



Municipal Drinking Water Supplies Questions and Answers

1. Why is drinking water important?

An adequate supply of good quality drinking water is vital to the social and economic well-being of our province as well as to the health of its people. Saskatchewan's water is primarily used for agricultural, industrial, domestic and recreational purposes.

Good quality drinking water is free from disease-causing organisms and harmful chemical substances. It tastes good, is aesthetically pleasing and free from objectionable colour, odour and taste.

2. Where do we get our drinking water from?

Municipal drinking water supplies in Saskatchewan are obtained from the ground and from surface water bodies. More than 12 per cent of Saskatchewan's surface area is covered by water; streams, rivers, ponds, lakes and man-made reservoirs. Our surface water comes from seasonal precipitation and runoff from the Rocky Mountains with small contributions from ground water discharges. About 27 per cent of municipal water supplies are from surface water sources.

Ground water is the most abundant source of water in Saskatchewan. Each year, trillions of litres of runoff and precipitation seep through the soil and are added to the aquifers or reservoirs below the surface. Aquifers occur in beds of sand and gravel, in glacial deposits or in bedrock formations. In Saskatchewan, aquifers vary in size from a few hectares to thousands of square kilometres in area, and range from a few metres to 90 metres (295 ft) thick. About 73 per cent of municipal water supplies are from the ground.

3. Are there differences between ground and surface water?

Surface water supplies usually have lower mineral concentrations than ground water, but are exposed to more types of immediate threats of contamination. For example, most surface waters must be treated to remove bacteria, organisms such as giardia and cryptosporidium, cloudiness, algae or remnants of household or industrial wastes.

The abundance of sunshine and the nutrient-rich shallow waters of southern Saskatchewan combine to produce high rates of aquatic plant growth. The most common plants are microscopic, single-celled plants called algae that are usually suspended in the water. An algae "bloom" near the surface, turns the water green and gives off a characteristic strong odour. This sometimes makes prairie lakes undesirable for recreation or as a source of drinking water. In contrast, northern lakes are visibly clearer as there are fewer nutrients and therefore less plant growth. When masses of algae and aquatic plants die in a surface water reservoir, significant taste and odour problems can develop which usually require expensive water treatment facilities to overcome.

Most ground waters from glacial deposit aquifers are considered to be "hard water", due to high concentrations of calcium and magnesium. Hard water requires more soap for proper cleaning and causes scaling in piping, hot water heaters, kettles, etc. Hard water minerals can also react with the

“tannin” in coffee and tea, to form an unpleasant surface film. This film is not a health concern, and it can be reduced by using demineralized water, or by drinking the coffee or tea while it is fresh. Hardness can be readily removed through softening processes, such as domestic water softeners or reverse osmosis units.

Saskatchewan’s ground water is also known for its high iron and manganese content. Removing these materials presents a real challenge in most water treatment facilities. If left untreated, iron and manganese can stain plumbing fixtures and laundry, and may affect the taste of the water. Other minerals in ground water supplies, such as sulphates and sodium, can affect the health of some individuals. High sulphate levels may have a laxative effect on consumers not accustomed to the water supply. People with hypertension or heart-related problems should consult their doctors if sodium levels in drinking water exceed 20 mg/L (milligrams per litre or parts per million).

4. How can we prevent contamination from entering our water supplies?

Even when far away from a particular well, contamination may migrate through the ground water into the aquifer and eventually affect the water quality. For this reason, protecting water supplies in Saskatchewan is an ongoing effort. Water pollution is very difficult and often expensive to clean up. The best way to ensure treated water is free from impurities is to prevent pollution in the first place. Any steps taken to protect surface water have the added benefit of protecting ground water by reducing the potential contamination that can migrate toward the ground water aquifers.

In terms of surface water supplies, this requires water quality monitoring, protection of the watershed (land containing the water source), storm water management and a regional emergency-response plan for spill clean up. Ground water can be protected by identifying possible sources of contamination, judging their potential for contamination, regulating activities that may contaminate the aquifer and monitoring well water quality.

Water sources are protected, in a general way, by laws and regulations that govern the transportation and disposal of human or hazardous wastes or application of herbicides, pesticides and fertilizers. Local bylaws may also control activities or development within a smaller region.

Here are some suggestions to protect the quality of prairie surface water:

- **Landowners** can keep livestock from grazing along shorelines, in order to keep animal wastes away from the water. They can use farming and landscaping practices that reduce runoff and erosion. They can minimize the application of fertilizers so that the excess is not lost through runoff;
- **Feedlot operators** can design and locate feedlots so that animal wastes do not drain into surface water bodies;
- **Industry managers** can ensure that harmful or toxic substances are not discharged into natural water bodies;
- **Municipalities** can optimize their wastewater treatment processes to reduce the levels of nutrients and other contaminants entering water bodies. They can also investigate alternate methods of disposal such as effluent irrigation; and
- **Consumers** can choose environmentally friendly household cleaning products and avoid disposing of harmful wastes, solvents, paints, etc. into the wastewater system.

