Arsenic Levels in Lakes around Yellowknife

1. Where does the arsenic in the Yellowknife area come from?

Arsenic is found at naturally low levels in the water of many NWT rivers and lakes. However, past gold mining activities have resulted in additional arsenic being released into the immediate environment surrounding the city.

2. Are these arsenic levels dangerous?

Trace amounts of arsenic detected in the Yellowknife River and Yellowknife Bay, as well as in a majority of the lakes tested (green dots as shown on the public health advisory map) are below Health Canada's Guidelines for Canadian Drinking Water Quality, and are similar to levels found in water supplies across Canada. Several lakes have arsenic levels above the drinking water guidelines but are not high enough to pose a human health risk for recreational activities in the lake (yellow dots).

This public health advisory is meant to address concerns about the fewer number of lakes that have elevated arsenic levels (orange, red and purple dots i.e., over 52 parts per billion or 'ppb') that require some precautions, particularly for vulnerable populations such as pregnant women and very young children.

This public health advisory provides advice based on open water (i.e. not winter/under ice) dissolved arsenic levels, unless winter values are the only information available. In smaller water bodies, ice freezing may increase the concentration of arsenic in the underlying water; however there is little to no exposure to the public from these small, frozen lakes. In larger lakes, we have not seen significant increases in arsenic levels when the ice freezes.

3. Is the tap water in Yellowknife safe to drink?

Yes. Yellowknife's tap water is safe to drink.

Residents of Yellowknife, N'dilo and Dettah receive their tap water from the City of Yellowknife. The drinking water is collected from the Yellowknife River upstream of the former Giant Mine, before the river enters Yellowknife Bay.

The City of Yellowknife also occasionally draws water directly from Yellowknife Bay when maintenance on the water pipe is required. Yellowknife Bay is tested regularly for arsenic and has consistently shown arsenic levels below drinking water guidelines. Testing of treated water from Yellowknife Bay has shown that this practice does not affect the quality of our drinking water, including with regard to arsenic levels. Regardless of water source, levels of arsenic in Yellowknife drinking water remain

below the national standard set by the Guidelines for Canadian Drinking Water Quality. This also includes trucked water which comes from the same source.

4. Is it safe to drink water from lakes (including frozen lakes) surrounding Yellowknife?

It is recommended not to drink untreated water anywhere in the Northwest Territories, primarily because of harmful microorganisms (germs such as E. coli, Giardia, Cryptosporidium and viruses) in untreated water that could make people sick. Individuals may, on occasion, boil water taken from lakes for personal use; however it is recommended to avoid doing so in lakes close to historical industrial activities. Boiling water, while killing harmful microorganisms, does not remove contaminants such as arsenic.

As the Chief Public Health Officer (CPHO) receives new data from water research or monitoring studies, the map of affected lakes and the associated health advice will be updated and the public notified.

It is also important to note that none of the affected lakes represented on the public health advisory map are sources of drinking water for the City of Yellowknife, Ndilo or Dettah.

5. Is the water safe for recreational use in lakes surrounding Yellowknife?

Yes, based on available arsenic data, most of the lakes near Yellowknife remain safe for recreational use such as swimming, boating and fishing. Public health advice in the advisory will be updated as data generated from research or monitoring studies is assessed by the CPHO.

Health risks associated with arsenic exposure depend on the mode of exposure (ingestion, inhalation or skin absorption), the concentration of arsenic and the form of arsenic. The advisory recommends that lakes with arsenic concentrations in water greater than 52 ppb not be used for regular recreational activities such as swimming. Research indicates that there is little uptake of arsenic through the skin, so occasional exposure through wading is not considered a significant health risk.

As an additional precaution, fish caught from such lakes should not be consumed but catch-and-release fishing can be done. The eating of sediments from all lakes should also be avoided.

Occasionally, there may be other reasons why a lake should not be used recreationally (e.g. blue-green algae). The CPHO will advise the public on any additional health risks from recreational water use separately from this public health advisory.

6. Can playing on the shorelines cause the release of arsenic into the water?

At this time, based on available information, the CPHO advises, occasional and brief period wading would not release sufficient quantities of arsenic that may be contained in sediment to create a health hazard. However, toddlers and young children should always be supervised around shorelines so that they do not inadvertently ingest dirt or mud, as well as for water safety reasons.

