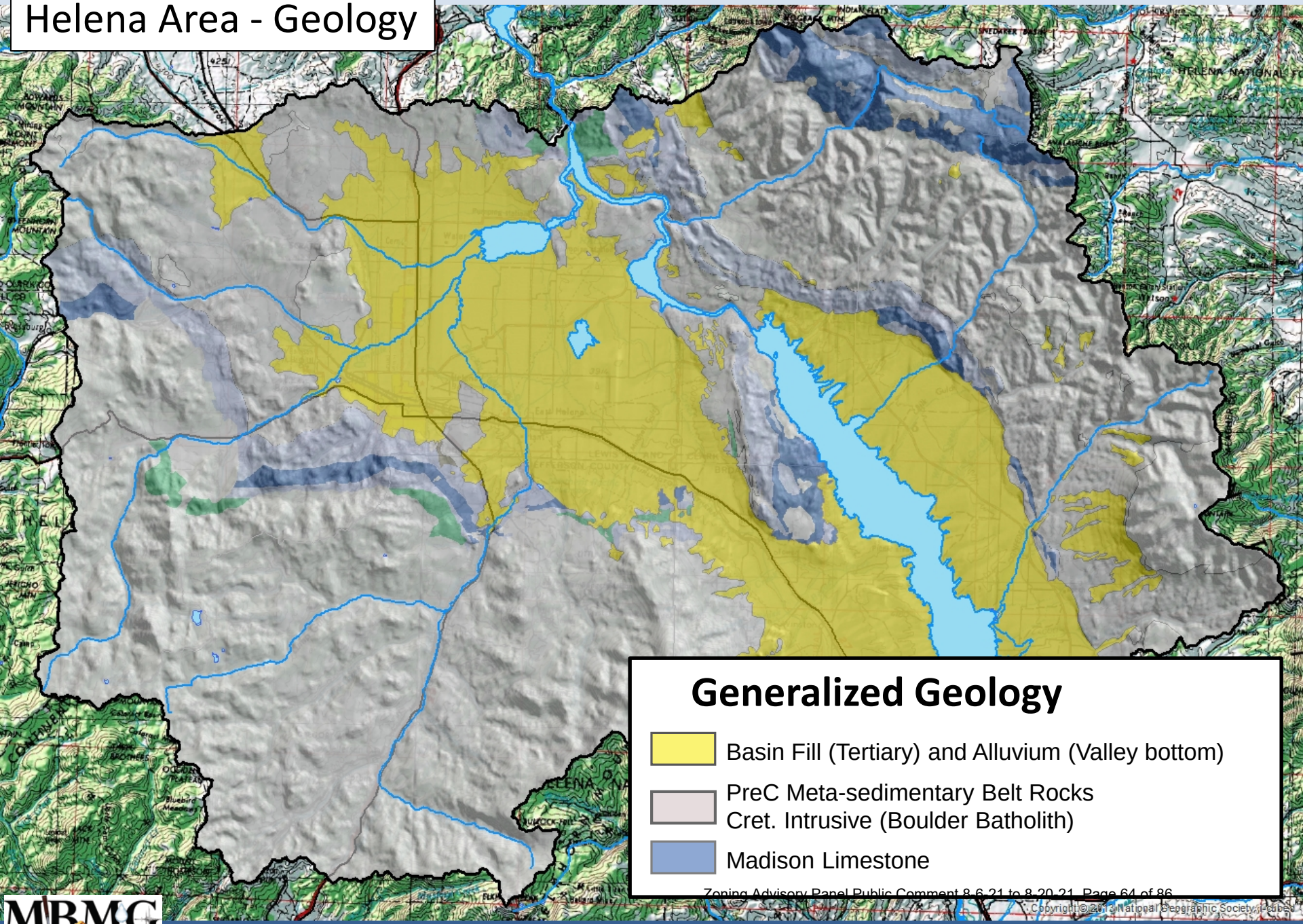
Helena Area - Geology



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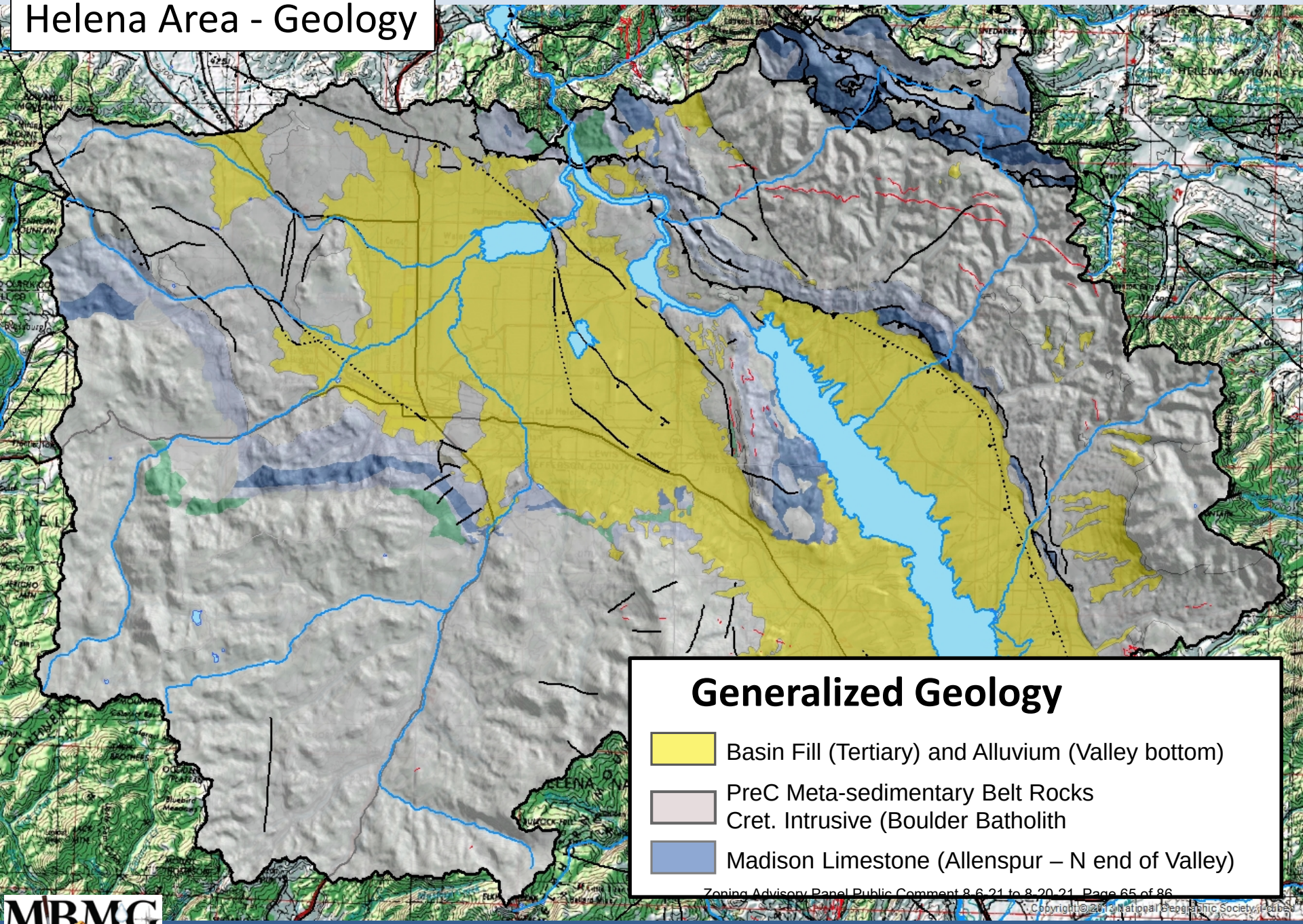
Helena Area - Geology



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Montana Bureau of Mines and Geology

