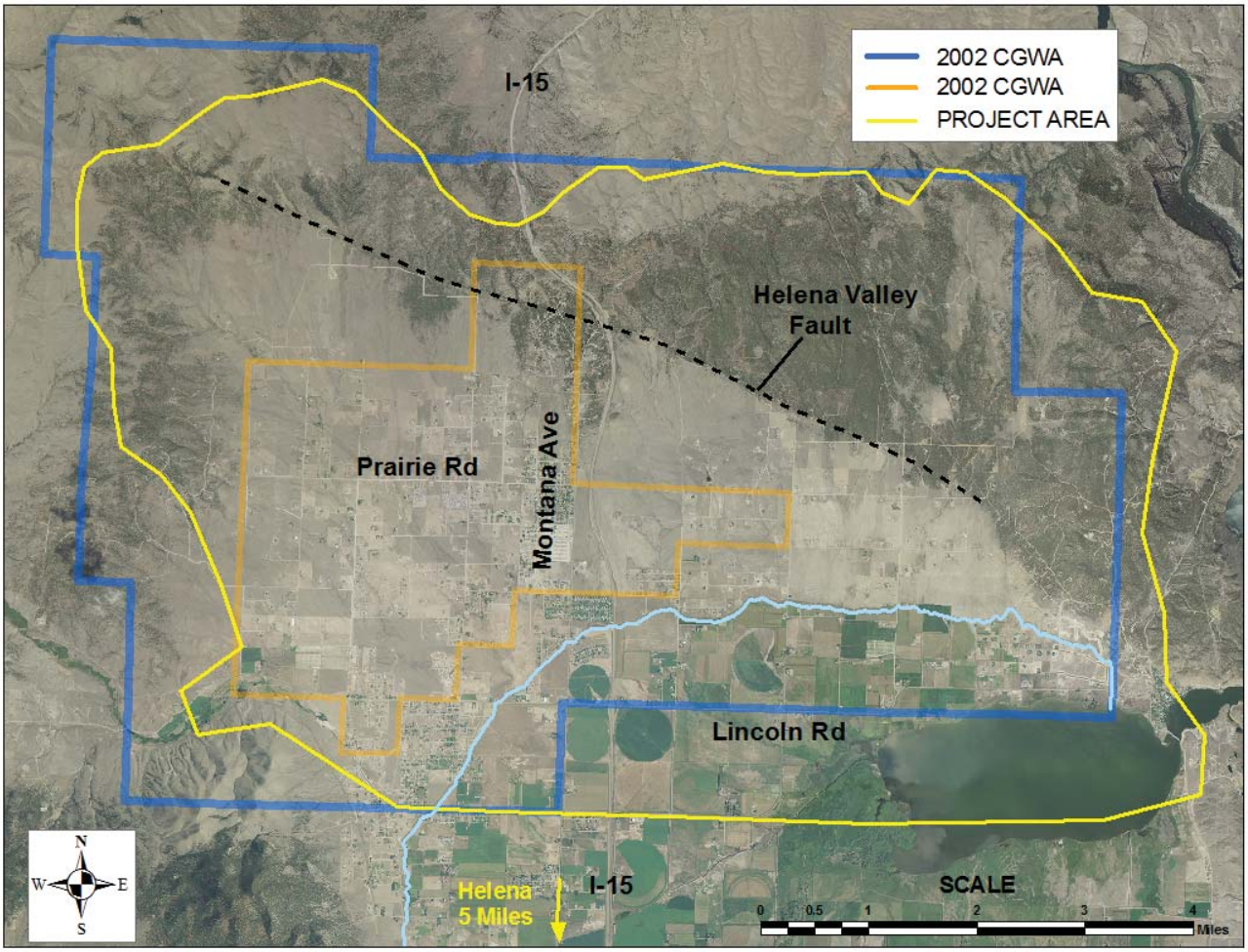
MBMG Ground Water Investigations Program

North Hills Study Area—
Lewis and Clark County

Introduction

High density subdivisions in the North Hills,and declining groundwater levels have caused concern about how much development can occur, how densely homes can be spaced, and if restrictions on water usage are needed. Elevated nitrate levels have been seen in some wells, creating concerns about the use of individual septic systems in places where thin soils overlie shallow fractured bedrock. These concerns resulted in the designation of a Temporary Controlled Groundwater Area (CGWA) by the Montana Department of Natural Resources and Conservation (DNRC) in 2002 and again in 2008.

