

# Baseline Water Quality of Minnesota's Principal Aquifers: Region 1, Northeast Minnesota

GWMAP, March 1999

## What was the baseline study?

Between 1992 and 1996, the Minnesota Pollution Control Agency's (MPCA) Ground Water Monitoring and Assessment Program (GWMAP) sampled 954 primarily domestic wells across Minnesota. The goal of this study, called the baseline study, was to determine ambient water quality in Minnesota's principal aquifers.

## What parameters were sampled?

Each well was sampled for 48 inorganic chemicals, such as nitrate, chloride, arsenic and metals; 68 volatile organic compounds (VOCs), such as benzene; other parameters, such as pH and temperature; total dissolved solids and total organic carbon. The water in selected wells was tested for tritium, the presence of which is an indicator of water less than 50 years old.

## What is Region 1?

The MPCA has divided Minnesota into six regions. Region 1 encompasses the northeastern portion of the state and includes the counties of Aitkin, Carlton, Cook, Itasca, Koochiching, Lake and St. Louis. The regional office is in Duluth.

## How many wells were sampled and in which aquifers?

Between 1995 and 1996, 139 wells were sampled in Region 1. Of these 139

samples, 21 were collected from wells completed in surficial sand and gravel aquifers, 64 were collected from wells completed in buried confined sand and gravel aquifers, 53 were from wells that went to Precambrian aquifers, and one was collected from a well that went to a Paleozoic aquifer.

## What is the quality of ground water in Region 1?

Ground water quality in most aquifers of Region 1 is good. Concentrations of chemicals in Precambrian aquifers were similar to concentrations in similar aquifers statewide. Concentrations of major cations and anions were lower in surficial and buried drift aquifers compared to similar aquifers statewide, while concentrations of trace metals were higher. The numbers of exceedances of drinking water criteria are shown in the table below. Geology controls ground water quality in Region 1. Consequently, trace inorganic chemicals, such as beryllium, boron, manganese, arsenic and selenium, may be of concern locally. VOCs were found in 28 (20 percent) of the wells. The primary VOCs were chemicals associated with well disinfection (chloroform), atmospheric fallout (chlorofluorocarbons or CFCs) and fuel oils (toluene). All VOC concentrations were below drinking water criteria.





Parameter	Number of exceedances of drinking criteria			
	Paleozoic aquifers	Precambrian	Buried sand and gravel	Surficial sand and gravel
Arsenic (As)	0	1	0	0
Beryllium (Be)	0	7	3	2
Boron (B)	0	3	1	0
Manganese (Mn)	0	2	3	1
Selenium (Se)	0	2	0	0

### What are the primary research needs in Region 1?

The primary research needs for Region 1 include:

1. a better understanding of ground water hydrology, particularly mechanisms of recharge and transport, and determining ground water residence times;
2. determining impacts of mineralogy of the different bedrock units on ground water quality;
3. collecting land use information to identify causes of the high occurrence of VOCs in ground water; and
4. developing a consistent method of classifying bedrock aquifers.

### What are the primary monitoring needs for Region 1?

Monitoring needs for Region 1 include:

1. collecting additional samples from Precambrian aquifers and

2. collecting an additional 50 samples for VOCs from aquifers most likely to be impacted by VOCs.

### What is the role of GWMAP in addressing these research and monitoring needs?

GWMAP discontinued baseline sampling in 1997. We feel the emerging ground water issues are identifying aquifer and regional water quality as impacted by human activity, assessing the effectiveness of environmental policies and programs, and establishing long-term monitoring networks to determine whether water quality is changing in response to human activity. We will strive to work with other ground water programs that deal directly with ground water problems and effectiveness monitoring, and attempt to secure funding for establishing long-term monitoring networks.