

# Arsenic in Groundwater<sup>1</sup>

February 2007

## What is arsenic?

Arsenic is a chemical element with the symbol “As.” It is found naturally in rocks in the earth’s crust. Arsenic is recognized as a poison and cancer causing substance (carcinogen). It occurs within organic compounds (combined with hydrogen and carbon), and within inorganic compounds (combined within sulphur, chlorine or oxygen).

In water, arsenic has no smell or taste and can only be detected through a chemical test. The ambient concentration of arsenic in surface and ground waters in Canada is very low, usually ranging from 0.001 to 0.002 milligrams per litre (mg/L). Concentrations in groundwater are often higher than those measured in surface waters. Some creeks that are recharged by groundwater with high levels of arsenic may also have high levels. The Canadian drinking water guideline for arsenic sets a Maximum Acceptable Concentration of 0.010 mg/L.

## What are the known sources of arsenic?

Localized high concentrations of arsenic have been found in well water from several regions in British Columbia, almost always associated with arsenic-containing bedrock formations. The most common sources of elevated arsenic levels in groundwater are:

- Weathering of arsenic bearing minerals and ores
- Infiltration or runoff from locations of past mining activities.

## What are the environmental health concerns?

Water that contains arsenic is only a concern if it is being used for drinking or food preparation. Exposure through breathing and skin contact is not considered significant or harmful. Ingested arsenic is transmitted through the blood stream and may concentrate within the internal organs, skin, hair and nails. It is eliminated from the body mainly in urine.

Exposure to high levels of arsenic can cause short term or acute symptoms, as well as long-term or chronic health effects. Symptoms of exposure to high levels of arsenic may include stomach pain, vomiting, diarrhea and impaired nerve function that may result in “pins and needles” sensation in hands and feet. Arsenic can also produce a pattern of changes in your skin which includes darkening of wart-like growths – most frequently found on the palms or soles. Because children tend to drink more water per unit of body weight than do adults they may have a greater exposure to arsenic from drinking water and as a result be at increased risk of adverse effects when elevated concentrations of arsenic are present.

Long-term (years to decades) exposure to even relatively low concentrations of arsenic in drinking water can increase your risk of developing certain cancers including skin, lung, kidney and bladder cancer. Cancer is the critical health effect used in setting the Canadian guideline for arsenic in drinking water.

## Other information sources:

Health Canada, Guidelines for Canadian Drinking Water Quality Supporting Documents. [http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/doc\\_sup-appui/index\\_e.html](http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/doc_sup-appui/index_e.html)

Health Canada, *It's Your Health*. [http://www.hc-sc.gc.ca/iyh-vsv/environ/index\\_e.html](http://www.hc-sc.gc.ca/iyh-vsv/environ/index_e.html)

B.C.'s Ground Water Protection Regulation: [http://www.env.gov.bc.ca/wsd/plan\\_protect\\_sustain/groundwater/index.html](http://www.env.gov.bc.ca/wsd/plan_protect_sustain/groundwater/index.html)

B.C. Ministry of Health, “Safe Water Supply Vital to Your Health.” (1999) <http://www.healthservices.gov.bc.ca/protect/pdf/PHI052.pdf>

B.C. Ministry of Health, Health Files. <http://www.bchealthguide.org/healthfiles/index.stm>

Type “water” in the search section and look for various articles including:

- #45 “Should I Get My Well Water Tested?”
- #49c “Arsenic in Drinking Water.”



