Greenough Lake Campground

Source Water Delineation and Assessment Report (SWDAR)

Greenough Lake Campground
United States Forest Service
Public Water Supply

State of Montana Public Water Supply ID# MT0062227

United States Forest Service
Beartooth Ranger District

HC 49
P.O. Box 3420
Red Lodge, Montana 59068

Phone: 446-2103

October 2003

Table of Contents

INTRODUCTION

The Safe Drinking Water Act (SDWA) Amendments of 1996 require states to develop and implement Source Water Assessment Programs (SWAP) to analyze existing and potential threats to the quality of the public drinking water supplies throughout the state. The US Environmental Protection Agency (EPA) formally approved the Montana SWAP, prepared and administered by the Montana Department of Environmental Quality (MDEQ), in November 1999. The Montana SWAP was developed from the former Wellhead Protection Program, but includes surface water sources and requires a more rigorous inventory of potential contaminant sources.

SWAP addresses only public water systems (PWS) regulated according to the Federal Safe Drinking Water Act. A public water supply system is defined, according to Federal and Montana regulations, as a system that supplies water for human consumption. A public water supply system has at least 15 service connections or regularly provides water to at least 25 persons daily for a minimum of 60 days in a calendar year. There are three types of public water supply systems:

- Community water systems provide water on a year-round basis, and have a minimum of 15 service connections or regularly serve at least 25 residents. In addition to incorporated towns, community systems may serve smaller areas such as housing subdivisions or trailer courts.
- Non-transient non-community systems do not serve communities, but provide water regularly to a minimum of 25 of the same people for at least 6 months of a year. These systems serve public buildings such as schools and hospitals, where people are employed but do not reside.
- Transient non-community systems do not serve communities, and do not regularly serve a minimum of 25 of the same people for at least 6 months of the year. These systems are usually seasonal, and are located in areas such as campgrounds and parks. The Greenough Lake Campground PWS is a transient non-community system.

The Montana Source Water Protection Program is intended to be a practical and cost-effective approach to help public drinking water supplies protect their water source from contamination. The United States Forest Service (USFS) works with the Montana DEQ to complete delineation and assessment reports for USFS managed public water supplies in Montana. The Source Water Delineation and Assessment Report (SWDAR) compiles the appropriate data and other technical information about an area to allow the USFS to develop source water protection plans for potable water supplies. Delineation is a process whereby areas that contribute water to aquifers or surface waters used for drinking water, called source water protection areas, are identified on a map. Geologic and hydrologic conditions are evaluated in order to delineate source water protection areas. Assessment involves identifying potential contaminant sources in delineated source water protection areas, and evaluating the potential for contamination of drinking water from these sources under "worst-case" conditions such as a flood, fire or human error.

Scope and Purpose

This report presents the source water delineation and assessments for the public water supply for the Greenough Lake Campground located southwest of Red Lodge, in Carbon County, Montana. This report is intended to meet the technical requirements for the completion of the delineation and assessment report for this PWS, as required by the Montana Source Water Protection Program (DEQ, 1999) and the federal Safe Drinking Water Act (SDWA) Amendments of 1996 (P.L. 104-182).

Acknowledgements

This report was prepared by James Swierc, hydrogeologist with the USFS Region 1 office, as part of a cooperative agreement with the United States Environmental Protection Agency. The Custer National Forest Engineer, Arlin Krogstad; and Engineering Technician, Joe Gibbs, provided information on well location and the inventory of potential contaminant sources.

Limitations

This report was prepared to assess threats to the Greenough Lake Campground public water supply and is based on published information. The terms "drinking water supply" or "drinking water source" refer specifically to sources for regulated public water supplies, and not any other type of water supply. The inventory of potential contaminant sources focuses on the management areas delineated for the public water supply in this report. As a result, other potential sources of contamination to surface and ground water in the area may not be identified.

BACKGROUND AND DELINEATION

The Greenough Lake Campground is located within the Custer National Forest, approximately 12 miles southwest of Red Lodge, Montana; 4 miles north of the Wyoming border. The campground is located along US Highway 212, which runs from Red Lodge to Yellowstone National Park through the Beartooth Mountains. The campground is a transient, non community public water supply. The Greenough Lake Campground and well is located at approximately 46.055º North latitude and 109.415º West longitude, in Section 8 of Township 9 South, Range 19 East. The location of the well in the Custer National Forest is shown in Figure 1, with a more detailed location shown in Figure 2. The Greenough Lake Campground well provides water for patrons of the campground. The sanitary survey for the system (Appendix A) indicates an estimated population of 50 people are served by the PWS. The campground is open from approximately May 15 to October 1 each year.