Public health advice will be updated as new data generated from research or monitoring studies is assessed by the CPHO.

7. How safe is it to swim at Long Lake?

Long Lake is one of the lakes in which arsenic levels in water are below the 52 ppb threshold that has been set for caution (yellow dot on public health advisory map). Recreational exposure in water, such as through swimming or wading activities, are therefore considered safe in terms of potential arsenic exposure.

Over the years, sand has been routinely added to the beach area, effectively covering the natural sediment layer and further reducing concerns about arsenic exposure. Residents can continue to enjoy recreational activities at Long Lake. It is also not a source of drinking water.

8. Is it safe to swim along the shore in Ndilo and Latham Island?

Testing results on water from Yellowknife Bay and Back Bay have consistently been well below drinking water guidelines for arsenic. Although there are some concerns about elevated arsenic levels in sediment sampled near the shore line, wading and swimming activities would not pose a significant health risk. Residents can continue to enjoy the Yellowknife River and local areas of Great Slave Lake for all types of recreational activities without restrictions.

9. What about Frame Lake?

Frame Lake is identified as having arsenic levels above 100 ppb (red dot on public health advisory map). Studies done in the past had already indicated a significant level of arsenic contamination in the sediment of Frame Lake. It is not advised to use Frame Lake for swimming, fishing or harvesting of nearby berries or other edible plants. Residents can continue to enjoy paddling on the lake and using the Frame Lake trail and nearby parklands.

10. Is it safe to eat fish from lakes in the Yellowknife area?

Based on contaminants studies that have been done to date, fish from Back Bay and Yellowknife Bay are considered safe to eat. Until additional information becomes

available, the advisory currently recommends avoiding eating fish from lakes with arsenic levels above 52 ppb.

11. What about people fishing at Jackfish Lake?

Jackfish Lake is identified as having arsenic levels that require some cautions with regard to recreational activities (orange dot). Fish caught in Jackfish Lake should not be consumed.

In 2015, blue-green algae was identified in the lake. Some types of algae have toxins that can cause bad rashes and other health problems. As a precautionary measure, people should avoid skin contact with the water (such as wear rubber gloves when handling fish) from any lake where blue-green algae are visibly present.

12. Is it safe to swim or fish at Kam Lake?

Kam Lake is identified as having arsenic levels above 100 ppb (dark red dot on public health advisory map), based on recent studies. It is not advised to use Kam Lake for swimming, fishing or harvesting of nearby berries or other edible plants. Residents can continue to enjoy paddling on the lake or walking through the area.

13. Is it safe to swim or fish at Grace Lake?

Grace Lake is identified as having arsenic levels above 10 ppb (yellow dot on public health advisory map), based on recent studies. Grace Lake can safely be used for swimming, fishing or harvesting of nearby berries or other edible plants. Residents can continue to enjoy paddling on the lake or walking through the area.

14. Is it safe to eat wild berries, mushrooms or other plants around Yellowknife?

In general, people should pick wild berries, mushrooms and plants in locations that are well away from industrial activities and roadways.

Although current information suggests it is unlikely that occasional consumption of such wild plants would pose any significant human health risks, the public is recommended to avoid harvesting berries, mushrooms or other edible wild plants in the immediate vicinity of lakes with high concentrations of arsenic. As more information is available, our recommendations may change.

15. What about garden vegetables grown in the Yellowknife area?

There has been no evidence to date that demonstrates garden vegetables grown within the City of Yellowknife pose a risk for human consumption. As a precaution, imported soil that has been tested could be used in gardens that will grow produce for consumption. If you are buying soil from a local source provider, inquire whether it is

from an area that has been impacted by industrial activities and/or whether the soil has been tested and deemed acceptable for agricultural purposes.

16. Does arsenic in dust affect the air quality in the Yellowknife area?

Elevated dust can affect the air quality in Yellowknife, regardless of whether it has arsenic or not. Exposure to dust can cause health problems or make current health conditions worse, such as asthma or other chronic respiratory problems.

