

Should Winnipeg Build a Water Treatment Plant?

Winnipeg gets its drinking water from Shoal Lake,

located on the border between Manitoba and Ontario. Water flows from Shoal Lake to Winnipeg by gravity through a 160 km aqueduct. The water is stored in Deacon Reservoir, a large open reservoir with a capacity of 8,800 million litres. The reservoir helps maintain an adequate supply of water during peak water usage and also allows the aqueduct to be shut down for maintenance. Two smaller aqueducts downstream of the Deacon Reservoir deliver water to three smaller reservoirs and pumping stations in different areas of the city. The three area reservoirs and pumping stations act together to provide water at adequate pressure to water users throughout the city. Fluoride is added to the water to protect against tooth decay and chlorine is added as a disinfectant to kill microorganisms.



What is a Water Treatment Plant?

A treatment plant is a large facility that passes raw water through a series of complex treatment processes that include filtration and the addition of chemicals to increase the safety of the water by removing microorganisms and organic material. Microorganisms, specifically bacteria, viruses and parasites, are capable of transmitting diseases to humans. These water treatment processes also improve appearance, taste and odour.

Why are We Considering a Water Treatment Plant?

There are three important reasons why construction of a water treatment plant is under consideration:

1 To reduce the risk of a waterborne disease outbreak caused by chlorine-resistant microorganisms.

Cryptosporidium (Crypto), a microscopic parasite, can cause gastrointestinal illness. For people in good health, the illness may come and go for up to a month. Symptoms can include diarrhea, abdominal cramps, headaches, loss of appetite, nausea, and a mild fever. For people with severely weakened immune systems, the disease can cause prolonged distress and can be life-threatening. Currently, there is no specific medical treatment for the disease caused by *Cryptosporidium*.

2 To reduce the levels of disinfection by-products (DBP's).

When chlorine is added to the water, it reacts with organic matter naturally found in Shoal Lake water to form chemical compounds called DBP's.

Studies show an association between long-term exposure to high levels of DBP's and cancer.

3 To meet evolving Canadian Drinking Water Quality Guidelines, which are becoming more stringent to protect public health.

Parasites such as *Giardia* and *Cryptosporidium* have been found in virtually all surface waters in Canada and the United States, including Shoal Lake. The primary source for these organisms is human and animal feces. Chlorine is not effective in killing *Giardia* and *Cryptosporidium*.

The proportion of the population with weakened immune systems is growing in Winnipeg, as it is elsewhere. People with severely weakened immune systems can include those with HIV/AIDS, persons with cancer, recipients of organ or bone marrow transplants, and persons being treated with immunosuppressing drugs.



Do We Currently Meet the Canadian Drinking Water Quality Guidelines?

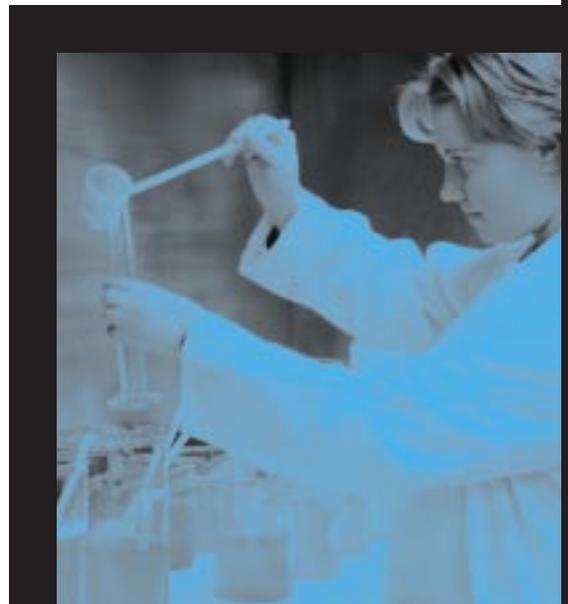
In Canada, guidelines for drinking water are set by the Federal - Provincial Subcommittee on Drinking Water. The Manitoba government uses these guidelines as a guide in regulating public water systems. The City of Winnipeg strives to meet the guidelines for drinking water quality and, in most cases, meets them. However, in some cases, such as disinfection by-products, the Winnipeg water supply is moderately higher than the allowable guidelines.