The public water supply uses one well (Source 002), installed to an approximate depth of 47 feet. The well was completed on August 3, 1968. Water enters the well through perforations in the casing, at a depth from 37 to 47 feet. The well log (Appendix B) reports a static water level of 6 feet, with a pumping water level at 18 feet after 4 hours pumping 30 gpm. The well has a MBMG-GWIC Classification number of 106080. The water right number for the well from DNRC files is C58283-00. Water is obtained from the well using a hand pump. There is no treatment of the water prior to use.

Hydrogeologic Assessment

The evaluation of the hydrogeology of the area is based predominantly on standard principles of hydrogeology. There are no readily available references specific to the hydrology or geology of the Rock Creek drainage in this area. Ground water for the wells occurs in a shallow unconfined aquifer in the base of a glacially carved "U" shaped valley. A geologic map of the region is shown in Figure 3, with the approximate boundaries of the aquifer shown in Figure 4. In mountainous area, stream flow typically increases due to ground water discharge into the base of the stream. Area well logs (Appendix B) indicate wells are installed to an approximate depth of 50 feet in the area, with ground water typically occurring at less than 10 feet. The upper 35 feet of the aquifer comprise gravel and large boulders, with finer grained sand and gravel occurring below this depth. The presence of fine-grained material at the base of the valley may reflect glacial deposits from the glacial activity which formed the major features in the area. The shallow depth to ground water and coarse grained nature of the aquifer material support the connection between surface water and ground water in this area.

Recharge to the aquifer occurs from bedrock discharge, as evidenced by increased flow in Rock Creek downstream from the PWS. Additional recharge may occur from stream loss in certain stretches of Rock Creek and where tributaries enter the valley, and from direct infiltration of precipitation. The depth to ground water in the area is typically shallow and varies during the year, and ranges from approximately 5 to 20 feet below the ground surface.

In summary, ground water is interpreted to flow in a direction that generally follows topography. Ground water discharge to the stream likely occurs in this area, with classification of the Rock Creek as a gaining stream. This type of unconfined aquifer is classified as having a ***high*** source water sensitivity to contamination according to the Montana SWAP Program (DEQ, 1999).

Source Water Protection Management Zones

The source water protection areas for the Greenough Lake Campground PWS are identified based on the criteria for a transient non-community PWS as defined in the Montana SWAP Program (DEQ, 1999). For the PWS source, two primary management areas are identified within the source water protection area; the control zone and the inventory region. The control zone, also known as the exclusion zone, is an area at least 100-foot radius around the well. The inventory region for the well is delineated as the area within a one-mile radius around the well. The inventory zone for the well and the surrounding area is depicted in Figure 4.

Since the aquifer is in communication with ground water, a surface water buffer zone is delineated as a secondary management zone. The surface water buffer zone represents the area of one-half mile on each side of a stream, within a four-hour time of travel distance not to exceed ten miles upstream from the inventory zone. For Rock Creek in the mountains, stream flow during a storm event would likely exceed ten miles in four hours; therefore a ten-mile limit on the distance is assumed. This distance includes the entire Rock Creek watershed upgradient from the Greenough Lake Campground. The surface water buffer zone is shown in Figure 4.

Greenough Lake Campground Sampling Results and Water Quality

Every PWS is required to perform monitoring for contamination to their water supply. The monitoring parameters for transient non-community systems typically include coliforms (as an indicator of pathogenic organisms), and nitrates as an acute health risk. A review of DEQ and USFS databases of monitoring results for the Greenough Lake Campground PWS indicates no detections of any contaminants. The detected level of nitrates has been consistently less than the drinking water standard of 10 mg/L.

INVENTORY

An inventory of potential sources of acute health hazards was conducted for the Greenough Lake Campground PWS source within the control and inventory zones. The contaminants in this category represent nitrates and pathogens, as required by the Montana Source Water Protection Program (DEQ, 1999). Potential sources include areas with septic systems and agricultural areas where nitrogen fertilizers may be used. These are shown in Figure 4 and Figure 5. While additional sources of contamination may be present, this assessment only focuses on the above listed potential contaminants.

Inventory Results/Control Zone

The control zone represents the most critical point to protecting the integrity of a wellhead for ground water sources. The land around the control zone for the well includes the loop road and part of campsites for the campground. The vault toilet for the campground is located across the campground access road from the well. The control zone around the wellhead is not fenced or otherwise protected from access.

