



Interior Health

Health Protection

Drinking Water Quality Improvement Program

**CONDITIONS ON
OPERATING PERMIT
HANDOUT**

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SOME BASIC PRINCIPLES

The Drinking Water Quality Improvement Program (DWQIP) is a way for Interior Health and water suppliers to work together to improve drinking water quality through better protection, monitoring, operation and water system upgrades.

The DWQIP takes basic principles of operation, protection, and monitoring of drinking water quality and tries to make improvements in all of them. These principles are included as conditions on the operating permits of participating water systems. The typical conditions include source protection, water treatment and disinfection, cross connection control, monitoring and reporting, operator certification, emergency response planning and capital improvement projects.

The basic principles of the program are adaptable so that each system can achieve the best level of protection possible. Interior Health recognizes that water systems serving 500 to 1000 people have different capabilities and capacities than water systems serving larger populations.

The Drinking Water Quality Improvement Program began in the 1990's with some of the largest water suppliers. The program is now being introduced throughout Interior Health with all water supply systems serving a population of 500 or more people. The municipal and community systems that have 300 or more connections, over 1000 population, are already participating in the program.

This program can help water suppliers to reduce risks to public health by using a multi-barrier, source to tap approach to protect, monitor, and improve drinking water quality. It can help them to respond quickly to changes in water quality that may cause an increased risk to the health of their consumers.

Where to Begin? For Water Systems Serving 500 to 1000 People

The Drinking Water Quality Improvement Program relies on a team approach between the water supplier and the local Public Health Inspector. He or she will arrange a meeting with you and other members of the Health Protection team. This can include the Senior Public Health Inspector, Public Health Engineer, Senior Drinking Water Officer and Medical Health Officer. The first meeting is an opportunity to do an initial overview of your water system's current operation and to discuss what your goals and challenges are. The Health Protection Team will introduce the typical conditions of permit to you, and together, you can discuss where you're at with each condition, where you would like to be, and how to get there.

During the meeting the group can develop an understanding of your system. What does it take to operate it and what are the public health issues. Is there a business plan? Is grant funding available? Do the customers support improvements to the water system? What successes have you had? What do you like about your system and what would you like to improve?

The initial meeting will lead to other consultations which will build a "roadmap" for conditions of operating permit. Conditions of operating permit provide for continuous incremental improvements and steps to fulfill the long term plan for system upgrades and enhancements.

Participation in the DWQIP leads to improved drinking water quality through better protection, monitoring, operations, and water system upgrades.



CONDITIONS ON OPERATING PERMITS FOR WATER SUPPLY SYSTEMS

The Drinking Water Quality Improvement Program outlines nine typical conditions on operating permits. It is expected that each participating water supplier will use these conditions as guidance for key areas to focus their water system improvements. This is intended to be a continuing process and for many of the conditions, the first step may be to develop a plan or program reference.

As water suppliers move through stages of improvement, the details associated with each condition will change. This allows for water supply systems to progress through improvements at a pace appropriate to their capacity.

Source Protection

- 1. Provide a source protection plan for each water source**

Operation Requirements

- 2. Provide a certified operator to operate the system**
- 3. Operate according to your Water Quality Sampling Program**
- 4. Operate according to your Cross Connection Control Program**

Treatment and Distribution Systems

- 5. Provide Turbidity Monitoring Program – including continuous on-line turbidity monitoring**
- 6. Provide continuous on-line monitoring of the water disinfection process**
- 7. Provide long-term plans for source, treatment and distribution system improvements taking into account the goal of 43210 objectives**

Monitoring and Reporting

- 8. Review and update Emergency Response Plan annually**
- 9. Provide monthly reports and an annual summary**

Health Protection**#1 SOURCE PROTECTION PLAN FOR EACH WATER SOURCE**

The purpose of the source protection plans is to identify areas and activities that could affect the quality, quantity and timing of flow of the drinking water sources. By identifying critical areas and activities, the water supplier can influence planning and measure impacts on their system. Additionally, the source protection plan is to reduce threats to water quality and provide an additional barrier for drinking water protection.