5. What are some potential sources of water contamination?

Potential sources are:

- natural contamination from soil impurities;
- urban developments;
- storm drains;
- fertilizers and pesticides on agricultural lands (excessive well use or improper application);
- municipal landfills;
- leaking underground fuel storage tanks and lines;
- municipal wastewater treatment operations;
- septic systems;
- spills from highway or railway accidents;
- livestock operations;
- mining operations;
- runoff of salt from urban developments and road de-icing;
- runoff of dust-control chemicals from roads; and
- industrial and food processing wastes.

6. What water treatment methods should we be using?

Many types of treatment processes can be used to remove contaminants and improve water quality. Water treatment facilities in Saskatchewan range from basic to very complex designs that are expensive to build and operate. There are more than 530 licensed water treatment facilities that supply water to municipal consumers in Saskatchewan. Water can be treated in a number of ways, depending on whether it is from a surface water or ground water source. Generally, ground water treatment is less complicated.

7. What are surface water treatment plants?

Approximately 27 per cent of the municipal water treatment facilities in the province treat surface water. This includes most of the cities and many towns, villages and hamlets.

The following outlines a typical surface water treatment plant:

- **Intake** is normally screened to keep debris, fish and plants from entering the intake as the water is drawn into the treatment plant;
- **Aeration** helps to control substances that produce taste and odours, corrosion, interference with water treatment chemicals and removes offensive gases such as hydrogen sulphide;
- **Chemical Addition** of aluminum sulphate (Alum), polymers, oxidants and/or activated carbon are added to the water to help settle out solids, remove colour and improve taste and odour;
- **Coagulation and Flocculation:** The alum and other chemicals mixed into the water, cause particles in the water to stick together to form larger particles (called floc);
- **Sedimentation:** The water and floc particles pass into a sedimentation basin where the flow slows, allowing the floc to settle to the bottom of the basin;
- **Filtration:** From the sedimentation basin, the water flows through filters with various layers of sand and gravel to remove any remaining particles, including bacteria and other organisms. Carbon can also be used in the filters to remove any residual colour, taste and odour; and

- **Disinfection:** A small amount of chlorine is added to the water to destroy any surviving organisms and to ensure the water remains bacteriologically safe as it travels through the distribution system to the consumer.

A reaction between chlorine and naturally occurring organic matter in surface water can produce trihalomethanes (THM) and other chlorinated organic compounds which are a potential health concern. Surface water supplies are regularly monitored to ensure that THM levels do not exceed the province's Interim Maximum Acceptable Concentration (IMAC) of 0.1 mg/L (100 µ/L). Facility operators are encouraged to use effective pre-treatment and treatment practices that reduce the level of organic material in the water entering a treatment plant to control THM levels. These practices must not compromise the effectiveness of disinfection done in order to destroy disease-causing organisms in the drinking water.

8. What are ground water treatment plants?

About 73 per cent of Saskatchewan communities use ground water supplies. Most of the ground water treatment plants are found in smaller centres.

The following outlines a typical ground water treatment plant:

- **Aeration** provides similar benefits as mentioned in surface water, plus it oxidizes iron in the raw water;
- **Chemical Addition** of potassium permanganate and/or chlorine are added to the water to enhance iron and manganese removal;
- **Oxidation:** The chemicals added in the previous step convert the dissolved iron and manganese in the water into visible particles (rust colour for iron, and black for manganese);
- **Sedimentation:** The water and oxidized iron and manganese particles flow into a sedimentation basin. The flow of water slows, and most of the particles settle to the bottom of the basin. Sometimes other chemicals are added to help the particles settle out. The sedimentation process is optional in many treatment plants;
- **Filtration:** The water passes through filters from the sedimentation basin. Ground water filters usually contain a specialized media intended to remove the iron and manganese; and
- **Disinfection:** A small amount of chlorine is added to the water to maintain bacteriological safety as the water travels to the consumer.

In cases of extremely mineralized ground water, sophisticated demineralization processes such as Reverse Osmosis or Electro-Dialysis Reversal may be used in addition to iron and manganese removal. These processes are very costly and are usually considered only when no alternative water supply is available.

The treated water is now piped into a closed reservoir which provides adequate storage for fire protection and for the community's commercial, industrial and residential users. The reservoir may be located at the treatment plant or at any point in the distribution system.