An improved understanding of the geologic setting, aquifer properties, aquifer recharge, and aquifer discharge is being obtained through the collection of detailed hydrogeologic data. Monitoring of water levels has allowed the potentiometric surface to be better defined. Aquifer tests and water chemistry are being used to define aquifer properties, the degree to which aquifers are connected, and to evaluate water quality patterns. A numerical model of groundwater flow is being developed using these data. This will allow for the impacts from various development scenarios to be evaluated.



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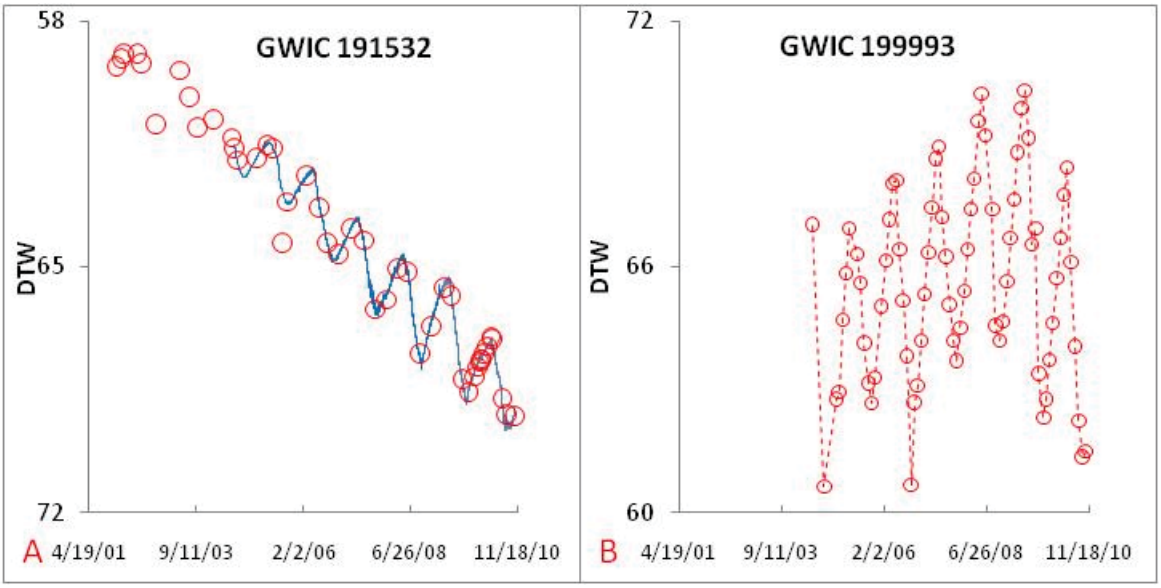
Project Issues:

- How much development can occur in the North Hills?
- Do septic systems need to be managed differently in the North Hills?
  - How densely can homes be spaced?
- Should future groundwater development within the area be limited or ongoing monitoring be established?
  - MCA 85-2-506:
    - Will groundwater withdrawals reduce groundwater levels to the point that water right holders cannot reasonably exercise their water right?
    - Will groundwater withdrawals reduce surface-water availability to the point that water right holders cannot reasonably exercise their water right?
    - Is the groundwater suited for beneficial use?
- How would prospective limitations of development benefit existing water users?
- What ongoing monitoring is needed and how could it be used to trigger prospective limitations of development within the area?