The Air Quality Monitoring Program, which is part of the Giant Mine Remediation Project, is set up to monitor local air quality so that remediation activities at Giant Mine do not cause adverse effects to people or the environment. Several monitoring stations have been installed and measure concentrations of contaminants in the air such as arsenic. When monitors detect elevated levels, site personnel take action by informing team members, watering to suppress dust, modifying or stopping work, and investigating to look for the cause (which may be off-site from the Giant Mine). Giant Mine also administers regular preventative dust suppression activities on-site.

17. Has there been a human health study on the effects of arsenic around Yellowknife?

Since 2000, several human health risk assessments have been completed to determine the health risks from arsenic contamination associated with Giant Mine. This includes a Tier 2 Risk Assessment completed by SENES Consultants in 2006, which was updated in 2010. No significant public health concerns were identified at the time; however the Mackenzie Valley Environmental Impacts Review Board (MVEIRB) later concluded that there were several concerns related to the accuracy of this risk assessment and that additional human health studies would be required.

The Giant Mine Remediation Team (Project Team) is currently conducting a Human Health Risk Assessment and a Human Health Biomonitoring Study, with a Stress Study to be initiated in late 2017.

1) Human Health and Ecological Risk Assessment

The Human Health and Ecological Risk Assessment (HHERA) will look for the presence of contaminants in the environment (specifically in country foods, soil, and water) and evaluate the different ways that people could potentially be exposed to arsenic and other contaminants.

It will evaluate current and future contamination risks (including any potential risks once remediation is complete), and discuss the potential health effects that may be associated with the levels of exposure. It will establish an effective baseline, and will consider a wide range of sources of contamination, including sources outside the Giant Mine site such as off-site contaminated soil and water, and consumption of grocery store foods.

A country food sampling program and dietary survey were conducted in 2016 as part of the HHERA. The supplementary sampling program identified knowledge gaps in, and analyzed, traditional foods and medicinal plants that community members harvested from the land around Yellowknife. The dietary survey looked at what country foods people in the area eat, how much they eat and how often, and where the country food is collected or harvested.

The end result of the HHERA will be a set of benchmarks against which the Remediation Project is measured to ensure human health and the environment are protected both during and after remediation. The Project Team anticipates that the proposed remediation will reduce contaminant levels and risks over time.

2) The Health Effects Monitoring Program

The purpose of the Health Effects Monitoring Program (HEMP) is to make sure the remediation activities that will take place at Giant Mine will not have a negative impact on people's health. Specifically, it will establish current or baseline levels of arsenic exposure among residents in Ndilo, Dettah, and Yellowknife before remediation work begins. Then, during remediation, new monitoring results will be compared to the baseline to ensure that participants' arsenic levels are not increasing because of work being done at Giant Mine.

The HEMP will include participants from Ndilo, Dettah, and Yellowknife and it will involve biological sampling such as collecting toenail clippings and urine. The study will also look at other factors that could affect exposure levels, such as age, gender, drinking water sources, fish and local produce consumption patterns, and lifestyle choices such as smoking.

Participants may be selected either through statistically-supported random sampling or voluntary participation. Sampling is scheduled to begin fall of 2017.

3) Stress Study

While the direct effects of arsenic exposure are being evaluated through the above-mentioned human health ecological risk assessment, Measure 10 of the MVEIRB Environmental Assessment requires the Project Team to also evaluate the indirect effects of potential exposures to arsenic on wellness, including stress.

The scope of the stress study is still under development; however, it is anticipated that it will evaluate the indirect effects on health from stress related to the possibility of arsenic exposure. It will include consultation with affected community members (in focus groups) to develop a survey for the measurement and analysis of stress effects.

18. How does HSS notify the public of any risks associated with contaminants in soil, sediments, water etc.?

Public health advice is provided to residents through a public health advisory issued by the Chief Public Health Officer. This information is circulated to community governments, media and the public, and is posted on the Department's website in the advisory section.

We will improve our public notification methods via social media, public advertisements, and wider brochure distribution. We are also placing signs at main entry points of lakes with legacy arsenic contamination in the Yellowknife area. We will continue to update our health messaging based on the latest available research and monitoring, and will continue to work with our partners to keep the public informed.

19. What is the "area of interest" shading on the public health advisory map?

The area of interest is defined as an area of elevated arsenic in water bodies (52 ppb or higher) in close proximity to a mine site. There are currently two areas of interest: near Giant Mine and Con Mine.