9. What is a distribution system?

A distribution system is a network of pipes by which the treated water is supplied to consumers.

10. Can treated water in a distribution system be contaminated?

Yes. However, the water utility operator can ensure that the distribution system works efficiently and that the water quality is maintained at acceptable levels throughout the system. This includes continual water quality monitoring, preventing cross connections, controlling corrosion, inspecting and cleaning water mains, detecting and repairing leaks and breaks and performing regular maintenance and emergency repairs.

11. Why do we need to monitor water quality?

Water quality is monitored to determine its condition throughout the entire system, from the raw water source, to the treatment plant, and through the entire distribution system to the consumer's tap. The duty of a water supplier is to ensure a consistent and adequate supply of safe water for consumers that always meets provincial water quality regulations.

Licensed water treatment facilities are required to perform routine on-site testing to ensure that the water meets provincial requirements. They must also submit samples of their drinking water for laboratory analysis. Representative samples are to be regularly collected from various locations throughout the whole system for analysis by the Saskatchewan Health Laboratory in Regina, by the Saskatchewan Research Council Laboratory in Saskatoon or the other accredited laboratories. The results of these analyses are compared with the *Saskatchewan Drinking Water Quality Standards and Objectives*, which outline stringent water quality parameters. These are the same as the Canadian guidelines, with the addition of some mineral parameters that are concerns in Saskatchewan. Sampling frequency and specific parameters of concern can be found in the Minister's Order or permit for a waterworks.

12. Why do we need certified operators?

Saskatchewan's water treatment and distribution systems are operated by a dedicated group of individuals. On behalf of the owner of the water utility, the operator ensures that a community always receives an adequate amount of water to meet its day-to-day needs, with enough storage to meet any emergency that could arise. The role of the operator is to provide drinking water that is safe and as aesthetically pleasing as possible by ensuring that the water meets provincial water quality standards. Failure to meet these requirements means that the operator must undertake changes in the facility's operation, or recommend process modifications to the owner, to bring the water quality back within provincial standards. In smaller communities, the operator is often the only person to handle all the duties and responsibilities. Despite this, the satisfaction gained from consistently meeting the challenge of providing the community with an ample and safe water supply can make this a very rewarding career.

Provincial regulations passed in July, 2000 require all municipal water and wastewater facilities to be under the direction of a certified operator by July 15, 2005. To be certified, an operator must pass the designated certification exams and have an appropriate combination of education and facility work experience. The Operator Certification Board issues certificates and sets certification and examination fees. Saskatchewan's criteria for certification are recognized throughout North America. They place Saskatchewan on par with other jurisdictions with mandatory programs including Nova Scotia, Alberta, British Columbia and most states in the United States. In addition, many operators are taking an active role in various training and educational opportunities to improve their level of knowledge and expertise.

Operators can obtain information and technical advice from Saskatchewan Environment (SE), from workshops and conferences offered by the Saskatchewan Water and Wastewater Association, as well as from a number of other agencies involved in water treatment, storage and distribution.

13. Why should we practice water conservation?

Consumers should also be aware that our water is a finite resource and that water conservation should be practiced at all times. Water conservation simply means using water wisely, it does not mean “going without”. It is relatively easy to conserve water, yet statistics show that we use more water today than we ever did before. Modern technology employed in many homes such as automatic dishwashers and sprinklers lead us to waste water. We can still enjoy all these amenities and conserve water at the same time.

Many home and garden water conservation tips and devices are available. They not only lead to a reduction in the amount of water consumed but also reduce the amount of money we pay for water. For example fix any water leaks, wash only full loads of dishes or clothes, avoid running the tap until the water gets cool every time you need a drink and have shorter showers

14. Who is responsible for maintaining water quality in municipal water systems?

Municipalities own, and are responsible for, municipal drinking water facilities and their operation. SE requires municipalities to submit water samples for testing at an accredited laboratory. The number of samples and frequency of submissions is dependent on the size of the population served by the system. This also applies to all communities or other privately owned waterworks which have a water flow of greater than 18,000 liters or 4,000 gallons per day. Municipalities or owners of other waterworks are notified of any concerns regarding the results of their samples and are required to ensure the appropriate follow-up and corrective actions.

15. What is SE doing to ensure safe drinking water is provided to Saskatchewan residents?

SE sets standards, objectives and guidelines to protect drinking water supplies within the province. In keeping with the development of the provincial Long Term Safe Drinking Water Strategy, SE created the Drinking Water Quality Section within its Environmental Protection Branch in the summer of 2002. It also unveiled its *Environmental Management and Protection Act, 2002*, with significant modifications in terms of water. A set of comprehensive amendments to the regulations governing drinking water also came into effect on December 5, 2002. SE works with the officials of communities, Saskatchewan Health, Health Regions and other agencies to protect water and resolve drinking water supply quality concerns.