Helena Area - Geology

Line of Cross Section

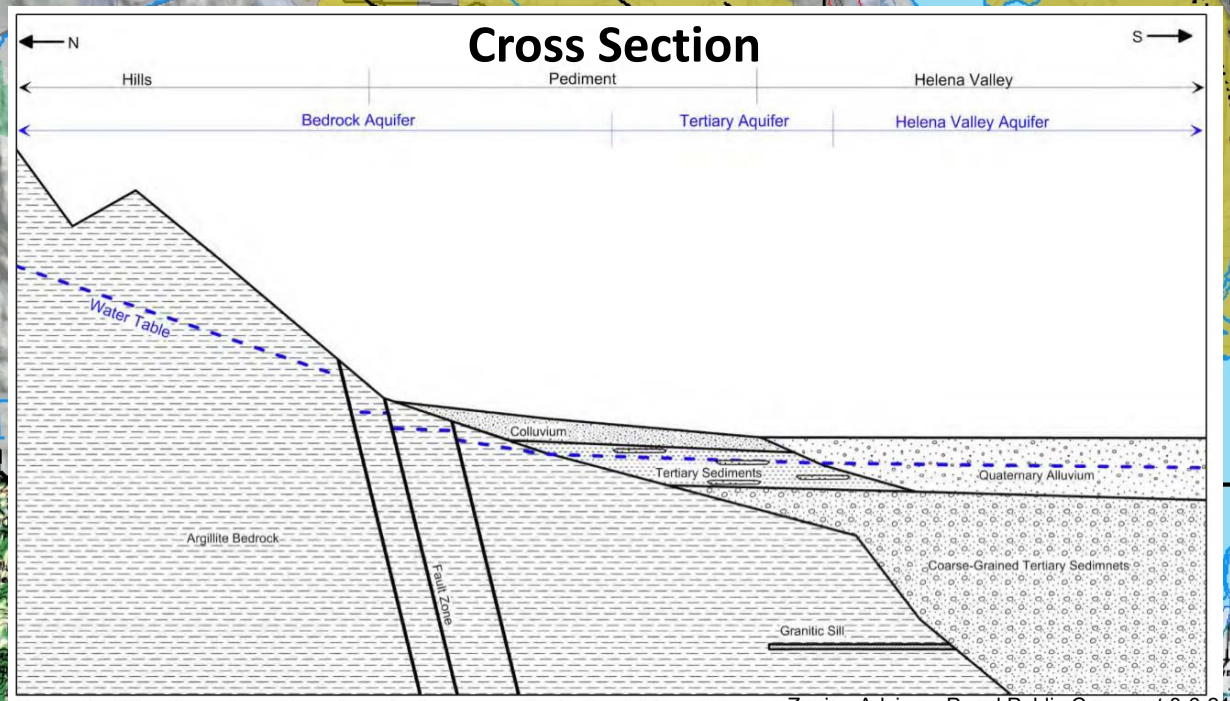

Figure 10. This schematic north-south geologic cross section in the vicinity of Interstate 15 illustrates the basic conceptual model for the North Hills Study Area. Physiographic areas are delineated in black, and principal aquifers are delineated in blue. Note that the clay-rich Tertiary materials include discontinuous sand and gravel lenses.

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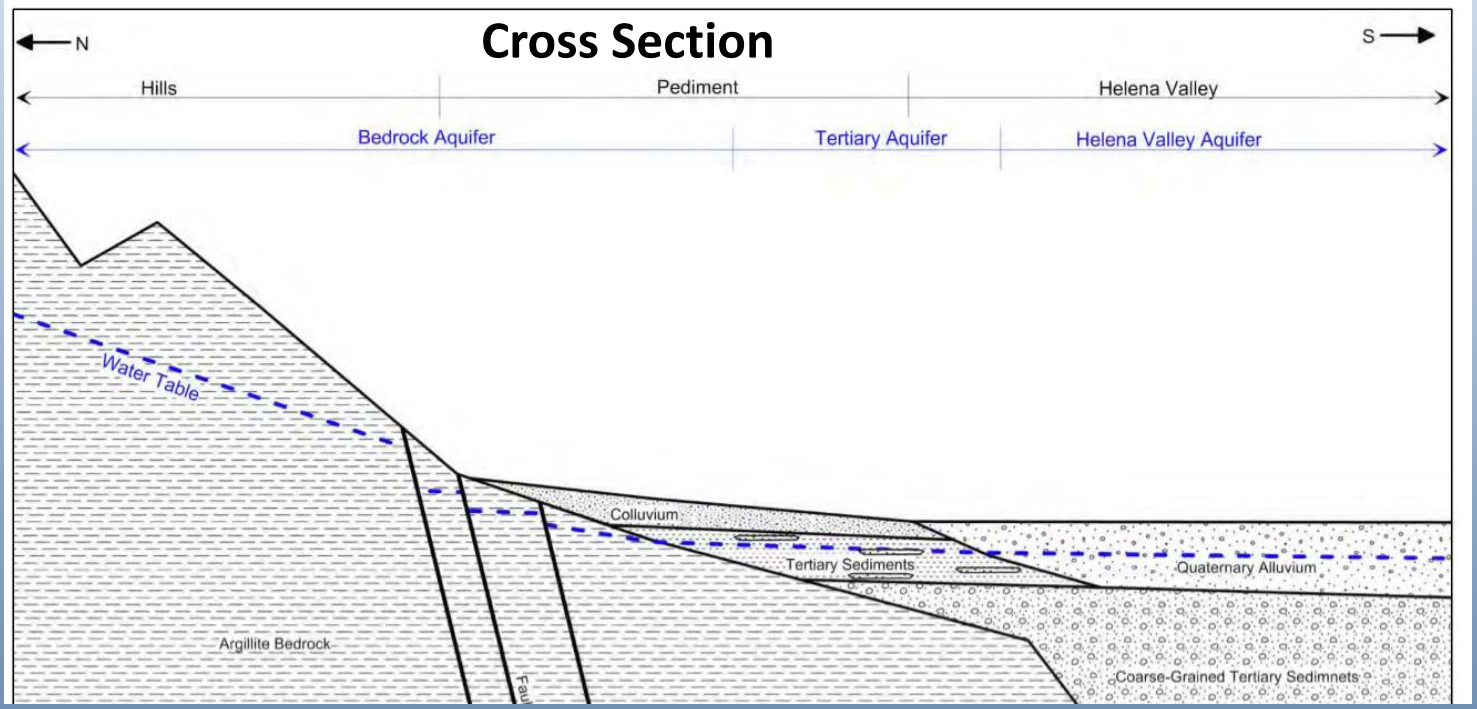
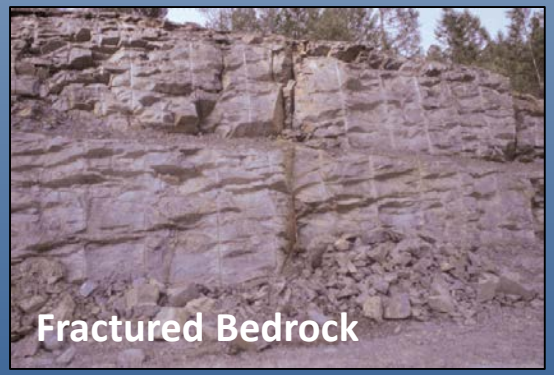
Montana Bureau of Mines and Geology

Helena Area - Geology





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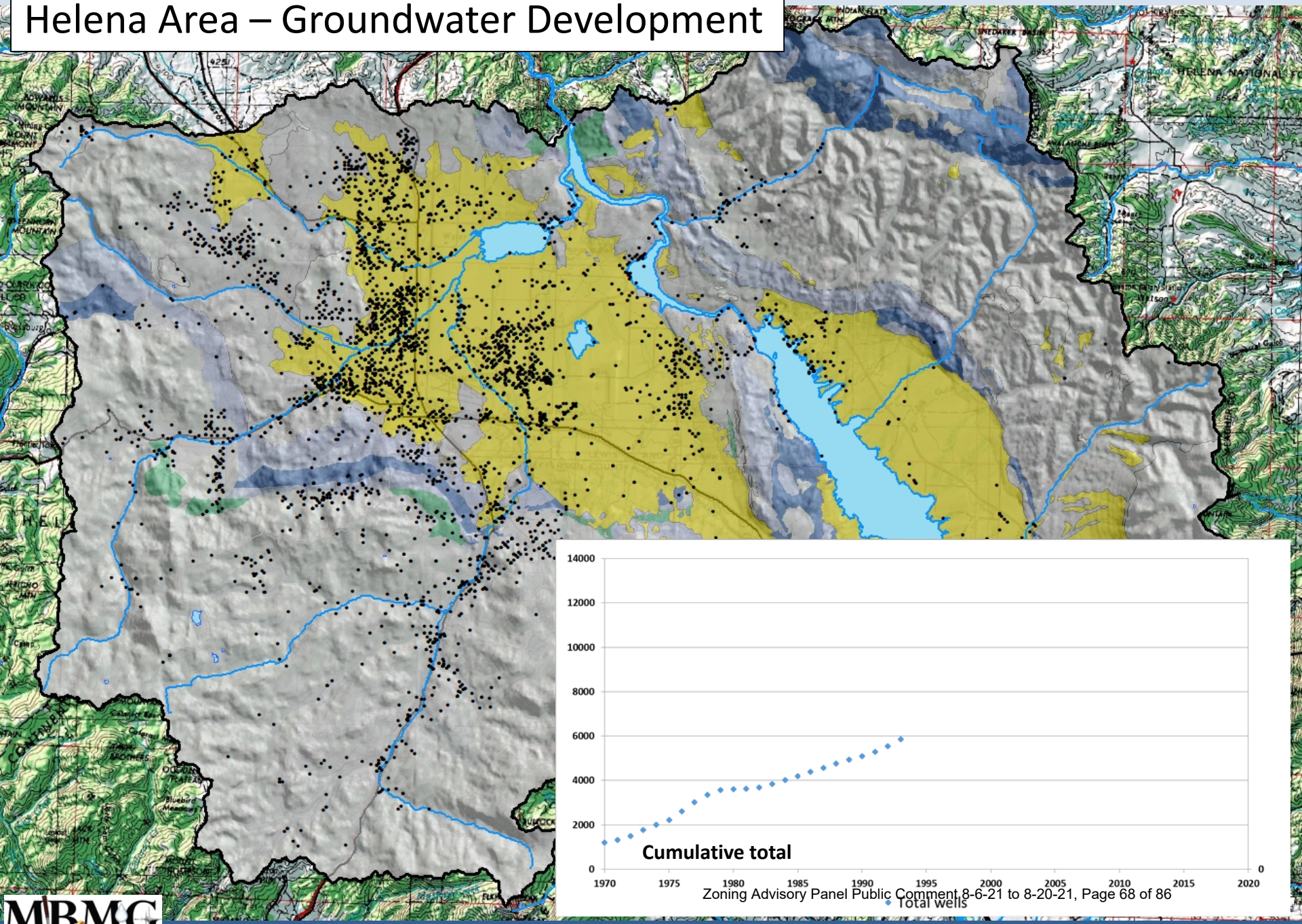
Helena Area – Groundwater Development