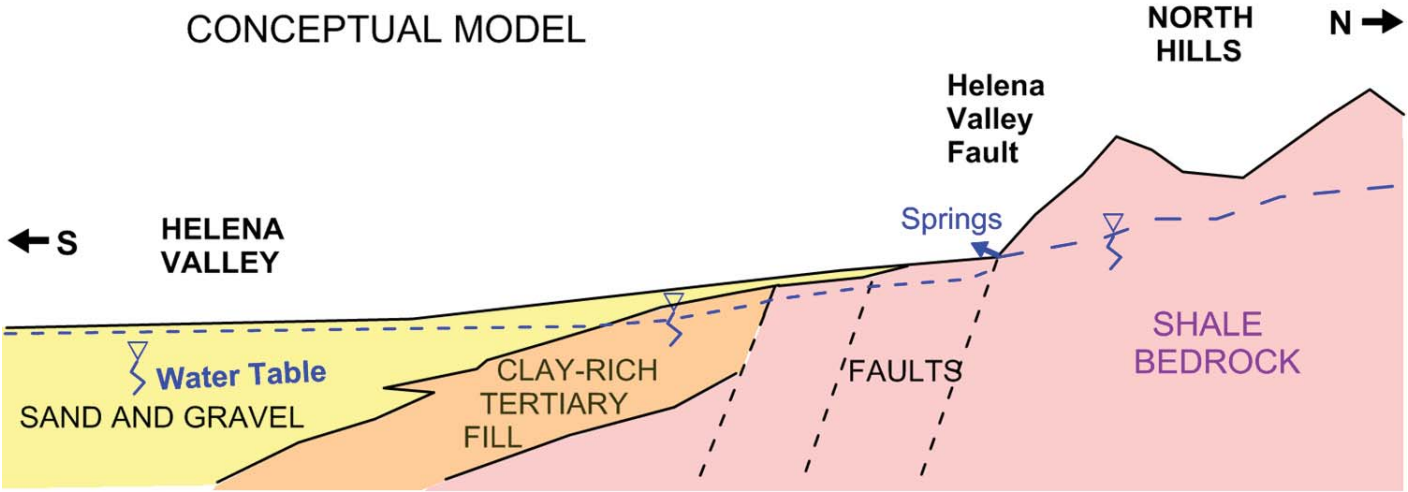
These are primarily regulatory issues, which must be addressed by the DNRC, Montana Department of Environmental Quality (DEQ), Lewis and Clark County, and others. The purpose of this investigation is to provide regulatory agencies and water policy experts with scientific information and products to assist in their decisions.

Approaches:

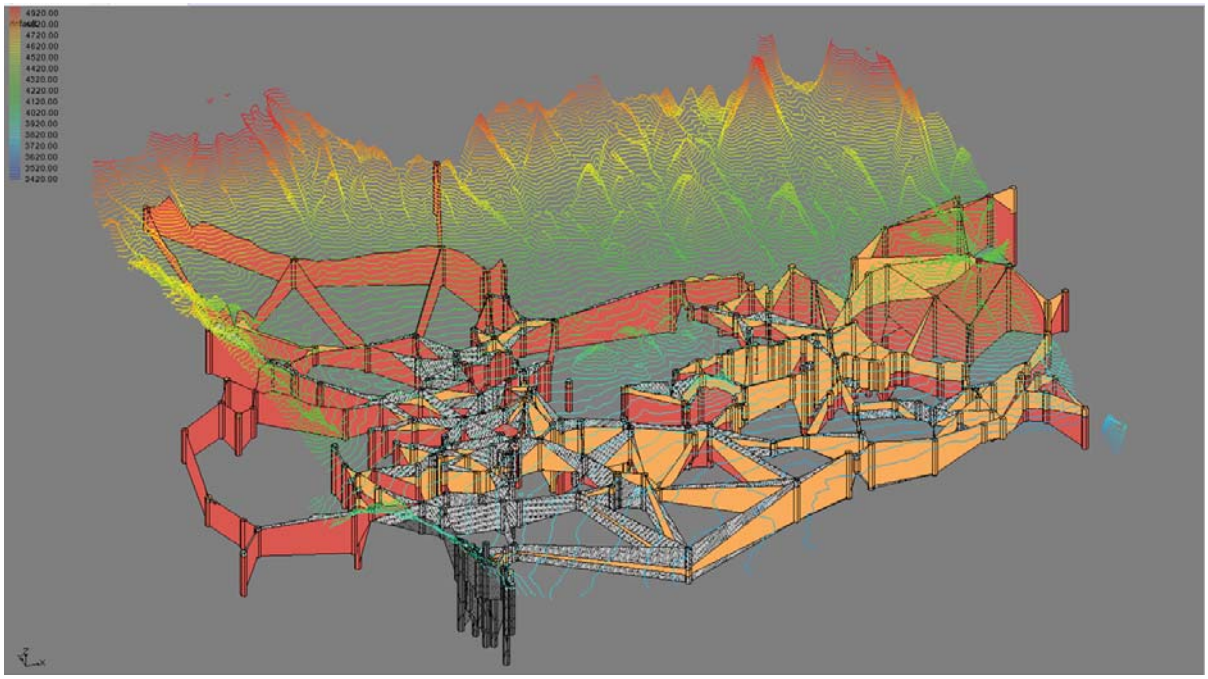
- Monitor groundwater elevations and spring discharges
- Conduct aquifer tests
- Document the water budget
- Explore the subsurface using geophysical methods
- Develop a conceptual hydrogeologic model
- Prepare a numerical hydrogeologic model
  - Calibrate using monitoring data
  - Test development and mitigation scenarios