SE's role in ensuring safe drinking water also includes:

- compliance inspections of water treatment plants;
- policy and protocol development to assist in consistent program delivery;
- licensing and approvals of waterworks;
- liaise with the Operator Certification Board which is responsible for overseeing the mandatory operator certification;

- tracking and reporting on the results of bacteriological samples submitted by municipalities; and
- taking appropriate measures and follow-up actions when drinking water concerns have been identified.

16. What is being done about communities whose treatment systems do not have minimum treatment capabilities?

Precautionary Drinking Water Advisories (PDWA's) have been issued for these communities. The PDWA's ask municipal officials to notify their residents of how to minimize the risks associated with drinking water until minimum water treatment processes are employed by the communities.

17. What is a precautionary drinking water advisory?

A PDWA is issued where immediate drinking water hazards have not been identified but when water quality concerns still exist. PDWAs are generally issued by SE in consultation with the local Medical Health Officer. A PDWA notifies the public of recommended actions to take to provide a greater level of safety for the people using the drinking water supply, while concerns with the water quality are investigated and examined. They remain in effect until monitoring results are instigated and resolved or the water treatment problems are fixed and solutions are found. It is the responsibility of the municipality or owner of a private waterworks to ensure that everyone is notified of a PDWA. A variety of techniques can be used to notify residents including postings on public buildings, telephone calls, direct mail and home delivery.

18. Why chlorinate?

Chlorine destroys disease-causing organisms in the water. Bacteria are invisible to the naked eye, so water that looks, smells and tastes good may not always be safe to drink. Chlorination is considered to be the most economical, efficient and also the easiest method of disinfecting water. Combined with advancements in sanitary disposal of sewage, chlorination contributes greatly to the improvement of health and longevity.

The Environmental Management Protection Act (EMPA) 2002
Questions and Answers

1. What is the purpose of EMPA 2002?

EMPA is the primary environmental statute for the Province of Saskatchewan and provides the Minister responsible for SE with the authority necessary to manage and to protect the environment.

EMPA is the legislation that provides the power to make regulations and provides general guidelines for activities including the management of drinking water, waste water and environmental discharges.

2. How does EMPA 2002 differ from the previous Act in terms of water?

To implement the province's Long Term Safe Drinking Water Strategy, several new sections have been added to EMPA, 2002. They include authority for permitting the construction, alteration, extension and operation of waterworks and sewage works (transferred from Sask Water Corporation); placing a duty on owners and operators of waterworks to provide safe drinking water; and authority for the Minister to issue emergency waterworks and sewage works orders and Precautionary Drinking Water Advisories.

EMPA, 2002 provides a more comprehensive enforcement and compliance framework that will allow SE to effectively enforce the Act and regulations. Environment officers have the power to conduct inspections and seize items where necessary to prevent environmental damage. Where a person is not complying with the terms of the permit and contravenes certain provisions of the revised regulations, the Minister will have authority to issue an administrative penalty. The Minister retains the authority to issue an order, but under EMPA, 2002, the order can be issued for any breach of the Act or regulations, or where there is damage to the environment or human health. There is also a new section to allow the Minister to issue an emergency order where damage is immediate or significant.

3. What did the North Battleford Inquiry Report recommend and where are these recommendations in EMPA, 2002?

EMPA, 2002 makes several recommendations based on the Report. They include:

- State of the Quality of Drinking Water – Annual Report to Legislature that will be released to the public (Section 19);
- Duty to provide safe drinking water (Section 20);
- Regulation of waterworks and sewage works (Sections 18 to 34);
- Precautionary Drinking Water Advisory (Subsection 32(1)); and
- Minister's Order to replace the operator of a waterworks or sewage works (Clauses 31 (2) (g) and (h)).

4. How will EMPA, 2002 ensure safer drinking water and prevent another North Battleford?

EMPA provides the legislative authority for the department to implement the Long Term Safe Drinking Water Strategy. EMPA provides SE with clear authority over drinking water quality, provides the ability to regulate waterworks and sewage works, issue protection orders where human health is at risk, issue Precautionary Drinking Water Advisories, collect and manage drinking water quality data and other aspects of water management.

5. What is the administrative penalty and when will it be applied?

EMPA, 2002 gives the Minister authority to issue a monetary penalty to a permit holder that is not complying with a permit or regulations. The amount of the penalty and precise infractions to which the penalty will apply is set out in regulations contained in this binder. The penalties will only be applied to clear-cut breaches, such as failure to submit required reports or tests.