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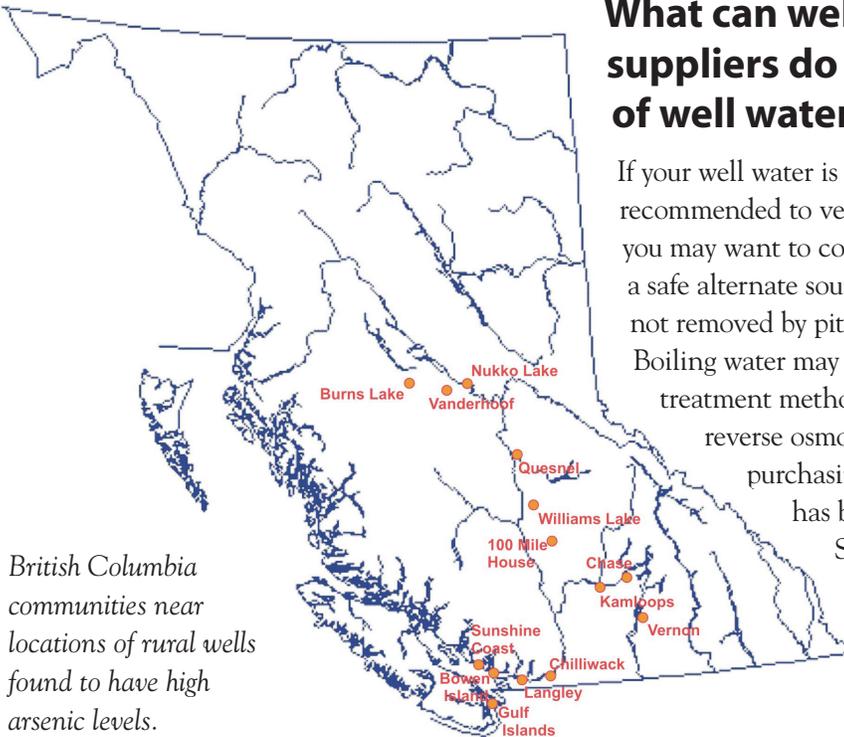


<sup>1</sup> Information in this fact sheet is generally intended for private wells. Please note that any water supply system or well serving anything other than one single family dwelling is defined as a water supply system under the *Drinking Water Protection Act* and Regulations and must be sampled according to the Act and Regulations. The person operating such a system is defined as a water supplier.

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## Where have high arsenic levels been found in B.C. well water?

The Ministry of Environment evaluated the results of groundwater samples obtained through the *Water Quality Check Program* carried out between 1977 and 1993. Over 2,100 samples were analysed for arsenic, of which 4.2% had arsenic levels over 0.010 mg/L. Arsenic concentrations above the drinking water guideline were found in some rural wells on the Sunshine Coast and the Gulf Islands and near the communities of 100 Mile House, Bowen Island, Burns Lake, Chase, Kamloops, Quesnel, Vernon, Chilliwack, Langley and Williams Lake. High arsenic has been found in isolated wells on Saltspring Island, the Lower Mainland, and near Nukko Lake. Arsenic levels above the drinking water guideline may also occur locally in other regions of the province.



British Columbia communities near locations of rural wells found to have high arsenic levels.

## What can well owners and water suppliers do about arsenic contamination of well water?

If your well water is tested and contains arsenic, a second test is recommended to verify the original results. If arsenic is present, then you may want to consider using bottled water, obtaining water from a safe alternate source, or treating the current source. Arsenic is not removed by pitcher-type filtration units, chlorination or boiling. Boiling water may increase the concentration of arsenic. Water treatment methods that can remove arsenic from well water include reverse osmosis, some filters and distillation units. When purchasing a treatment device, you should consider one that has been certified by an organization accredited by the Standards Council of Canada (SCC). The treatment device should meet the following standards: NSF/ANSI Standard 62 on drinking water distillation systems, or Standard 58 on reverse osmosis drinking water treatment systems, or Standards 53 on drinking water treatment units — with specific designation for the water quality

parameters you are trying to remove (e.g. arsenic removal). Be sure that the device not only meets the standard, but meets it for arsenic removal. Certification assures that a device works as the manufacturer or distributor claims. Devices can be certified for treating a range of water quality concerns, so make sure that the device you purchase is explicitly certified for arsenic removal. Find an up-to-date list of accredited organizations at [www.scc.ca](http://www.scc.ca). Monitoring and upkeep of the treatment system is critical and all manufacturer's instructions should be followed carefully.

## Well water testing and source protection

Well owners are encouraged to test their water periodically to make sure it is safe to drink. When testing for arsenic, a “low level” analysis is required to ensure that the minimum detection limit of the analytical method used by the laboratory is below the drinking water guideline. If a water test detects arsenic, even at levels below the guideline, it would be important to have a second test done to confirm the results. Consult Public Health at your local Health Authority for advice regarding the specific parameters to test for and how often testing should be done. For more information on protecting your well water source, a *Well Protection Toolkit* is available from the Ministry of Environment on the internet: [http://www.env.gov.bc.ca/wsd/plan\\_protect\\_sustain/groundwater/wells/well\\_protection/wellprotect.html](http://www.env.gov.bc.ca/wsd/plan_protect_sustain/groundwater/wells/well_protection/wellprotect.html) to help water suppliers and communities develop a well protection plan to minimize the threat of land use activities on groundwater quality.

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