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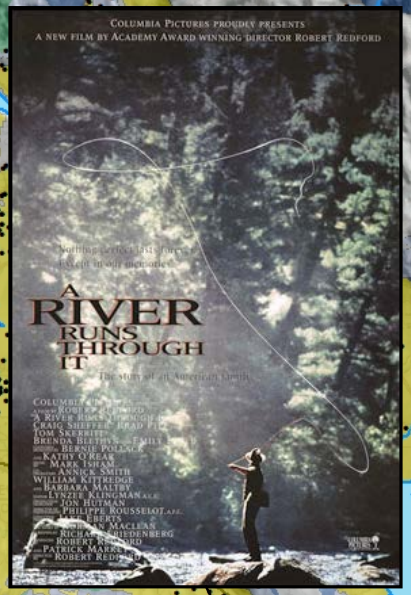
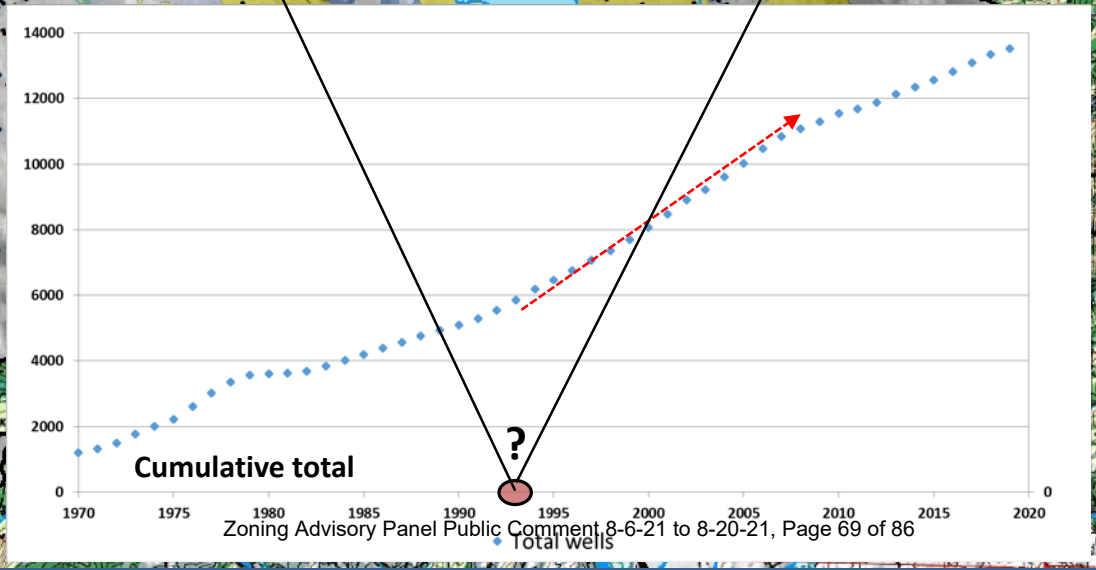
Helena Area – Groundwater Development



Overview

In 1993 the Montana Department of Natural Resources and Conservation (DNRC) put in place an Administrative Rule defining "combined appropriation of exempt wells" as an appropriation of water from the same source aquifer by two or more groundwater developments, that are physically manifolded into the same system (ARM 36.12.101(13)). Under



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Helena Area – Groundwater Development

THE WALL STREET JOURNAL.

TUESDAY, SEPTEMBER 16, 2008 - VOL. CCLII NO. 65

AIG, Lehman Shock Hits World Markets

Focus Moves to Fate of Giant Insurer After U.S. Allows Investment Bank to Fail; Barclays in Talks to Buy Core Lehman Unit

The convulsions in the U.S. financial system sent markets across the globe tumbling, as two of Wall Street's biggest firms looked set to exit the scene and insurance titan American In-

By Susanne Craig, Jeffrey McCracken, Jon Hilsenrath and Deborah Solomon

ternational Group Inc. turned to the Federal Reserve and the state of New York for assistance.

The U.S. stock market suffered its worst daily point plunge since the first day of trading after the Sept. 11, 2001, terrorist attacks. Financial markets were rattled by the rushed sale Sunday of Merrill Lynch & Co. and the bankruptcy-court filing of Lehman Brothers Holdings Inc., which scrambled Monday to sell its asset-strapped businesses before ing. For much of the day, the major U.S. market indexes were down 2%, which, while a good-sized decline, was smaller than many had thought would be the case. But in the final hour of trading, a wave of selling hit, driven by concerns about the fate of AIG. The Dow Jones Industrial Average ended down 504.48 points on Monday, off 4.4%, at its daily low of 10917.51, down 18% on the year. Of the Dow industrials' 30 components, all but one—Coca-Cola Co.—fell, led by a 60.8% plunge in AIG.

In Europe, London's FTSE 100 index dropped 2.9%. Several Asian markets, including Japan and China, were closed Monday due to holiday. By Tuesday, Tokyo shares were down 5.1% in early trading, and Hong Kong's Hang Seng Index was down 6.1%.

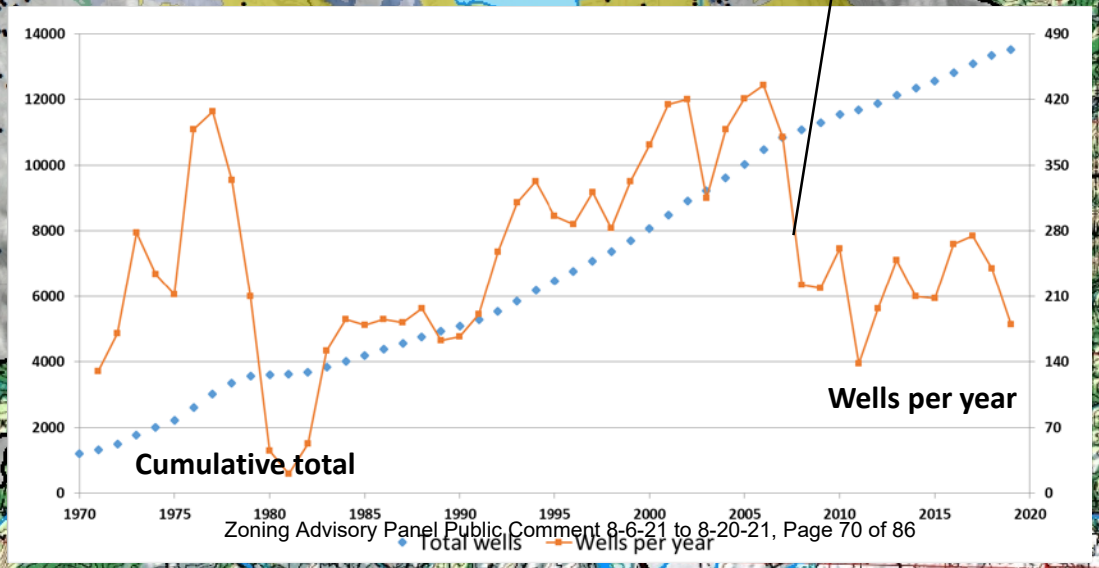
Monday's action was the latest fallout in a widening finan-

AIG Faces Cash Crisis As Stock Dives 61%

By Matthew Karnitschnig, Liam Pleven And Serena Ng

American International Group Inc. was facing a severe cash crunch last night as rating agencies cut the firm's credit ratings, forcing the giant insurer to raise $14.5 billion to cover its obligations.