There is an ongoing trend in the United States and Canada toward even more stringent drinking water standards and guidelines. It is expected that these guidelines will address issues related to waterborne organisms, such as Crypto, and chemical contaminants, such as disinfection by-products. With our current practice of adding chlorine and fluoride, Winnipeg would be unable to meet these stricter guidelines.

What Steps are Taken to Monitor the Quality of Winnipeg's Drinking Water?

The Water and Waste Department has a rigorous schedule of sampling and testing. More than 45 different tests at over 70 different locations are conducted within the water supply system, including Shoal Lake. Testing is conducted on a daily, weekly, monthly or quarterly basis to determine compliance with the Canadian Guidelines and other water quality objectives. Routinely, almost all of these tests are found to meet the guidelines. In addition, testing is also conducted on a number of parameters over and above current normal requirements, such as disinfection by-products, *Cryptosporidium*, *Giardia*, and algae toxins.

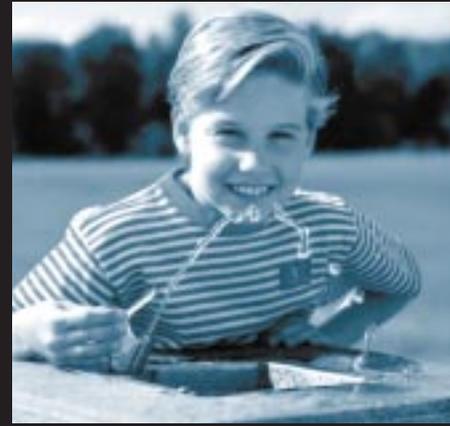
The Department also has monitoring partnerships with the Province of Manitoba and the Government of Canada. The Province monitors the water supply system on a quarterly basis for parameters of interest in public water supply systems, such as arsenic, cyanide and pesticides. Test results show that there are no concerns regarding these substances. The Government of Canada monitors Shoal Lake on a monthly and a quarterly basis for a wide variety of water quality parameters.



Since 1994, Shoal Lake and the Deacon Reservoir have been routinely tested for Crypto. Crypto has not been found in any of the 85 tests conducted on water samples from the Deacon Reservoir. Water samples taken from Shoal Lake are normally negative for Crypto. Test results show that only 4 of 80 samples from Shoal Lake have been positive for Crypto.

What is Being Done to Protect Winnipeg's Water Source

A committee comprising representatives of the City of Winnipeg, the provincial governments of Manitoba and Ontario, the federal government and First Nations are working to develop a sustainable watershed management plan for Shoal Lake. In 1912, Shoal Lake was selected as the best source of water for Winnipeg because it was inaccessible, relatively isolated, required no treatment and was an enormous reservoir of clear, pure and soft water. However, since then, the lake has become more accessible, and there are now well-established summer cottages at Falcon Lake (Falcon Lake is on the Shoal Lake watershed), as well as on the shores of Shoal Lake itself. There are proposals for the development of additional cottages, industries and a gold mine. The committee is working to ensure that development does not negatively affect water quality. Public consultation will be an important aspect of this process.



Is There a Risk to Public Health with the Present Water Supply System?

The City of Winnipeg conducted a review of the public health risks associated with the present water supply system. Experts in public health, along with Canadian and international specialists in waterborne disease and water supply issues, agreed that the existing system poses potential health risks. The health risks are waterborne disease-causing parasites, disinfection by-products, and the potential for natural or manmade incidents, such as sabotage, chemical spills and accidents. The existing water supply system has two serious vulnerabilities:

- the lack of control over future human activity and industrial development around Shoal Lake, resulting in a potential for deteriorating water quality and increasing public health risk; and,
- the lack of a water treatment plant to address potential health risks.

After considering all the issues, the experts who conducted the review were of the opinion that a water treatment facility for Winnipeg's water supply is justified to protect public health. The following are two of the key factors supporting their opinion:

1 Providing the best possible protection against waterborne parasites is the highest priority. While the risk of a major waterborne disease outbreak is relatively low for Winnipeg, experience shows that the consequences could be severe in terms of human health, economic losses, and loss of public confidence.

