New Brunswick Groundwater Chemistry Atlas: 1994-2007

Introduction

Under the *Potable Water Regulation* of the *Clean Water Act*, the Province of New Brunswick maintains a database of groundwater quality data collected from domestic water wells drilled since 1994. The data are valuable to various user groups, notably health professionals, scientists, groundwater researchers, land use planners, municipal officials and well owners. The database comprises results from approximately 10,500 inorganic chemistry samples from 1994 to 2007 that were previously only available as aggregate data. The New Brunswick Groundwater Chemistry Atlas aims at making this information more accessible to user groups through the geographical representation of the data.

In the Atlas, 28 parameters are individually mapped (plates 4-31): alkalinity, aluminum, antimony, arsenic, barium, boron, bromide, cadmium, calcium, chloride, chromium, conductivity, copper, fluoride, hardness, iron, lead, magnesium, manganese, nitrate, pH, potassium, selenium, sodium, sulphate, thallium, uranium and zinc. These parameters constitute the standard inorganic analysis conducted at the New Brunswick Department of Environment Analytical Services Laboratory. The range in concentrations for each parameter is presented along with information pertaining to the distribution of the data and their relationship to applicable drinking water quality guidelines.

Over the course of the reporting period, a number of changes in laboratory equipment and reporting protocols have taken place. For example, in instances where earlier lab reports may have indicated trace amounts of a chemical, the same result might now be reported as below detection. In addition, the detection limits for several parameters have changed over the years. For the purpose of the frequency graphs presented in this Atlas, values below the detection limit were not plotted. Hence, ranges in concentration on the distribution plots represent quantifiable values only. Median values were calculated only for parameters that had all or most of the data greater than the detection limit.

The ranges in concentrations plotted on the maps were chosen to reflect both the data distribution and any health-based or aesthetic guidelines that exist for each parameter.

Throughout the Atlas, reference is made to the Guidelines for Canadian Drinking Water Quality established by Health Canada. The New Brunswick Department of Health has adopted these guidelines and uses them to evaluate the quality of drinking water in the Province. The maximum acceptable concentration (MAC) is the health-based criteria. The aesthetic objective (AO) is established for parameters that may impair the taste, smell or colour of water but do not cause adverse health effects.

Two parameters experienced changes in MAC during the reporting period: arsenic was lowered from 0.025 mg/L to 0.010 mg/L in 2006; and uranium was lowered from 0.100 mg/L to 0.020 mg/L in 1999. For arsenic, this change is reflected in the distribution plot and in the mapped data ranges. Analysis for uranium in drinking water does not pre-date 2000 at the New Brunswick Department of Environment Analytical Services Laboratory, therefore, there are fewer samples reported for this parameter.

Plate 1 shows the location and depth of domestic water wells across the Province for which chemistry data and complete well driller's reports are available. Variations in population density should be taken into consideration when comparing water quality from different areas of the Province. In areas with very little data, results may not be representative of background groundwater quality. Thus, the Atlas should be used for general information purposes only and independent confirmation of groundwater quality for specific sites is recommended.

Plates 2 and 3 respectively present surficial and bedrock geological maps for New Brunswick. Since natural groundwater quality is influenced by the geologic materials encountered, the reader is encouraged to consult these maps in conjunction with the water quality maps presented. More detailed copies of these geology maps can be obtained from the New Brunswick Department of Natural Resources.

In general, the water quality of domestic water wells in New Brunswick is good. The following tables provide a detailed breakdown of the compliance of water well samples with health-based guidelines (Table 1) and aesthetic guidelines (Table 2).

Table 1: Compliance of NB domestic water well samples with health-based guidelines

Parameter	Percentage of samples in compliance
Antimony	99.4%
Arsenic	94.1%
Barium	98.6%
Boron	100%
Cadmium	99.9%
Chromium	99.8%
Fluoride	95.0%
Lead	97.3%
Nitrate	99.4%
Selenium	98.9%
Uranium	97.9%

Table 2: Compliance of NB domestic water well samples with non-health-based aesthetic guidelines

Parameter	Percentage of samples in compliance
Chloride	96.7%
Copper	99.9%
Hardness	89.2%
Iron	71.2%
Manganese	60.2%
pH	86.3%
Sodium	96.6%
Sulphate	99.4%
Zinc	99.9%