Implementation

The water supplier:

1. Completes the source to tap screening tool and discusses the outcomes with the Drinking Water Officer / Public Health Inspector
2. Completes a comprehensive assessment of the drinking water source including:
 - a) formation of a community planning team
 - b) definition of the capture zone or watershed
 - c) mapping potential sources of threats to drinking water in the study area
3. Completes an assessment response plan including:
 - a) development and implementation of protection measures to prevent threats to drinking water
 - b) development of a contingency plan against any accidents
 - c) monitoring, evaluation and annual reporting

Timelines

Suggested timelines for the completion of the various implementation tools:

1. Screening tool – within two months of the request
2. Comprehensive assessment – within three years of the initial request
3. Comprehensive response plan – an on-going process

Monitoring

Progress should be documented by the water supplier in an annual report.

References

- Source to Tap Screening Tool – <http://www.bcwwa.org/source-to-tap/index.php>
- Comprehensive S2T Draft doc – <http://www.bcwwa.org/source-to-tap/index.php>
- Inter Agency Memorandum of Understanding will be supplied when it is finalized
- Well Protection Toolkit – http://www.env.gov.bc.ca/wat/gws/well_protection/wellprotect.html
- Interior Health Direction for Source Water Protection – A Discussion Framework
- Interior Health Source Protection Framework for Establishing Protocols
- Interior Health Drinking Water Protection Act and Source Protection
- Interior Health Investigations of Threats to Drinking Water

SOURCE PROTECTION

Investigation of Threats to Drinking Water

Each water supplier should strive to provide a source protection plan for each water source. Section 29 of the Drinking Water Protection Act is very broad. “If a person considers that there is a threat to their drinking water, the person may request the drinking water officer to investigate the matter”. The drinking water officer must review the request and consider whether an investigation is warranted.

There are a number of similar situations that Interior Health anticipates will prompt the request for investigations. These include but are not limited to logging, cattle grazing, and recreational use in watersheds that contribute to water supplies for individuals or communities.

Each case will be considered separately for the need to undertake an investigation. Of key consideration is whether the matter is a health risk to the users of the water source.

It is the provincial government’s position that there will be shared use of watersheds.

The DWPA is clear that there is a prohibition against contaminating drinking water. This imposes a duty of care on people conducting activities within watersheds. A multi – barrier approach to drinking water requires minimization of impact in watersheds. Where a drinking water health hazard exists or there is a significant risk of an imminent drinking water health hazard the drinking water officer can order an abatement of the activity. A number of best management practices have been established for activities in watersheds. Stakeholders operating to best management practices are not likely to be seen a posing significant risk to drinking water.

The responsibility to provide potable water lies with water suppliers. They must take actions to supply potable water such as providing treatment to meet the 4 3 2 1 0 drinking water objectives set by Interior Health. Typically for surface water this means filtration and disinfection.

4 3 2 1 0 refers to levels of removal of viruses, Giardia, Cryptosporidium, two treatment processes, level of turbidity, and the absence of *E.coli*.

As an initial step in investigating drinking water health hazards the Drinking Water Officer may order the affected water supply systems to conduct a source-to-tap assessment which may include the development of a hazard remediation plan

A request for an investigation must include the following information: locations and types of water intakes and populations drawing water, water treatment measures in place, nature and evidence of the threat to drinking water.

Interior Health has a policy of addressing risks to larger populations and high risk populations as a priority and will consider this in the decision to conduct an investigation.

SOURCE PROTECTION - Legislative Information

The Drinking Water Protection Act and Source Protection

Section 18: A water supplier can be required to conduct an assessment of their drinking water source, including land use and other activities.

Section 22: The drinking water officer can order the preparation of an assessment response plan. Provisions in the plan can include public education, best management plans and input respecting local authority zoning and other land use regulation.

Section 23: A person must not contaminate or tamper with a drinking water source if this will result in a drinking water health hazard in a water supply system. This does not apply where a person is acting under another enactment.

Section 24: Officials under other authority or employed by the public service of BC must report situations that they consider to be a threat to drinking water.

Section 25: Drinking water officers may make an order where they believe there is a drinking water health hazard or the risk of a hazard. Orders may be directed at the person in charge of the thing that caused the hazard or risk and at their cost. The orders can include investigations, abatement, remediation measures or plans. The authority under this section applies despite any other enactment.

Section 29: If a person thinks there is a threat to their drinking water, they can ask for a drinking water officer to investigate. The request must be made in writing.

Refer to the DWPA for complete references and actual legal wording.

While Medical Health Officers have been appointed Drinking Water Officers, and have further appointed or delegated the powers and duties of Drinking Water Officers to Public Health Inspectors, there is still a responsibility of many other Ministries to protect sources of drinking water by reviewing activities that could cause drinking water hazards.