2 The current process of disinfection causes disinfection by-products to be produced at undesirable levels. Long-term consumption of water with high levels of DBP's increases the risk of serious health effects. With the present system, there is little choice but to apply fairly high levels of chlorine in order to achieve the best possible disinfection. There is a delicate balance between the benefits of adding chlorine to provide protection against microorganisms, and the risks associated with the resulting disinfection by-products. While increased disinfection helps to reduce the health risks due to microorganisms, higher rates of added chlorine produce more DBP's, which in turn, can increase health risk. Balancing these health risks is a major challenge.

The largest waterborne disease outbreak in recent North American history occurred in April 1993 in Milwaukee, Wisconsin. The outbreak was identified as cryptosporidiosis (illness caused by *Cryptosporidium*) and caused approximately 400,000 people to become ill. Over 100 deaths were associated with the outbreak, mostly immunocompromised persons. In addition, the outbreak is estimated to have cost the community millions of dollars and many lawsuits are pending. Even though Milwaukee had a water treatment plant, unusual operating circumstances resulted in parasites passing through the facility and contaminating the water. Milwaukee has since upgraded its treatment plant and made many improvements, including better water quality monitoring.

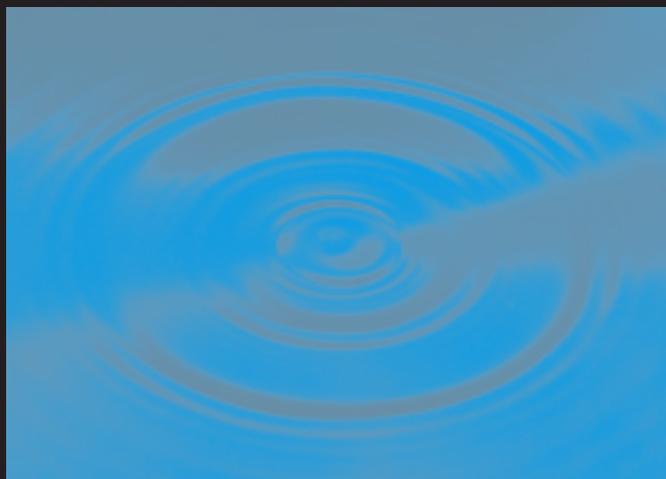
An outbreak of *Giardia* ("Beaver Fever") occurred in Dauphin, Manitoba in February 1996. A new water treatment plant began operating in the summer of 1999.

A Northwestern Ontario First Nations Community located on Shoal Lake had a Crypto outbreak in February 1997. A new water treatment plant for this community of about 370 began operating in the fall of 1998.

In August 1996 an outbreak of Crypto occurred in Kelowna, B.C., reportedly affecting more than 10,000 people.

Are There Any Alternatives to Ensure Safe, Quality Drinking Water into the Future?

Individual residents have several options available to them, such as buying bottled water, or filtering, distilling and boiling tap water. It is not likely that all Winnipeg residents would use a home water treatment device or buy bottled water. First, the cost and effort involved can be prohibitive. Second, there is a high public expectation that the water utility will take all necessary and reasonable steps to provide a water supply that is reliable and as safe as possible.



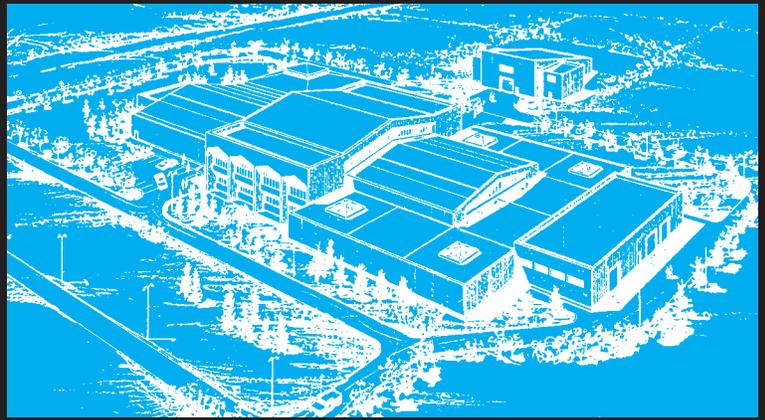
With respect to the waterborne parasite *Cryptosporidium* (Crypto), consumers should be aware of the following:

Bottled water

Bottled water is defined as a food product by Health Canada, and is not required to undergo the same monitoring as public water systems. Some bottled water on the market might not meet the Canadian Drinking Water Quality Guidelines. Bottled water suppliers typically do not test for Crypto, and these parasites can live for weeks in the water, even if the water is refrigerated. Labels on bottled water stating 'well water', 'artesian well water', 'spring water', or 'mineral water', do not guarantee that the water does not contain Crypto.

