



PUBLICLY AVAILABLE RESULTS INCLUDE

- ⇒ Detailed, peer-reviewed MBMG published reports, with more in review.
- ⇒ Computer models of site-specific groundwater flow are available for use.
- ⇒ Each project’s scientific teams answer public inquiries regarding the hydrogeology of GWIP areas.
- ⇒ Comprehensive set of hydrogeologic data for each investigation are publicly available in GWIC database.
- ⇒ Presentations to stakeholders and other interest groups.

The *Ground Water Investigation Program (GWIP)* answers locally identified, site-specific questions prioritized by the Montana Ground Water Steering Committee (MCA 85-2-525). As mandated by the Montana Legislature, GWIP conducts research on the most urgent water issues in the state.

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Ground Water Investigation Program

PUBLISHED REPORTS (2019-2020)

Hydrologic Investigation of the Upper Jefferson River Valley, Montana: Whitehall Groundwater Modeling Report, 2020, Report of Investigations, RI 27

Aquifer Tests in the Upper Jefferson Valley, 2020, Open-File MBMG 727

Virginia City, Montana, Aquifer Test, 2020, Open-File MBMG 726

West Crane Buried Valley Aquifer: A Hidden Resource, 2020, Information Pamphlet, IP 13

Hydrogeologic Investigation of the Stevensville Study Area Ravalli County, Montana, 2020, Open-File MBMG 733

South Medicine Lake Area of the Clear Lake Aquifer: Groundwater Model Report, 2019, Open-File MBMG 720

Hydrogeologic Investigation of the Four Corners Area, Gallatin County, Montana, Open-File (by November 2020)

ACTIVE PROJECT SUMMARIES (2020)

Musselshell River Musselshell, Rosebud and Petroleum Counties

Purpose: Determine the sources of salinity in the lower Musselshell River and in the Horse Creek Coulee near Melstone. High salinity irrigation water can result in crop yield loss, degraded soils and groundwater.

Status: Twenty monitoring wells were installed and instrumented to record hourly salinity, temperature, and water levels. The first set of seasonal groundwater and surface water samples were analyzed for major ions, trace metals, and strontium isotopes.

Personnel: Liddi Meredith (Lead), Shawn Kuzara

East Flathead Valley Flathead County

Purpose: Determine the connection between the shallow aquifer, deep alluvial aquifer and surface water. This information will be used to evaluate the effects of pumping on these aquifers and on surface water.

Status: Groundwater and surface-water monitoring is ongoing. Water chemistry samples have been collected and drilling is in progress.

Personnel: Andy Bobst (Lead), Jim Berglund, Dean Snyder

Upper Gallatin Gallatin County

Purpose: Evaluate the effects of existing and future residential/commercial development in the Upper Gallatin Valley on water quantity and quality. The area is rapidly developing and serviced by individual wells and septic systems.

Status: Groundwater and surface-water monitoring is ongoing. Drilling to define the alluvial aquifer is complete. Sample collection continues to characterize water chemistry (including nutrients) at 33 groundwater and 15 surface-water monitoring sites.

Personnel: James Rose (Lead), Ron Breitmeyer

ACTIVE PROJECTS (CONT.)

Lolo Creek Missoula County

- Purpose:** Determine the cause of changes in streamflow character that occur in the lowest reaches of Lolo Creek, resulting in the channel occasionally being dry. Possible causes of the dry creek episodes range from climate, water withdrawn from the creek, groundwater pumping, changes in surface storage and groundwater recharge, and geomorphological changes.
- Status:** Groundwater model development and report writing are underway. The geologic framework for the groundwater flow model is complete. In conjunction with hydrogeologic interpretations, the model will help quantify the water budget and the effects hydrologic stresses on Lolo Creek.
- Personnel:** Ali Gebril (Lead)

Sidney Area-West Crane Buried Valley Aquifer Richland County

- Purpose:** Determine the availability of water from the buried channel aquifer in the Sidney area and the aquifer's ability to meet the needs for future municipal, irrigation, and oil and gas development.
- Status:** Data collection is complete. A numerical groundwater model is being developed to simulate hydrogeologic conditions and make predictions on the effects of irrigation pumping on groundwater and surface-water.
- Personnel:** Jon Reiten (Lead), Kevin Chandler