Even with approval of activities, persons conducting activities within watershed source areas still have a responsibility to avoid or remediate drinking water hazards.

Interior Health recommends that issuing officials or approving officers seek an indication that source water protection has been considered and that there will not be a drinking water hazard expected as a result of normal operations.

Proponents of activities within watershed areas should be aware that they may be required to address the costs of remediation of health hazards should they occur.

4-3-2-1-0 Drinking Water Objective

Water suppliers are required to provide potable water to all users on their systems. The 4-3-2-1-0 drinking water objective provides a performance target for water suppliers to ensure the provision of microbiological safe drinking water. Interior Health supports water suppliers to meet this objective. All water suppliers should have an implementation plan to meet this as a standard.

This objective will be applied as a performance standard for all new water systems. Many existing water systems already meet most of the standard. Risk to human health is substantially reduced when water suppliers meet this objective.

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 Lamblia and Cryptosporidium
- ❑ 2 refers to two treatment processes for all surface drinking water systems
- ❑ 1 for less than 1 NTU of turbidity with a target of 0.1 NTU
- ❑ 0 total and fecal coliforms and E. Coli

Definitions:

4 log inactivation of viruses:

Viruses are easily inactivated by the use of chlorine. The common practice of maintaining 0.5 mg/L of free chlorine for 20 minutes is adequate in most cases.

3 log removal or inactivation of giardia lamblia and cryptosporidium protozoa

The 3 log removal or inactivation of these protozoa is the minimum level required of water systems that have a source that is considered “low risk” by Interior Health and have not had an outbreak of either disease. **Giardia** may be inactivated by large doses of free chlorine, ultraviolet light, ozone and chlorine dioxide, or removed by filtration. The US EPA 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. The Guidelines for Canadian Drinking Water Quality for **Cryptosporidium** have developed design guidelines to determine that the proposed treatment 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 40mj/sq. cm.

2 treatment barriers are a minimum for all surface water sources. A multiple barrier 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 barrier is not effective. A minimum dual barrier of treatment is 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 surface water supplies in order to meet the 4-3-2-1-0 performance objectives. For other sources where the turbidity standard can be met without filtration (for example, a well beside a lake), dual treatment may mean chlorination and UV light disinfection. Ground water sources that are not under the influence of surface water will be given credit for filtration.

<1 NTU of turbidity (less than)

The Guidelines for Canadian Drinking Water Quality currently specify that the filtered treated water turbidity should have a target of less than 0.1 NTU at all times. Specific filtration technologies may have target turbidity ranges from 0.1 to 1.0 NTU. Exemptions for filtration may be considered for those systems that use two disinfectants plus maintain chlorine residual in the distribution system and can demonstrate compliance with the GCDWQ for exemption for filtration..

0 Fecal coliform or E. coli bacteria

The Drinking Water Protection Act requires water suppliers to provide water with 0 E.Coli sample results. Coliform bacteria are easily controlled with chlorine, UV light and can be reduced by filtration.

#2 CERTIFIED OPERATOR TO OPERATE WATER SYSTEM

Providing a certified operator ensures that the water supplier has appropriately trained staff that are certified to the level of the water system and to make sure succession planning is being done.

Implementation

1. The water system staff should attain EOCP system classification for treatment and distribution
2. The water supplier should develop a plan for continuing education and training for operators
3. The Drinking Water Officer / Public Health Inspector and water supplier should review the plan and establish dates for certified operator compliance
4. The water supplier should identify a schedule of training events

Timelines

- January 1, 2006 for Level I, II, III as required by legislation
- The Drinking Water Officer / Public Health Inspector may apply a condition on the Operating Permit establishing a later date for compliance
- Collaboration between the Drinking Water Officer / Public Health Inspector and the water supplier may be used to set a date for compliance
- The Drinking Water Officer / Public Health Inspector should review the EOCP classification every five years or with significant changes to the system

Monitoring

1. The water supplier should document operator qualifications in the annual report
2. Annually, the Drinking Water Officer / Public Health Inspector should review the operator status and documentation
3. The Drinking Water Officer / Public Health Inspector should annually review the water supplier training plan

References

- Drinking Water Protection Act Section 9
- Drinking Water Protection Act Section 12
- Environmental Operators Certification Program <http://www.eocp.org>

#3 OPERATE ACCORDING TO YOUR WATER QUALITY MONITORING PROGRAM

Water quality monitoring programs are an essential part of due diligence performed by water system owners. Water quality monitoring programs check the effectiveness of treatment and the integrity of the water supply system as well as demonstrate and document the water quality.