Water filters

Some home water filters as certified by NSF International (National Sanitation Foundation) can be effective against Crypto. However, poor maintenance or failure to replace filter cartridges as recommended by the manufacturer can cause a filter to fail. Filters collect disease-causing organisms from water, so someone who is not immune compromised should change the water filter cartridges.



Conceptual design of a water treatment plant

How Long Would it Take to Build a Water Treatment Plant?

If City Council approved the construction of a water treatment plant in 2000, the plant could be operating in 2006.

How Much Would it Cost to Build a Water Treatment Plant?

The cost to build a water treatment plant is estimated at \$204 million. This includes design, construction and environmental approval costs, and provides for inflation, since it is anticipated that construction, if approved, would not begin until late 2003 or early 2004.

The Water and Waste Department's current financial plan provides for cash funding for 50% of this cost from the Water Treatment Plant Reserve Fund, and for financing the remaining 50% through long-term debt.

Established in 1993, the Water Treatment Plant Reserve Fund is financed through water rates. In 1999, 16.5 cents of every dollar customers pay for water service goes into the Water Treatment Plant Reserve Fund. By the end of 1999, the Department will have accumulated savings of approximately \$25 million in this reserve fund.

What Would it Cost to Operate a Water Treatment Plant?

The annual cost to operate the water treatment plant is estimated at \$12 million. This includes operating and maintenance costs and provides for inflation, since it is anticipated that the water treatment plant would not begin operating until 2006.

Would We Have to Pay More for Water if a Water Treatment Plant is Built?

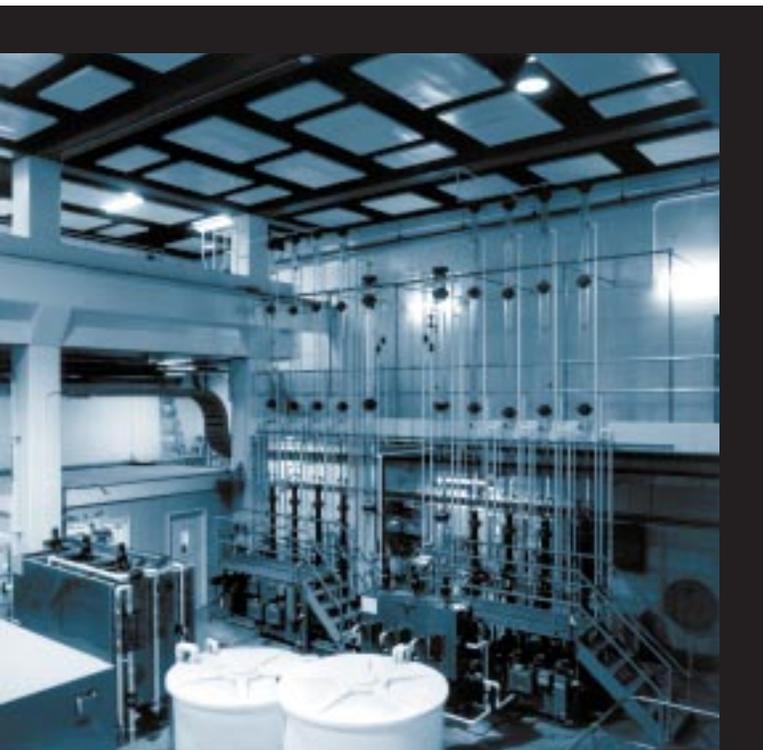
Since 1992, the Department has been following a Council-approved 10-year financial plan designed to finance the cost of two large-scale improvements, the Aqueduct Rehabilitation Program and the proposed water treatment plant. We are more than halfway through the 10-year program to rehabilitate the Shoal Lake aqueduct. If a water treatment plant were approved, it would be necessary to increase the combined water and sewer rate by less than 5% of the 1999 rate. For residential customers, the 1999 combined rate is \$5.34 per 100 cubic feet of consumption. For a typical residential customer (a family of four), the increase would be less than \$6.20 on a quarterly bill of \$124.00.

