VANCOUVER ISLAND health authority

Health Protection **Drinking Water Program**

4-3-2-1 - Drinking Water Treatment for Surface Water Policy

Water suppliers are required to provide potable water to all users of their system. The 4-3-2-1 surface water treatment policy is a performance target for water suppliers to ensure the provision of microbiological safe drinking water. Vancouver Island Health Authority (VIHA) supports water suppliers to meet this objective. All existing water suppliers serving populations greater than 500 people/day should have an implementation plan to meet this policy.

This policy will also be applied as a performance target for all new surface water systems, regardless of size. Many existing water systems already meet most of this standard. Risk to human health is substantially reduced when water suppliers meet this goal.

Water suppliers will be required to provide long term plans to reach the goals of:

- 4 log inactivation of viruses
- 3 log removal or inactivation of Giardia cysts and Cryptosporidium oocysts
- 2 refers to two treatment processes for all surface drinking water systems
- 1 for less then 1 NTU of turbidity in finished water

Definitions:

4 log inactivation of viruses:

Viruses are easily inactivated by the use of chlorine. Achieving a 0.5 mg/L residual of free chlorine for 30 minutes is adequate in most cases.

3 log removal or inactivation of Giardia cysts and Cryptosporidium oocysts:

Giardia cysts may be inactivated by large doses of free chlorine, ultraviolet light, ozone and chlorine dioxide, or removed by filtration. Health Canada has developed design guidelines to determine that the proposed treatment will provide the inactivation desired. For example, chemically assisted rapid sand filtration with sedimentation is given a credit of 3.0 log inactivation. Log inactivation credits of 3.0 for slow sand filtration and 2.5 for direct filtration are given. The remaining credit must be accomplished by another means such as ultraviolet disinfection or free chlorine with a long contact time. Health Canada has also developed guidelines for **Cryptosporidium oocyst** removal that outline treatment methods, which will provide the inactivation, desired. Systems with optimized conventional rapid sand filtration are given a credit of 3.0 logs. Membrane filtration may be required to demonstrate removal efficiency through challenge testing and verified by direct integrity testing. Ultraviolet disinfection is given a credit of 3.0 logs if the dose is a minimum of 42mJ/cm^2.

2 treatment processes are a minimum for all surface water sources. A dual disinfection approach to water treatment is associated with providing potable water:

The main risk to water quality is from microbiological agents. Some of these microbial risks are more resistant to some forms of treatment than others. It is recognized that effective treatment for all microbial risks by a single treatment process is not effective. Dual treatment processes are required for all surface water to reduce the risk of microbial or health threats to drinking water. Water filtration and disinfection will become the norm for many surface water supplies in order to meet the 4-3-2-1 policy objectives. For other sources where the filtration waiver can be met, dual treatment may mean 2 forms of disinfection, usually chlorination and UV light disinfection. It may also include watershed protection measures to ensure good raw water quality.

<1 NTU of turbidity

Raw surface water will need to be filtered if turbidity readings indicate poor results. A filtration waiver may be granted, if all of the requirements of Section 2 of the policy can be met.
The Guidelines for Canadian Drinking Water Quality currently specify that turbidity in filtered treated water should be less than 0.1 NTU. However, specific filtration technologies may have target turbidity ranges from 0.1 to 1.0 NTU.