With AIG now tottering, a cri-



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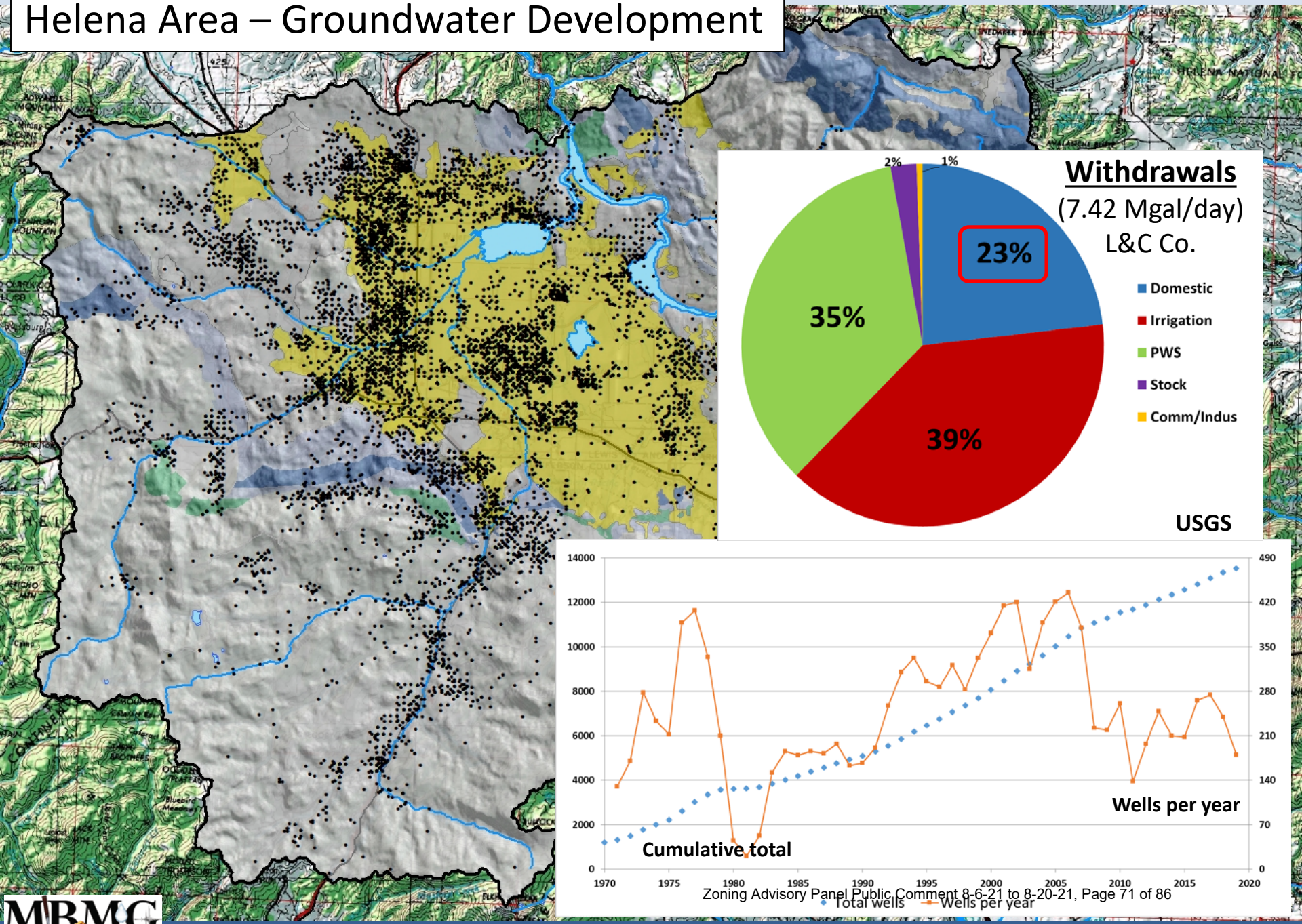
Helena Area – Groundwater Development



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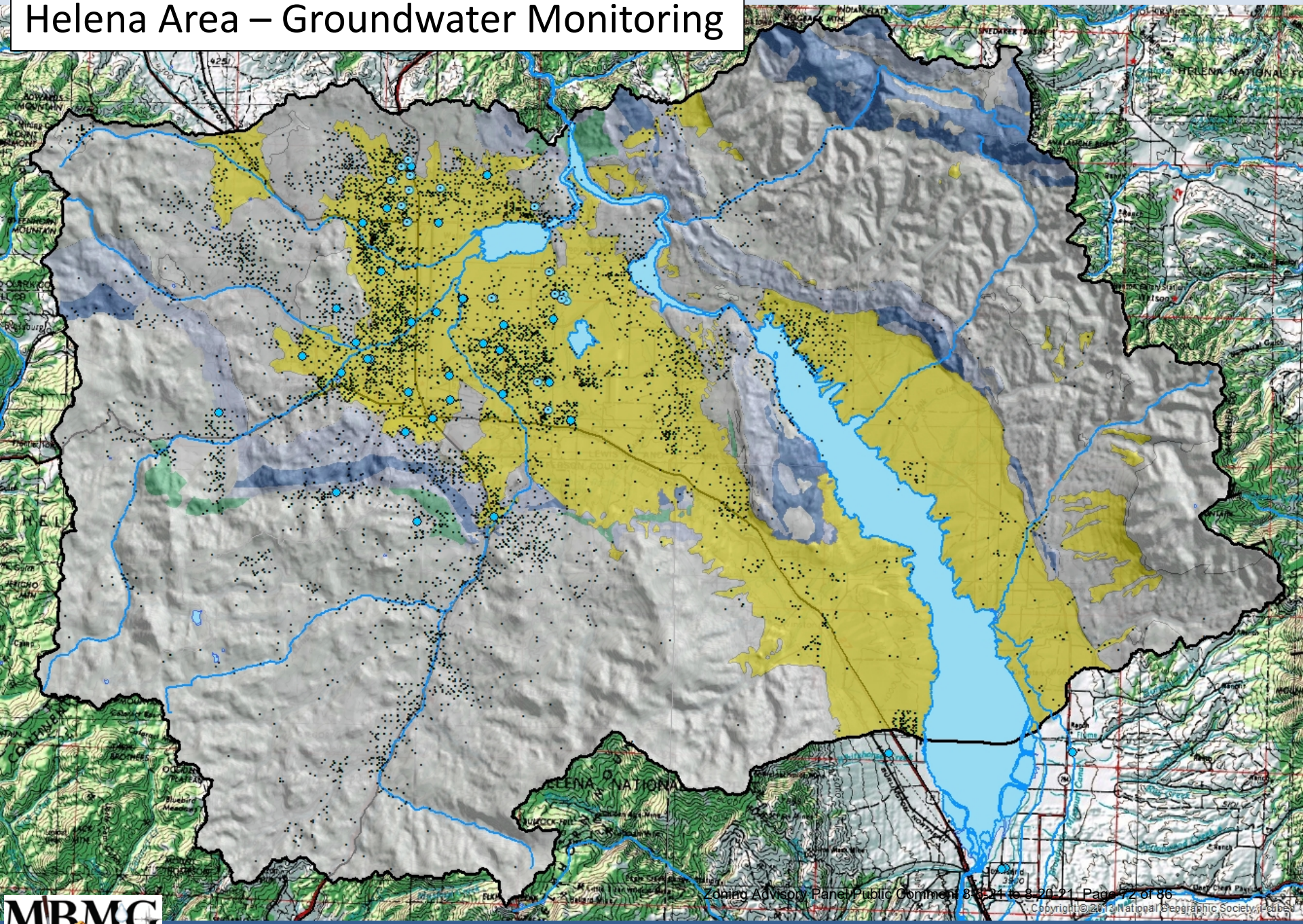
Helena Area – Groundwater Monitoring



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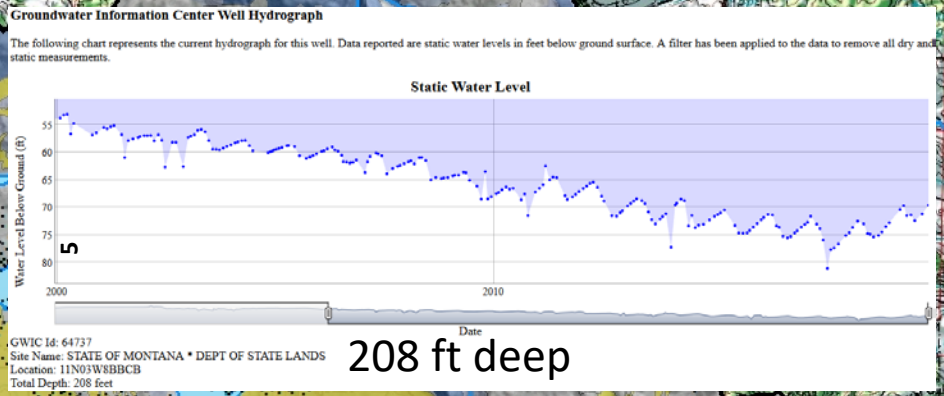
Montana Bureau of Mines and Geology