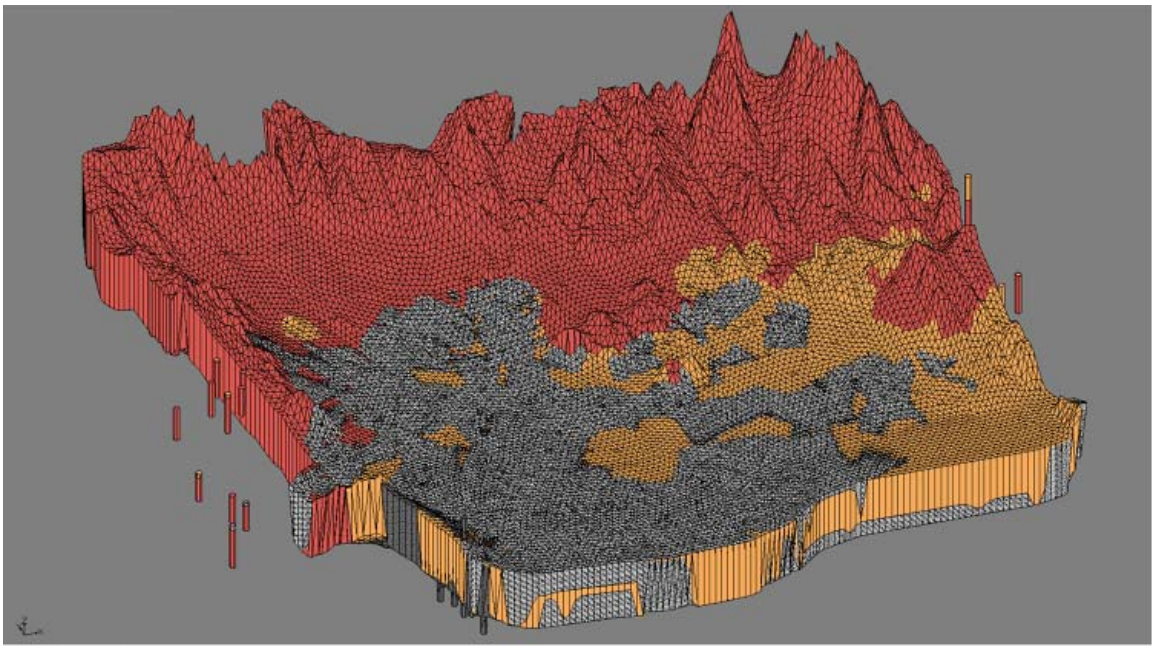


Groundwater levels are showing a consistent downward pattern in some portions of the North Hills (A). Some recovery occurs during the winter, when there is less pumping; however, maximum annual water levels have been consistently falling. In other areas, there is seasonal variation, but the overall pattern does not show increasing or decreasing trends (B).

