

Data for Water Wells Visited during the Cascade-Teton Groundwater Characterization Study

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INTRODUCTION

This map shows locations and selected field data for wells and springs visited by the Montana Characterization Program between March 2008 and July 2008 during the Cascade-Teton Groundwater Characterization Area study. A total of 553 wells, completed in the study area's significant aquifers, were chosen from about 7,800 known water wells. Additionally, 61 springs were inventoried. Some previously visited wells near Bell, Montana (Reiter, and others, 2006) were revised to gather updated information.

This map is the first of a series that describes the hydrogeologic framework of the study area. Geologic structures, mapped extents of geologic units, and cross sections are included on the Hydrogeologic Framework map (Atlas 7, Map 2).

GEOLOGIC UNITS AND THE HYDROGEOLOGIC FRAMEWORK

All visited wells/springs were assigned geologic unit codes (tables 1 and 2; fig. 1) that describe the geologic source and the rocks/materials supplying the water. These are their names and their relationships to aquifer systems and the hydrogeologic framework. The hydrogeologic framework is based on the lithologic log and completion record (when available) to geologic maps (Vade, 2009; Berg, 2009a, 2009b), Berg and Vade (2002), Vade and others (2002a,b), and Reynolds and Brandt (2005, 2007). Important stratigraphic distinctions between units have been described and mapped by Cobban and others (1959), Peterson (1966), and Patterson (1991). Cobban and Peterson's descriptions of the stratigraphic column are the most recent and are used here to identify the sequence and age of rock units from northwest to southeast having very little lateral variation. The stratigraphic column (fig. 1) illustrates ages and relationships between the various rock units. There are numerous unconformities that represent missing geological units and erosion during periodic uplift along the Sweetgrass Arch between the early Cambrian and late Cretaceous.

Geologic units are part of the hydrogeologic framework when they act as aquifers. An aquifer is a geologic unit (or more than one unit) that can provide adequate quantities of water to a well or spring. The geologic unit, the topographic position, and the well's position in the groundwater flow system (distance from recharge and/or groundwater-residence time along groundwater paths) affect water quality and quantity.

The most important aquifers in the southern half of the study area are mid-Cenozoic members in the Choteau-Kootenai Formation and limestone in the Mississippian Madison Group. These aquifers are bordered to the south by the Little Belt Mountains and to the southwest by the Adel Mountain Volcanics. North of the Missouri River, the Madison Group and overlying strata dip into the subsurface and are covered by Cretaceous Colorado Plateau (central and eastern parts of study area) and the Montana Group, which include several intervening water-bearing sandstone units such as the Virgilia Formation. The Madison Group is the primary source of groundwater in the study area. Aquifer thicknesses derived from depositional and erosional processes of glacialiation from the west and continental glaciation from the north. Whereas these Cenozoic deposits are permeable and adjacent to surface water, or under marine influence, they are productive aquifers. In the Greenfords Bench area the underlying Madison Group produces large amounts of potable water. Farther northwest, the Montana Group's Two Medicine and Virgilia Formations contain sand lenses that are viable groundwater sources. Groundwater is also available to a limited extent from other thin sand units in the Horseshoe and Telegraph Creek Formations.

SITE VISITS

Selected sites were visited to baseline data for alluvial and bedrock aquifers. Coordinates for locations of wells and springs are provided in table 1. Locations are given in UTM coordinates for accuracy. Elevations and true location were determined using USGS 1:100,000 topographic maps. Where possible, data collected included the static water level, water temperature, pH, and the specific conductivity. All reported parameters represent stable readings attained after a ~30-minute pumping duration. Staff collected water-quality samples from selected wells and springs after field parameters were measured. Samples were collected in plastic containers and sent to the laboratory to be analyzed to measure water-quality parameters or were not accessible to measure water levels. Selected data for the visited wells/springs are included in table 2; well locations and their Groundwater Information Center (GWIC) identification numbers are shown on the map. Selected wells were sampled as indicated in table 2; results for complete water analyses (major ions and trace metals) and nitrate analyses are available from GWIC.

DATA SOURCES

All data, including water-quality analytical results, are available from the MBMG's GWIC database (<http://mbmgc.mtech.edu>). Land ownership, hydrography, public land survey, and road data were obtained from the Natural Resource Information System at the Montana State Library in Helena, Montana (<http://nris.mts.lib>).

ACKNOWLEDGMENTS

We thank all property owners who gave permission to visit their wells. Reviews of the map by Tom Parham, Stinson, Kirk Warren, John Metz, and Ed Deal are greatly appreciated. Many thanks go to Patrick Beyer for his help in identifying wells and his extensive discussions and thoughts about the topography of the Madison Group and the thickness of glacial deposits. Layout by Susan Smith, editing by Susan Barth.

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