If Council decides not to proceed with the plant, a decrease in the combined water and sewer rate of approximately 18% could be considered by City Council for implementation over the next four to six years. This drop in the cost of water and sewer services would result from both a decision not to build a water treatment plant, and completion of the Aqueduct Program in 2003. This decrease also assumes no other major improvements in Winnipeg's water and sewer system would be required.

Do Other Canadian Cities Have Water Treatment Plants?

Most cities with surface water supplies (like Shoal Lake) have water treatment plants. Vancouver, Victoria, Kamloops and Kelowna are examples of major Canadian cities that do not have a water treatment plant. Vancouver is currently in the design stage of a water treatment plant and Kelowna is considering building a water treatment plant. In Kamloops, the Ministry of Health issued an order to have water treatment in place by 2003, because *Cryptosporidium* and *Giardia* have been detected in the water system. In Manitoba, Winnipeg is the only large community without a water treatment plant.

Many cities with existing water treatment plants are planning to upgrade their systems to provide higher and more reliable water quality. Calgary has started the design and construction of a four-phase upgrade to their water treatment plant that will result in improved protection from *Cryptosporidium* and *Giardia*, as well as reduce disinfection by-products to meet future limits, which are expected to be more stringent. Edmonton is carrying out a study to upgrade both its water treatment plants.



Pictured here is the pilot water treatment plant built at Deacon Reservoir by City of Winnipeg staff in early 1996. Pilot testing was conducted over a 16-month period to identify the best available treatment technology for the specific characteristics of Winnipeg's water. Testing was conducted over four different seasons to assure that treatment would be effective for the changing seasonal water quality characteristics.

How Will the Decision Be Made About Whether or Not to Build a Water Treatment Plant?

The Executive Policy Committee (EPC) of City Council is holding two special meetings in October 1999 to receive public opinion on the issue of water treatment. EPC will then provide a recommendation to Council on whether or not to proceed with the construction of a water treatment plant. A decision by City Council is required at this point because of the preparation time necessary for financing and planning.

Are There Any Other Major Expenses on the Horizon for Our Water Supply System?

The City of Winnipeg has successfully undertaken the following two initiatives to ensure that Winnipeg has an adequate supply of water into the foreseeable future without building another aqueduct or developing another water source in addition to Shoal Lake:

Aqueduct Rehabilitation

In the early 1990's, engineering studies showed that the aqueduct was in need of major repairs. A \$54 million rehabilitation program began in 1993 and will be complete in 2003. The restoration program is expected to extend the useful life of the aqueduct for at least another 50 years.

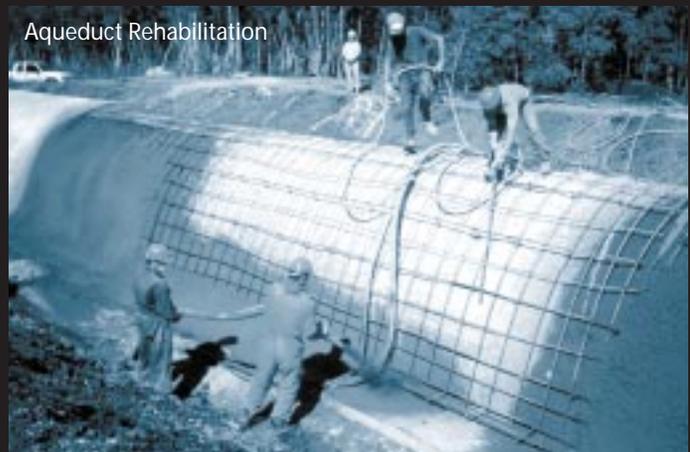
Water Conservation

The City implemented a Water Conservation Program in 1992 to promote more efficient use of water, including the use of water-efficient plumbing fixtures. The community supports this program, and residential, commercial and industrial water use has reduced in recent years. As a result, the water demand for Winnipeg is expected to be stable for the next 20 years, even with a projected growth in population.

The Water and Waste Department recently completed a four-year program studying water treatment technologies; this study included a conceptual design for a water treatment plant. The proposed water treatment plant is sized to meet current and foreseeable water demands and standards.



City of Winnipeg
Water and Waste Department



Reliable, safe water is vital for the social and economic well being of our community!