Helena Area – Groundwater Monitoring

Declining



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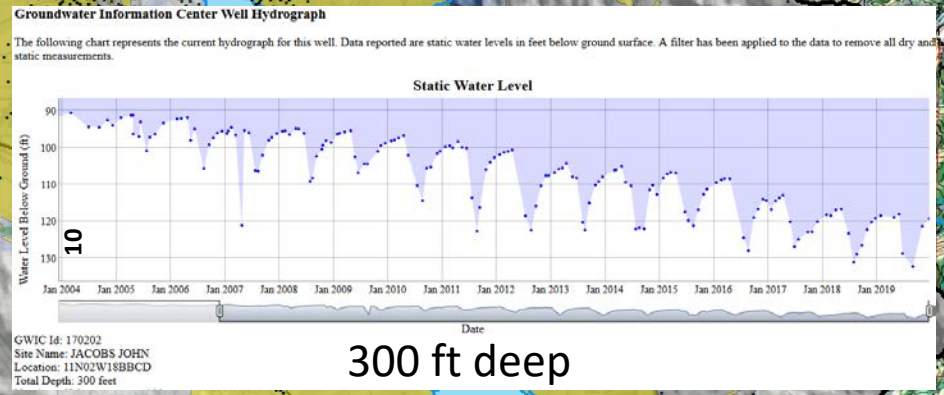
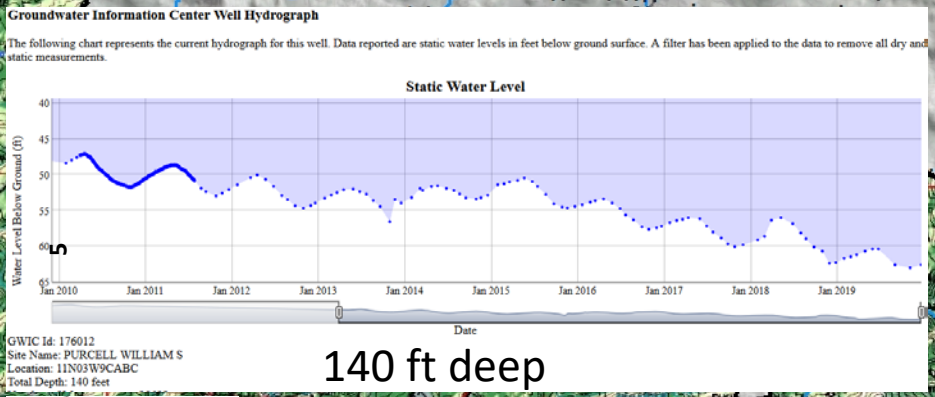
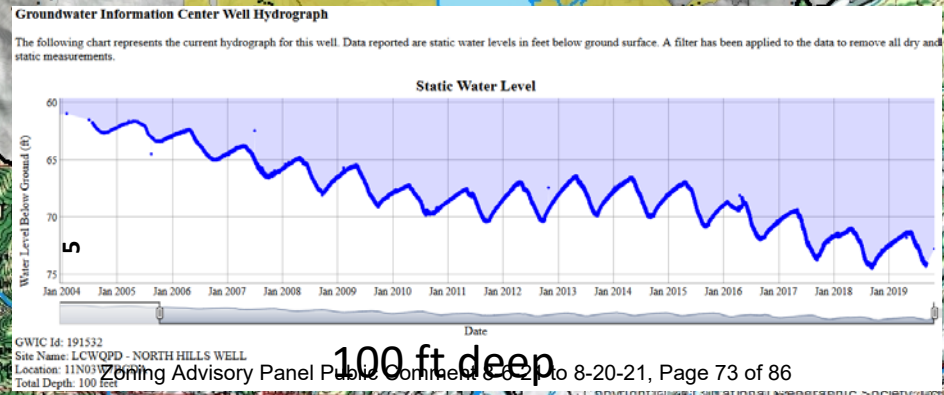


300 ft deep



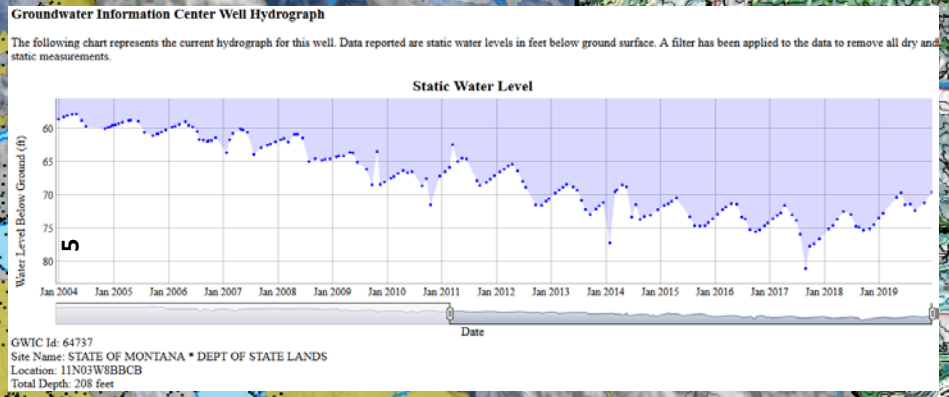
140 ft deep

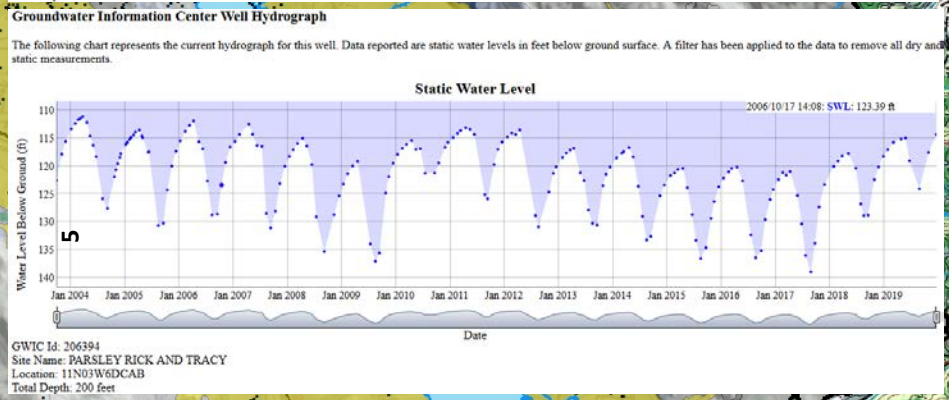


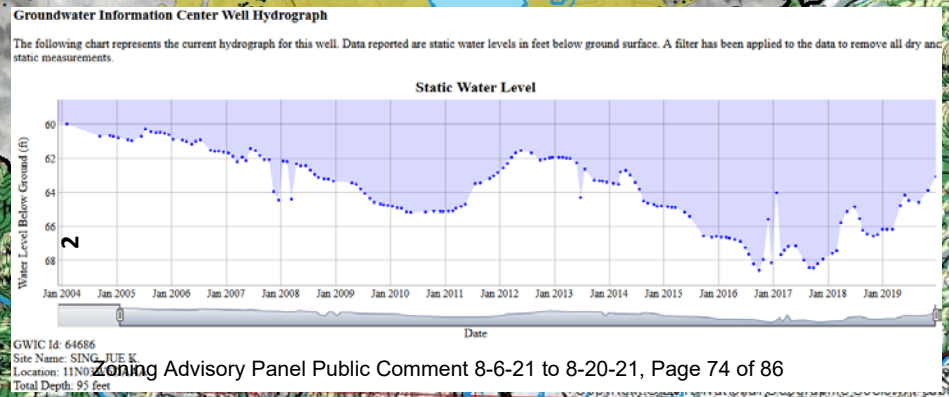
100 ft deep

Helena Area – Groundwater Monitoring

Vexing!



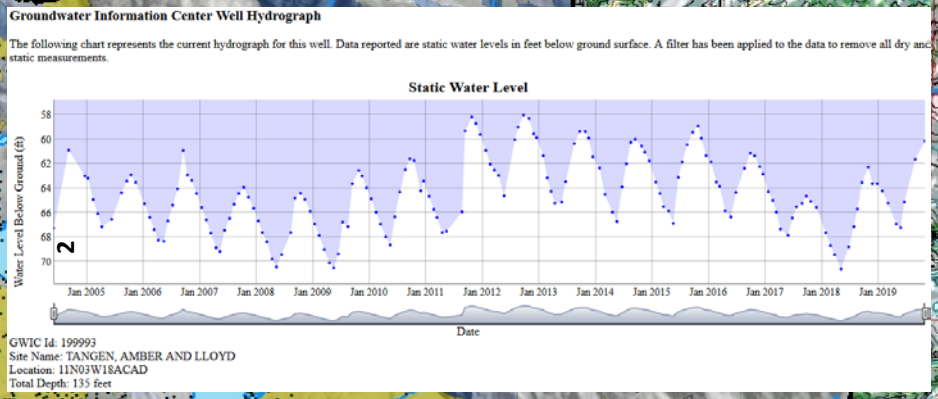


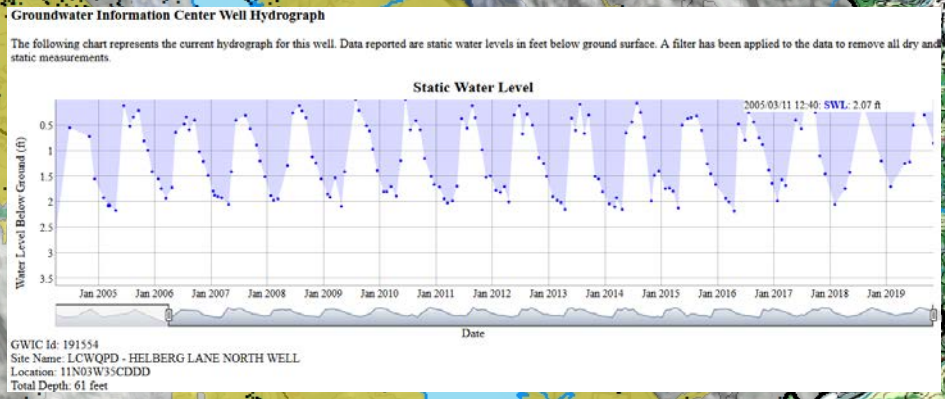


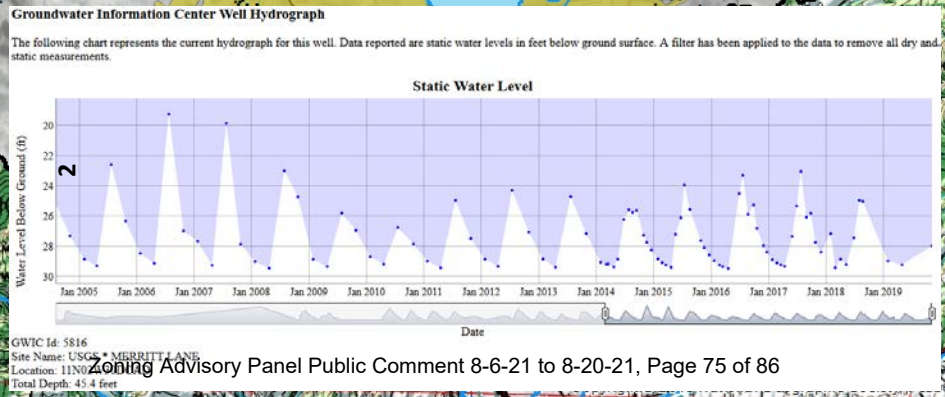
MBMG Montana Bureau of Mines and Geology