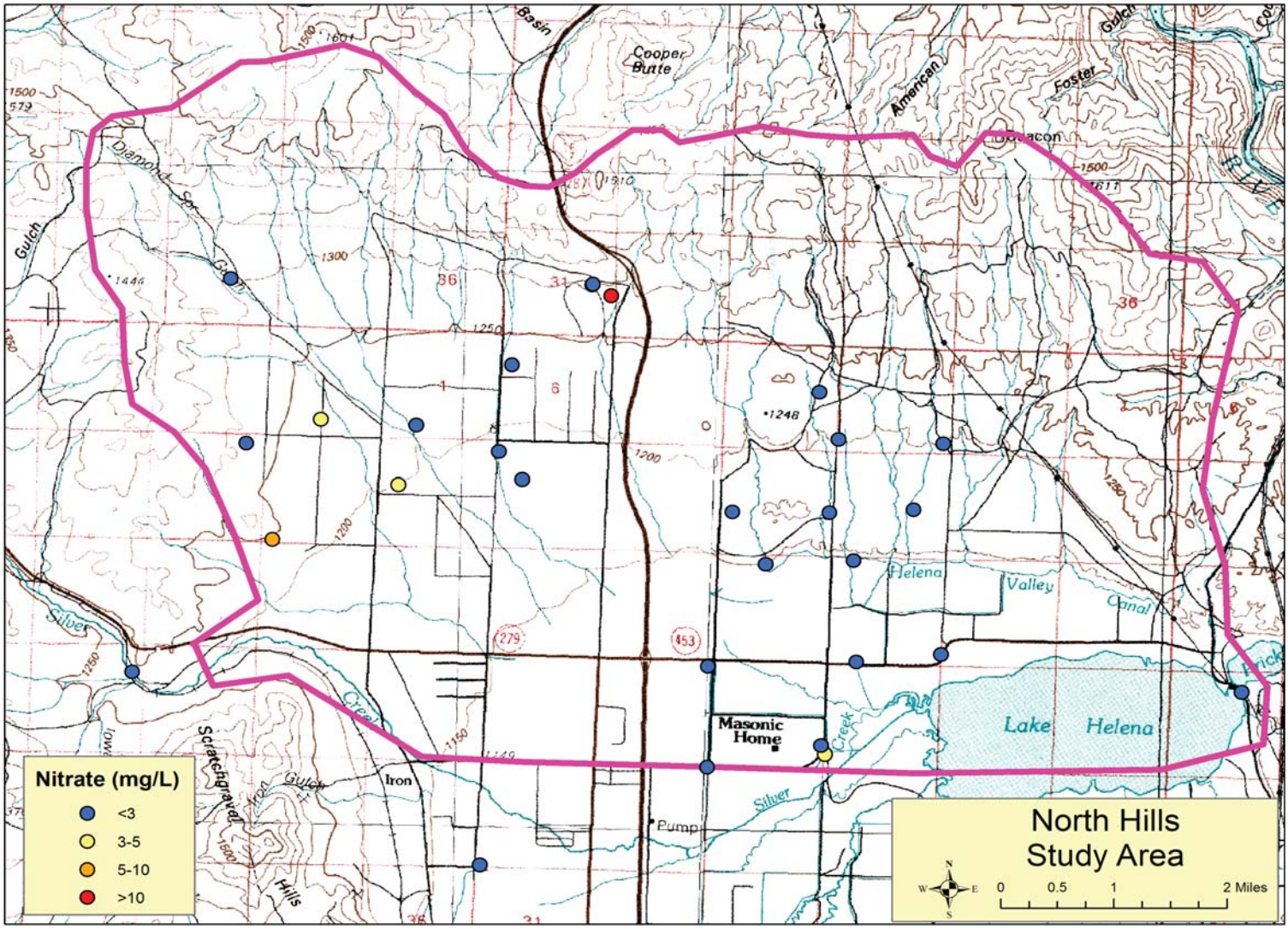


A basic conceptual hydrogeologic model for the North Hills, obtained by reviewing previous work in the North Hills.





A detailed evaluation of well logs in the North Hills was conducted as a part of this study. This work is being used to help guide the development of the numerical groundwater model grid and aquifer properties.



Analysis of groundwater chemistry has shown that standards for nitrate (above), arsenic, and manganese have been exceeded in some samples. The occurrence of these higher values appears to be localized.

Preliminary Project Results/Status:

- A refined potentiometric surface
- Aquifer test results
- Water quality data
- Surface water/groundwater interactions have been assessed.
- The water budget is being analyzed.
- A numerical hydrogeologic model is being constructed in consultation with the DNRC, DEQ, and Lewis and Clark County. It will be constructed using aquifer test data and calibrated using observed water levels and the water budget.
- Once the model is calibrated, it will be used to evaluate numerous development scenarios. The model will be able to evaluate local and regional impacts from each scenario.

It is anticipated that this information will assist the DNRC, DEQ, and Lewis and Clark County in making necessary regulatory decisions. This information may also be used by the Legislature's Water Policy Interim Committee (WPIC) to determine if legislative actions are needed.