

Water Treatment Plant Answer Sheets

GROUNDWATER

1. How deep down is the water intake?

If it is a shallow well (less than 30 m or 100 feet) then chances are that the quality of water is very different from a deep well (can sometimes be more than 100 m deep). The water from a shallow well can often have low levels of salt and other contaminants. With a shallow well the major concern is often if it is under the influence of surface water. This is called Groundwater Under the Influence of Surface Water abbreviated GUDI. The main concern with being a GUDI is the potential for contamination by disease-causing microorganisms.

2. Does the water smell when it comes to the treatment plant before treatment is started? If so, describe the smell.

If the answer to this question is yes then chances are high that there is very little oxygen in the water. When the oxygen disappears it is called anaerobic water. In anaerobic water different chemical processes start occurring. One of these processes is the formation of hydrogen sulphide, which dissolves in the water. When an egg goes rotten it is hydrogen sulphide that makes it smell.

In addition to potentially high levels of hydrogen sulphide (which is toxic) the level of carbon dioxide increases. Both of these compounds will have to be removed before the water can be effectively treated. The simplest way of doing this is straight aeration. The addition of chlorine can also partially achieve this.

Sometimes there are concerns about nitrates in groundwater. But, if there is no oxygen in the water then the nitrate (which has three oxygen atoms for every nitrogen atom) gets transformed to ammonium. While in regular testing it may look great to have no nitrate in the water, but if the nitrate has been transformed to ammonium then a whole new set of problems occur in the treatment plant. The biggest challenge for water with ammonium in it is disinfection. The water operator needs to add 15 times more chlorine than there is ammonium before the water starts to become properly

disinfected. Residual Chlorine tests for the presence of ammonium may also give false positives. There are problems determining the chlorine residuals if there is ammonium in the water.

3. What happens to the water once it enters the treatment plant?

What is the first treatment step? What is the second treatment step? etc.

SURFACE WATER

1. Where do you get your water from?

Water quality from large rivers and lakes are often better than water from small creeks and reservoirs.

2. What is the size of the reservoir (area, maximum depth)?

This depends on your community.

3. What problems do you have with your reservoir?

In the summer some reservoirs will have large algae blooms. Frequently water from reservoirs contain high levels of microbes and may be highly coloured due to the organic material released from the decay of plant material.

What happens in the winter under the ice. Does the water start smelling late in the winter? This is an indication, similar to a groundwater system that the oxygen has disappeared and the water is now anaerobic. This can actually happen in the summer as well if the reservoir “stratifies”. This means that there will be two different water layers in the reservoir/lake. A top, warmer layer, with a bottom colder layer. If the water intake is close to the bottom then anaerobic water can be sucked into the water treatment plant.

4. Is your reservoir treated with copper sulphate or some other chemical? If so, what is the chemical and its purpose?

Copper sulphate is often used to control algal blooms, the pesticide

Diquat (Reglon A), is used to control weed growth in the reservoir. If the Copper level in the drinking water is too high, it is more likely to result from copper distribution pipes, which can generate higher copper levels than correct additions of copper to treat a reservoir.

5. What happens to the water once it enters the treatment plant?

What is the first treatment step? What is the second treatment step? etc.

WATER QUALITY

1. Is our water supply considered safe for human consumption?

The answer to this would be based upon the water quality tests which are carried out on the water in your community. Sometimes, however, a community only needs to test its water once every couple of years. Can you think of reasons why this may not be enough? Also, there are around 60 health guidelines in the Canadian Drinking Water Quality Guidelines and smaller water treatment plants may not test for compounds that can actually be present in the water. For ground water sources there should be tests for arsenic, dissolved organics, ammonium, nitrate, manganese and iron to mention a few.

2. What water quality tests are carried out on our drinking water supply and how often are they monitored?

For microbiological parameters the frequency of samples is dependent upon the population served. In general, drinking water should be sampled semi-annually for all chemical substances for which a maximum acceptable or interim maximum acceptable concentration has been set. There is now a tendency to sample more frequently for bacterial indicators, the *E. coli* and total coliform tests, but that may not be the entire solution as most waterborne disease outbreaks have no coliforms associated with them.

DRAWING OF OUR WATER TREATMENT PLANT

The water treatment plant will likely have a pamphlet with sketches of the plant layout; encourage students to gather this information. If this information is not readily available, try to make arrangements to have additional information sent to the school so that a thorough follow-up of the tour can be carried out.