Helena Area – Groundwater Monitoring

Stable







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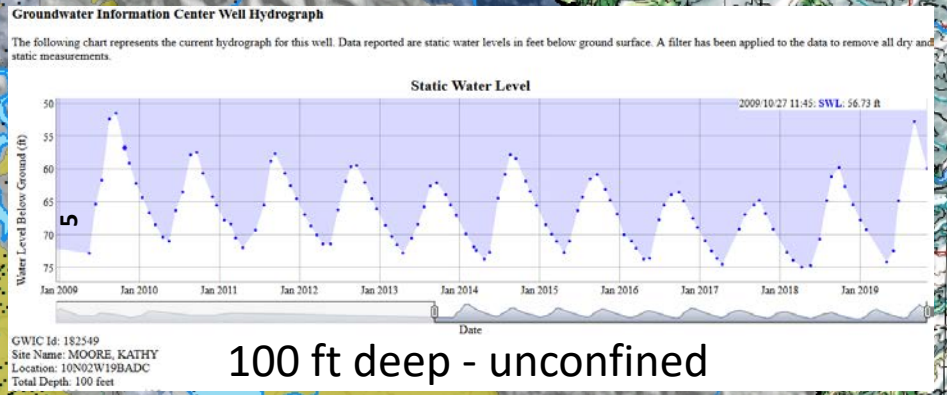
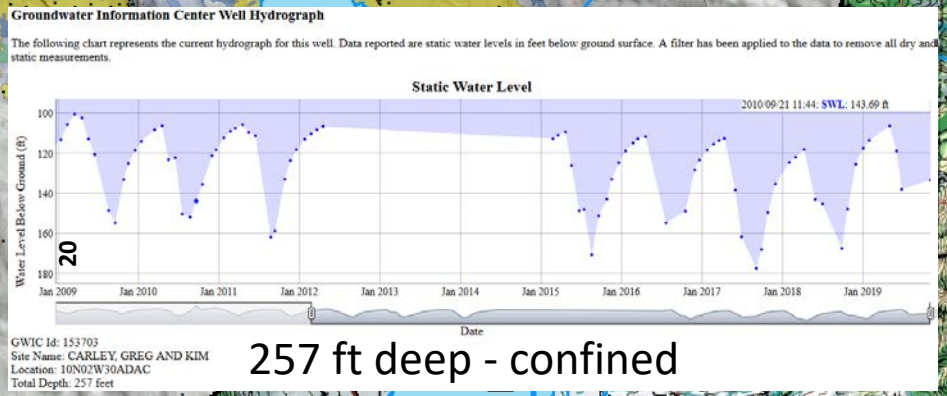
Helena Area – Groundwater Monitoring

Unconfined - Confined



100 ft deep - unconfined



257 ft deep - confined

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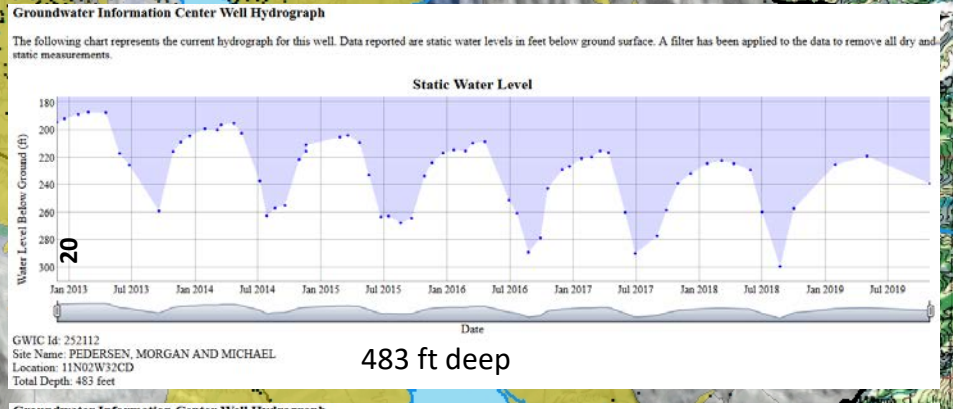
Montana Bureau of Mines and Geology

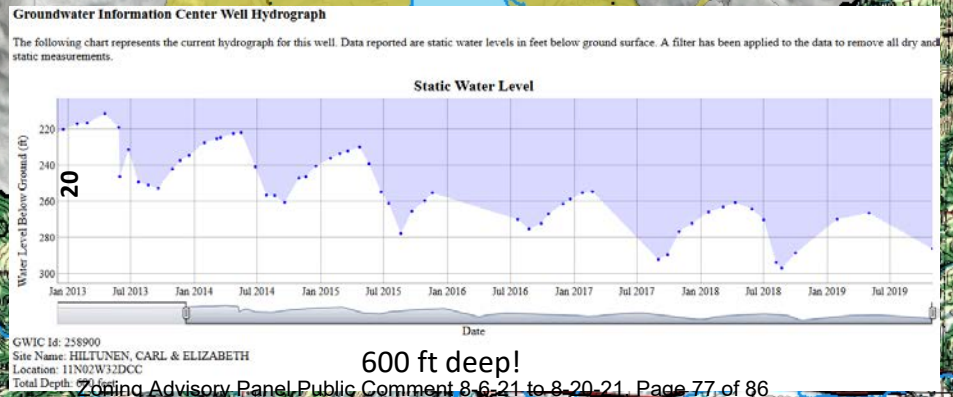
Helena Area – Groundwater Monitoring

Emerald Ridge

356 ft deep !



483 ft deep



600 ft deep!

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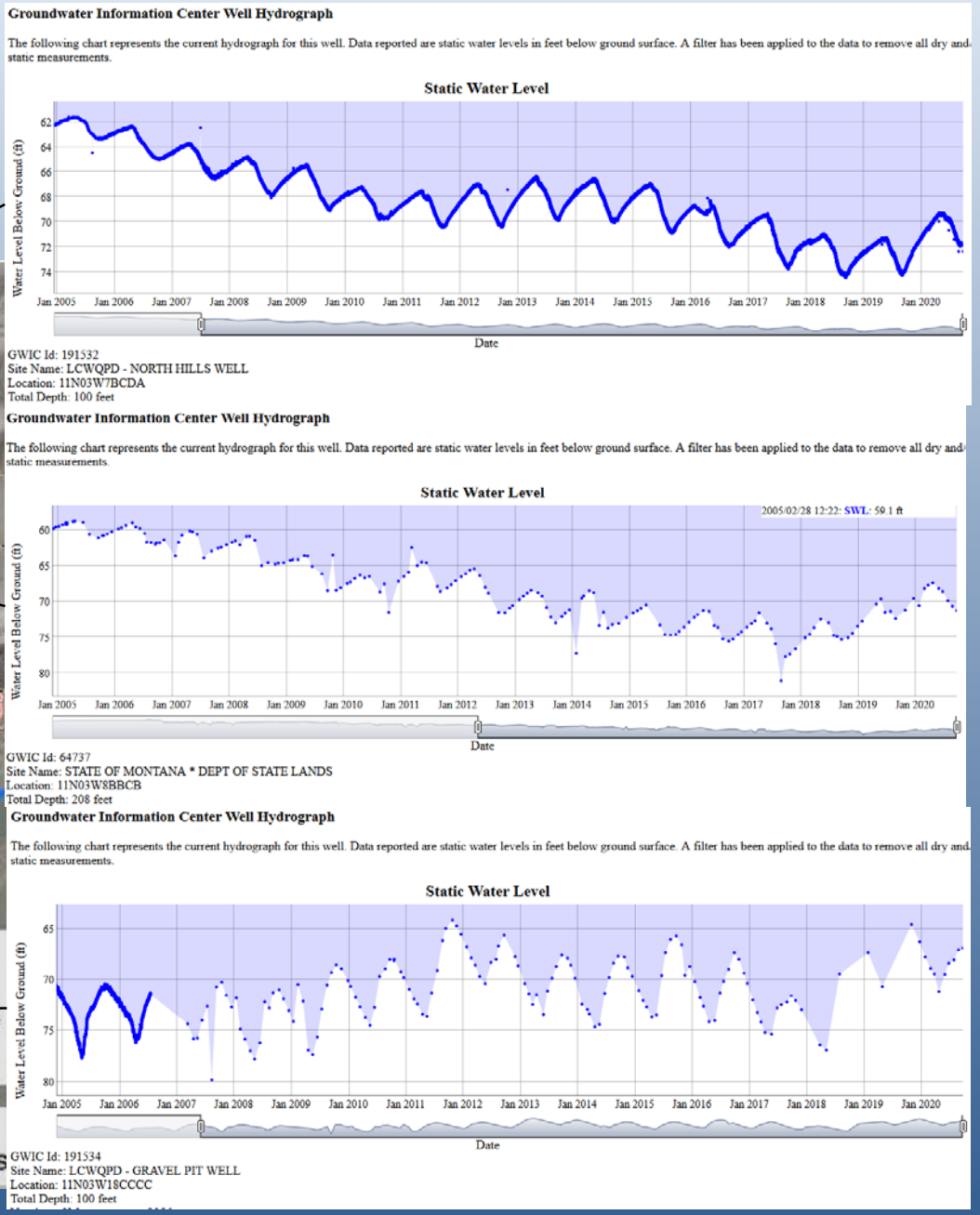
North Star – Groundwater Levels