Inventory Results/Inventory Region

The inventory region represents the area near the source wells where any contamination spilled onto the ground or subsurface has the potential to migrate directly into the PWS source aquifer. Vault toilets for the Greenough Lake Campground, and for adjacent campgrounds, represent the only potential contaminant source identified within the inventory zone. Land use within the inventory region is classified as non-agricultural and non-urban; primarily forest as shown in Figure 5. The area is primarily undeveloped with a limited number of residences. The access road to the campground, and US Highway 212 are present in the inventory zone.

Inventory Results/Watershed Region

Land use within the watershed region is classified as non-agricultural and non-urban. The region has experienced some mining activity, with the location of mining prospects shown with watershed land use in Figure 6.

SUSCEPTIBILITY ASSESSMENT

Susceptibility is the potential for a public water supply to draw water contaminated by inventoried sources at concentrations that would pose concern. Susceptibility is assessed in order to prioritize potential pollutant sources for management actions by the Custer National Forest, in this case the Greenough Lake Campground PWS.

The goal of Source Water Management is to protect the source water by controlling activities in the control zones and managing significant potential contaminant sources in the Inventory Regions. Management priorities in the Inventory Regions are determined by ranking the significant potential contaminant sources identified in the previous chapter according to susceptibility. Alternative management approaches that could be pursued by the Custer National Forest for the Greenough Lake Campground PWS to reduce susceptibility are recommended.

Susceptibility is determined by considering the hazard rating for each potential contaminant source and the existence of barriers that decrease the likelihood that contaminated water will flow to the Greenough Lake Campground PWS source. Hazards are assigned based on the percent of land in the inventory zone for non-point sources, and the location for point sources. Susceptibility ratings are presented individually for each potential contaminant source.

After the relative hazard of a potential contaminant source is assigned, the relative susceptibility is determined based on the presence of barriers that may mitigate the potential for a contaminant source to impact a water source. Barriers may represent natural conditions, engineered barriers or management actions. Natural barriers include anything that can be demonstrated as effective in slowing the migration of any chemicals released at the surface. Engineered barriers represent man-made structures to contain chemicals if they are released. Management barriers are plans that prohibit or control potentially polluting activities, but only if there is a plan or approach that has been formally implemented. For the Greenough Lake Campground PWS source, no barriers were identified for the aquifer and well. A management barrier is noted for the vault toilets, representing the proper maintenance of the facilities.

Susceptibility Assessment Results

The results of the susceptibility assessment for the Greenough Lake Campground PWS are listed in Table 1. The primary threats identified are the vault toilets for the campground and adjacent campgrounds, and the access road. The summary information in Table 1 reviews the relative hazard, barriers and susceptibility ranking of each potential source. Management alternatives are recommended that can help reduce the relative susceptibility of each identified potential contaminant source to the PWS sources.

Table 1. Susceptibility assessment of significant potential contaminant sources.

Source	Contaminant	Hazard	Hazard Rating	Barriers	Susceptibility	Management
Control Zone						
Vaulted Toilet	Nitrates and Pathogens	Infiltration and Runoff	High	Management	High	Maintain proper operation and maintenance protocols
Inventory Zone						
Vaulted Toilets	Nitrates and Pathogens	Infiltration and Runoff	High	Management	High	Maintain proper operation and maintenance protocols
US 212 and Campground Access Road	Various Chemicals	Spills	High	None	Very High	Develop emergency response plan

REFERENCES

Alden, W.C., 1953. Physiography and Glacial Geology of Western Montana and Adjacent Areas; U.S. Geological Survey Professional Paper 231.

Fetter, C.W., 1994. Applied Hydrogeology, Macmillan College Publishing Co., New York, NY.

Heath, R., 1982. Basic Ground Water Hydrology, U.S. Geological Survey Water Supply Paper 2220.

Lopez, D., 2001. Preliminary Geologic Map of the Red Lodge 30 x 60 minute Quadrangle, Montana. United States Geological Survey.

Montana Department of Environmental Quality (DEQ), 1999. Montana Source Water Protection Program.

Ross, C.P., Andrews, D.A., and I.J. Witkind, 1955. Geologic Map of Montana; United States Geological Survey, in cooperation with the Montana Bureau of Mines and Geology.

Todd, D.K., 1980, Ground Water Hydrology, John Wiley and Sons, New York, NY.

United States Environmental Protection Agency (EPA), 1993. Seminar Publication – Wellhead Protection: A Guide for Small Communities, EPA/625/R-93/002.

United States Geological Survey, 2000. Preliminary land use classification data for Montana