Ennis Area Madison County

- Purpose:** Investigate the effects of increased residential development and groundwater withdrawals in the bedrock aquifer on the west side of the Ennis Valley. Implications for increased withdrawals on adjacent aquifers will be considered.
- Status:** Data collection including drilling and aquifer testing is complete. Data interpretation and report preparation will commence the winter.
- Personnel:** Todd Myse (Lead), Mary Sutherland

Hamilton Area Ravalli County

- Purpose:** Provide detailed hydrogeologic information that can be used to examine the effects of land use changes on groundwater and surface-water. Evaluate nitrate concentrations as an indication of residential growth and associated increase in septic systems.
- Status:** Data interpretation is complete and the draft report is near completion.
- Personnel:** Todd Myse (Lead), Dean Snyder

Belgrade/Manhattan Gallatin County

- Purpose:** Assess the effects of pumping from high capacity wells for a municipality or subdivision on groundwater and surface-water resources. Evaluate changes in groundwater quality that may be related to increased wastewater disposal.
- Status:** Groundwater model is complete and the report is in preparation.
- Personnel:** Mary Sutherland (Lead)



Developing the hydrogeologic framework, monitoring, and communicating results to the public.

IN REVIEW

Clear Lake Aquifer Sheridan County

- Purpose:** Determine how much groundwater can be withdrawn from the Clear Lake Aquifer without affecting groundwater and surface-water. Evaluate water quality as it relates to development of irrigation water.
- Results:** Preliminary results indicate that at current levels of irrigation development, the aquifer is not being depleted. Model scenarios suggest that moderate irrigation development in the South Medicine Lake area have minimal effects on wetlands and streamflow in Big Muddy Creek.
- Personnel:** Jon Reiten (Lead), Kevin Chandler

Flathead Valley Flathead County

- Purpose:** Determine whether withdrawals from the deep aquifer affect surface-water resources; and if current stresses are creating declining water-level trends.
- Results:** Pumping has created water-level declines in some areas, but not valley-wide. The deep sand and gravel aquifer is protected from surface activities by an overlying confining unit. This unit also constrains pumping drawdown to the deep aquifer. A 3-dimensional hydrostratigraphic model (MBMG Open-File 703) allows future users to access lithologic information for any location in the valley.
- Personnel:** James Rose (Lead)

Upper Jefferson River Valley Jefferson, Madison, and Silver Bow Counties

- Purpose:** Evaluate the effects of current and potential future groundwater withdrawals and changes in land use on baseflow to Willow Springs, Parson's Slough, Jefferson Slough, and the Jefferson River.
- Results:** Lining irrigation canals in conjunction with switching from flood to pivot irrigation in the Waterloo area would result in the greatest reduction in Jefferson River flows. In the Whitehall area, modeling predicted that groundwater pumping effects from residential development was greatest in areas where the land was previously irrigated.
- Personnel:** Andy Bobst (Lead), Ali Gebriel

Virginia City Madison County

- Purpose:** Estimate sustainability of the public water supply springs under scenarios of increasing demand and adjacent future development. Investigate potential of augmenting the municipal springs with a well(s).
- Results:** The municipal springs emanate from the contact between overlying lava flow deposits and tuffs. Preliminary results indicate that the springs are susceptible to effects from surface activities and septic systems.
- Personnel:** Andy Bobst (Lead)

Big Sky Gallatin and Madison Counties

- Purpose:** Evaluate the sustainability and production capacity of the Meadow Village Aquifer and the feasibility of groundwater withdrawals from bedrock aquifers in the Big Sky area.
- Results:** Geology and structure have an influence on aquifer productivity in the Meadow Village, Spanish Peaks, Mountain Village, Moonlight Basin, and the Yellowstone Club areas. The groundwater model for the Meadow Village Aquifer is a useful management tool to evaluate water availability for future development.
- Personnel:** James Rose (Lead)