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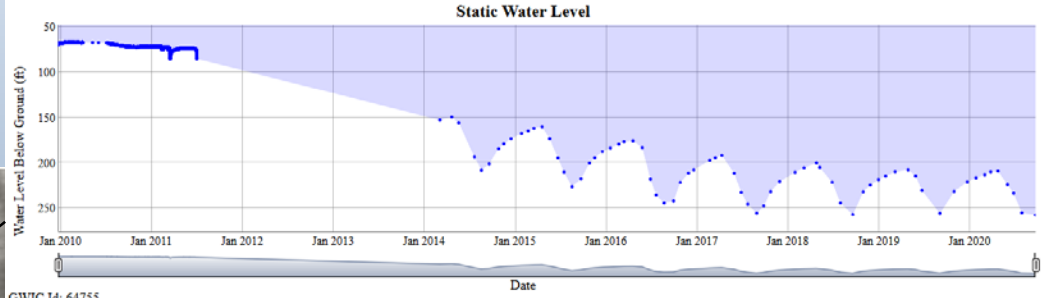
North Star – Groundwater Levels

Groundwater Information Center Well Hydrograph

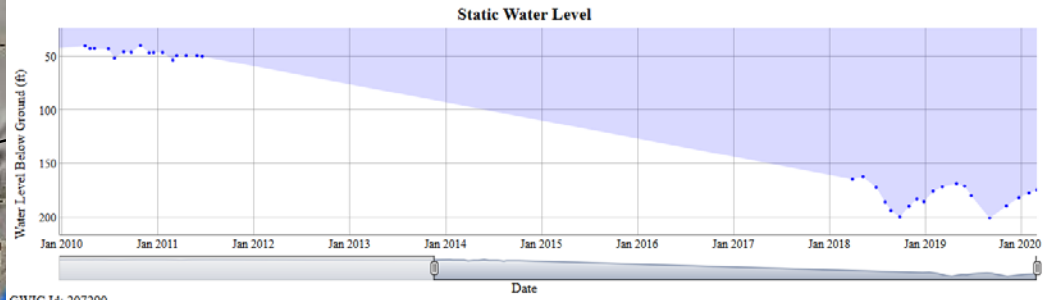
The following chart represents the current hydrograph for this well. Data reported are static water levels in feet below ground surface. A filter has been applied to the data to remove all dry and/or static measurements.



GWIC Id: 64755
Site Name: OFFICE OF STATE FORESTER
Location: 11N03W8CBCC
Total Depth: 441 feet

Groundwater Information Center Well Hydrograph

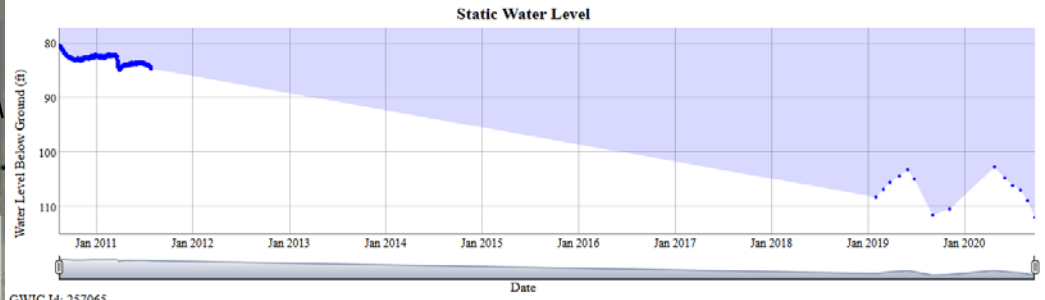
The following chart represents the current hydrograph for this well. Data reported are static water levels in feet below ground surface. A filter has been applied to the data to remove all dry and/or static measurements.



GWIC Id: 207290
Site Name: SKILLMAN DAN AND LOLA
Location: 11N03W8DCBC
Total Depth: 535 feet

Groundwater Information Center Well Hydrograph

The following chart represents the current hydrograph for this well. Data reported are static water levels in feet below ground surface. A filter has been applied to the data to remove all dry and/or static measurements.

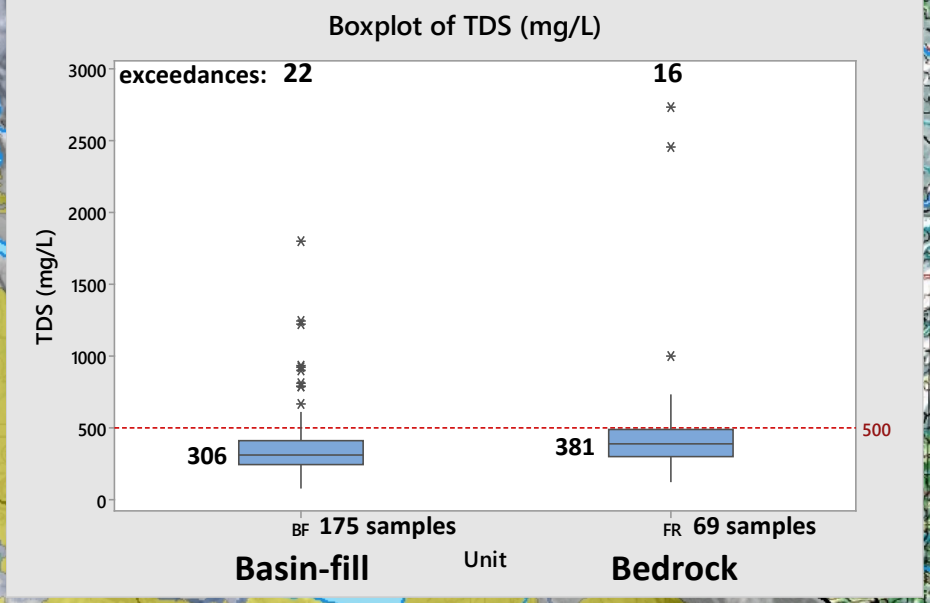


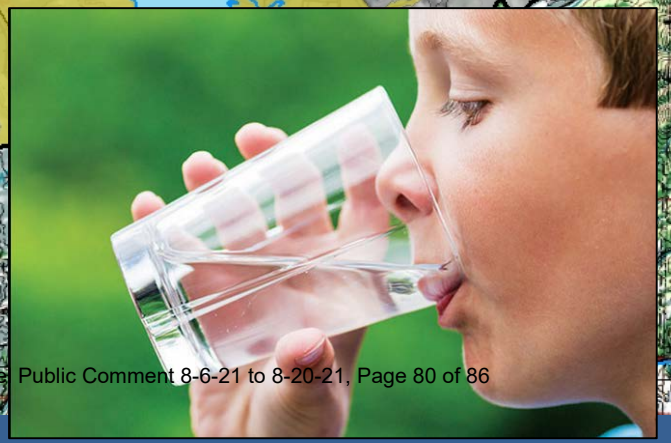
GWIC Id: 257065
Site Name: MONTANA BUREAU OF MINES AND GEOLOGY
Location: 11N03W9CABB
Total Depth: 360 feet

MBMG Montana Bureau of Mines and Geology

Helena Area – Groundwater Quality - TDS

Secondary drinking water standard = 500 mg/L





Bedrock Basin-fill

< 500 mg/L

500 – 1,000 mg/L

> 1,000 mg/L

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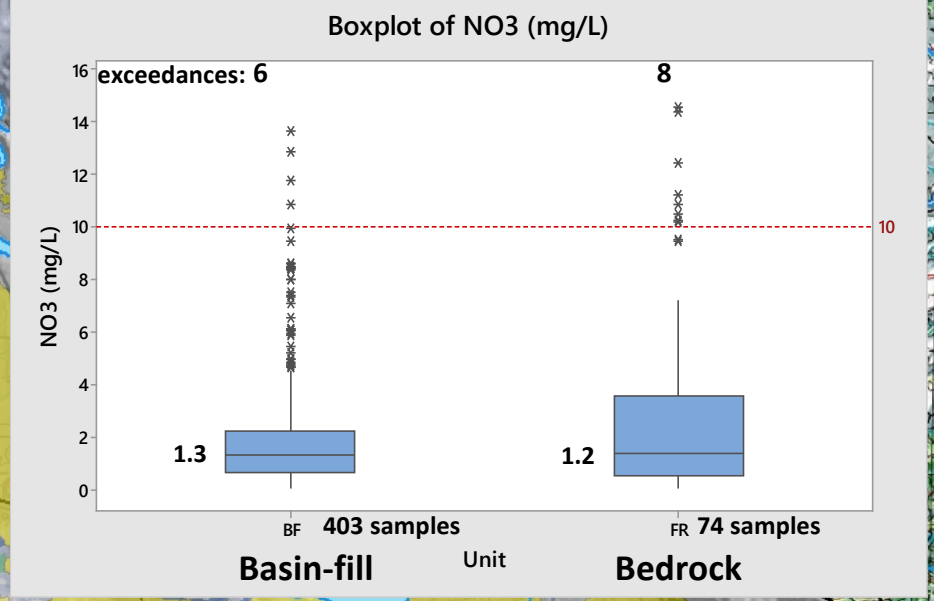
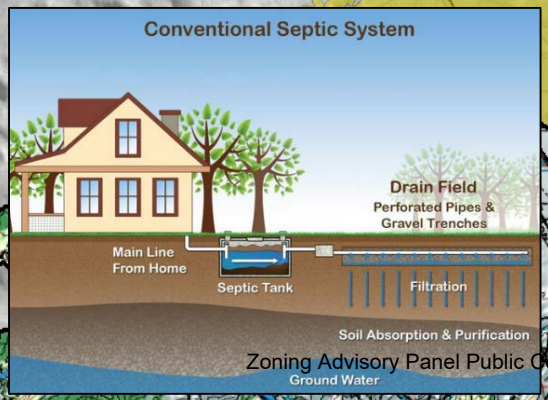
Helena Area – Groundwater Quality – Nitrate (NO3)

Primary drinking water standard = 10 mg/L





Bedrock Basin-fill

- < 2 mg/L
- 2 – 10 mg/L
- > 10 mg/L

MBMG Montana Bureau of Mines and Geology

Questions?

Ground-Water Information Center:

http://mbmggwic.mtech.edu/

Montana Bureau of Mines and Geology:

http://www.mbmg.mtech.edu/

James Madison
496-4619
jmadison2@mtech.edu

ATTN ZAP: Public Input from Chris Stockwell, 8/18/2021 C Stockwell
401 445-0706

Sustainable Missoula: Planning for a sustainable future

BY NEVA HASSANEIN DECEMBER 7, 2020

Neva Hassanein

Why would a sustainability scholar and farmland advocate support a new plan that will likely convert another 450 acres of prime agricultural soil to other uses? I have asked myself that many times as the so-called "Mullan Area Master Plan" has moved through the public process.

That's a lot of a finite, valuable resource. I was not an easy sell.

Now, though, I am totally convinced this cutting-edge approach is the way to go. I am one of the members of the City-County Consolidated Planning Board, which recently voted unanimously for the plan and code, along with a recommendation to change the name (more on that below). I write on my own behalf.

What makes this plan different from previous ones? A lot.

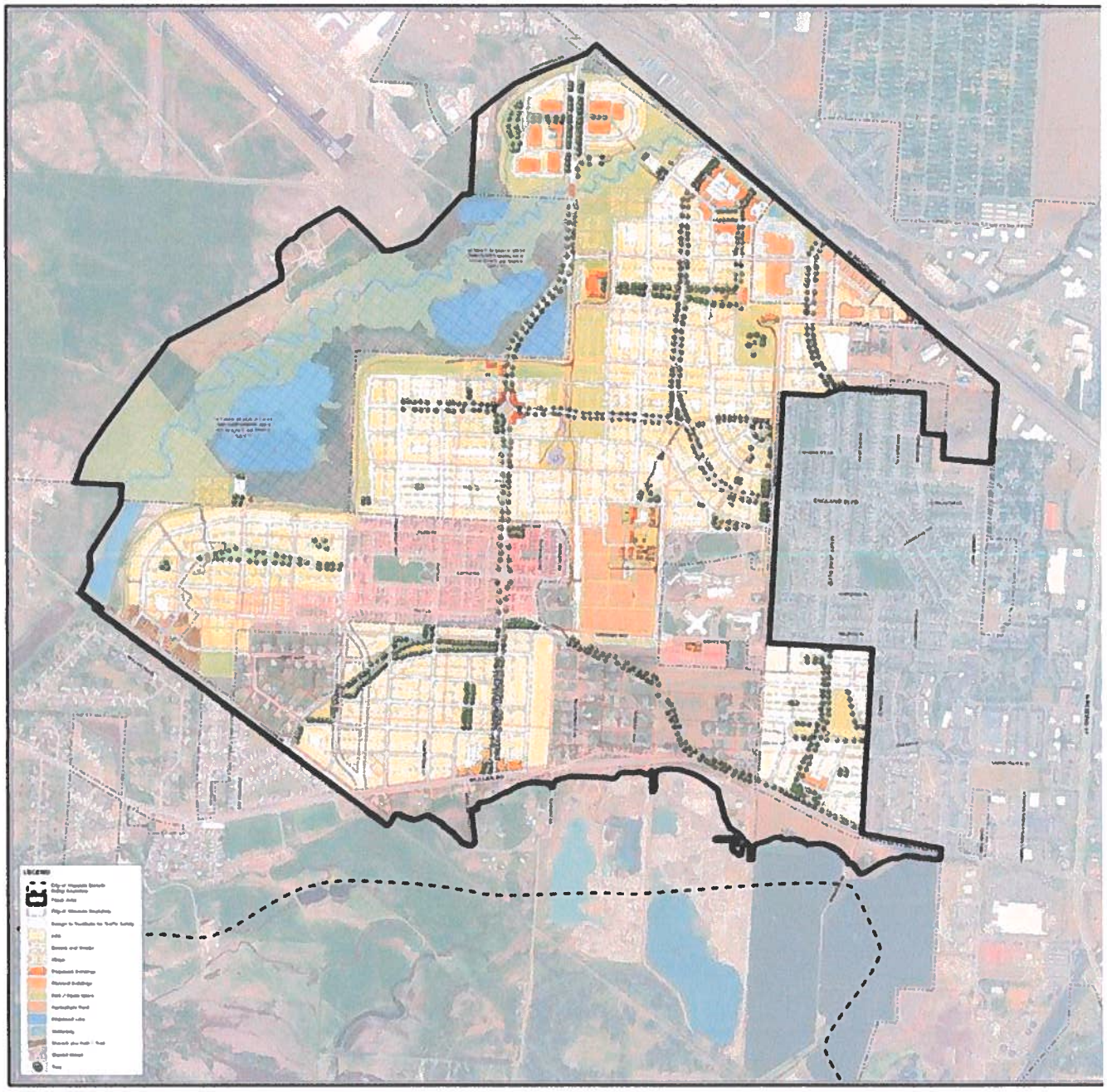
Here are some of my favorite aspects:

First, the plan creates seven neighborhoods in the area west of Reserve, south of Broadway, and towards the airport. A variety of housing types will absorb at least 20 years of anticipated population growth. Mixed land uses will create neighborhoods and town centers where people can shop, dine, and work close to home.

Second, the plan has an accompanying zoning code, which means its vision has teeth. Simultaneous passage of the code critically ensures that what the illustrative plan depicts will basically be built. This kind of zoning, called "form-based," specifies the desired character and physical attributes of an area, rather than simply allowable uses.

Third, unlike sprawl, which is car-centric, the level of housing will be sufficiently dense so that a variety of transit options can be provided. These so-called "complete" streets are designed to accommodate all modes. Bike lanes and trails will crisscross through the area. New parks and open spaces will enhance quality of life for residents.

Fourth, new community farms and gardens will not only echo the past, but will also become a vibrant part of future neighborhoods. Cottage food businesses and the like will be encouraged through the zoning. This plan can also set the stage for future protection of precious agricultural land to the west in Grass Valley and elsewhere.



MULLAN AREA MASTER PLAN - DRAFT ILLUSTRATIVE PLAN

Fifth, the "green infrastructure" aspects of this plan are on the leading edge of sustainable design. For example, to manage stormwater in this area, the code requires the use of natural processes -- incorporating features like grass swales and detention ponds -- to slow runoff, reduce pollution, and protect our waterways.

Sixth, this plan (along with the BUILD Project) calls for the restoration of Grant Creek, which has been channelized over the years. The plan creates a 200-foot buffer on each side of the stream.

Seventh, the cultural heritage of this place will not be lost, but rather reimagined and made more inclusive. Historical and educational initiatives can inform residents and visitors about this rich, cultural landscape.

For thousands of years, the Séliš and Qĺispé people used this open prairie, rich in bitterroots and other plants, and managed the area with the careful, regular application of fire. Historic structures, harkening to the agricultural production of the last century, will be preserved.

For all these reasons and more, the Planning Board unanimously recommended approval of the plan and code.

In addition, the full Board also recommended that the governing bodies work to find a more accurate and inclusive name for the plan. Specifically, we did not want to continue to name things after Captain John Mullan, who was very disrespectful of the self-determination and sovereignty of the Séliš, Qĺispé, Kootenai, and other indigenous groups. Mullan's biographer and other historians have repeatedly described him as racist and his opinions as "vile."

The City Council and Board of County Commissioners will hold a joint hearing on this plan, code, and the proposal to change the name on Monday Dec. 7 at 6 PM.

Once the plan and code are formally adopted by early 2021, Missoulians will have to collaborate in our characteristic fashion to bring the innovative features to fruition. If we do this right, we will be creating neighborhoods that reflect the uniqueness of this place and the sustainability values we share.

Neva Hassanein is a member of the Missoula City-County Consolidated Planning Board and a Professor of Environmental Studies at the University of Montana. This Sustainable Missoula column is brought to you – via the Missoula Current – every week by Climate Smart Missoula and Home ReSource.