Implementation

The water supplier should:

1. Review the intent and purpose of a water quality monitoring program, the regulatory requirement to sample and the costs incurred (since 1992)
2. Develop a water quality monitoring program in collaboration with the Drinking Water Officer / Public Health Inspector
3. Implement the monitoring program

Timeline

The water supplier should establish a timeline for implementation giving consideration to budget cycles. Six to twelve months between discussion with the Drinking Water Officer / Public Health Inspector and implementation is considered reasonable

Monitoring

1. The Drinking Water Officer / Public Health Inspector will conduct audit sampling
2. The water supplier must submit a summary of results in a monthly report
3. Monthly reports should include and identify the following underlying four question principle:
 - a) Was the monthly report submitted?
 - b) Were there anomalies reported?
 - c) Were actions taken to address the anomalies?
 - d) Can trends in data be tracked?

References

- Drinking Water Protection Act
- Drinking Water Protection Regulation
- Guidelines for Canadian Drinking Water Quality
- Interior Health Issue Paper – Drinking Water Sampling
- Interior Health Issue Paper – Monthly Reports
- Interior Health Water Quality Monitoring Guide
- List of laboratories approved by the Provincial Health Officer for bacteriological analysis http://www.pathology.ubc.ca/education/Certificate_Programs/Enhanced_Water_Quality_Assurance/PHO_-_Approved_Laboratory_List.htm
- CAEAL - Canadian Association For Environmental Analytical Laboratories – Chemical analysis <http://www.caeal.ca/>

WATER QUALITY MONITORING PROGRAM (WQMP) GUIDE

Type of Monitoring	Issues	Questions that should be addressed by WQMP	Things that should be considered when addressing WQMP questions
Biological Monitoring	<ul style="list-style-type: none"> • Cryptosporidium • Giardia • Total Coliform • Fecal Coliform • E. coli • HPC (heterotrophic plate count) 	What lab is being used?	PHO Certified / Internal / BCCDC / costs
		Who is responsible?	Management / maintenance staff
		How often?	Number and type of test
		Sample locations?	Raw water / treatment process / pressure zones / dead ends / location of low water use / watershed / complaints / large reservoirs with low turnover
		Who is notified of results?	Covered in emergency response plan / public health / public users
		How are results reported?	Automated / internet / fax
		Who trains staff?	
Chemical Monitoring	<ul style="list-style-type: none"> • THM (trihalomethane) • TOC • Routine chemical • Historical problems • Daily quality control • Fluoride 	What lab is being used?	Certified / internal / costs
		Frequency?	Historical problems / watershed
		Who is responsible?	Management / maintenance staff
		Sample locations?	Raw water / treatment process
		Complaints?	How to respond
		Who compares with guidelines?	Internal / help from health protection
		Who is notified of results?	Covered in Emergency Response Plan / public health / public users
		How are results reported?	Automated / internet / fax
		What is done when operating anomalies occur?	Covered in Emergency Response Plan
Real Time Monitoring	Chlorine	Where is the monitor located?	Treatment / distribution system / free Cl or total Cl
		Does monitoring regulate chlorine injection?	Feed back on flow / feed back on residuals
		How often is the data checked?	SCADA feed back / data recording / manual daily check
		How often is the system maintained?	Calibration checks
		What is done when operating anomalies occur?	Covered in Emergency Response Plan / automatic system shutdown
		Who is notified of results?	Covered in Emergency Response Plan / public health / public users
		Rate on consumption?	Form / stock on hand / length of supply / shelf life
	Turbidity	Where is the monitor located?	Raw / treatment / distribution system
		How often is the data checked?	SCADA feedback / data recording / manual daily check
		How often is the system maintained?	Calibration checks
		What is done when operating anomalies occur?	Covered in Emergency Response Plan / automatic system shutdown
		Who is notified of the results?	Covered in Emergency Response Plan
	Pressure	Where is the monitor located?	Pre/post filter / PRV stations
		How often is the pressure checked?	
		How often is the system maintained?	
What is done when operating anomalies occur?			
		Who is notified of the results?	

Type of Monitoring	Issues	Questions that should be addressed by a WQMP	Things that should be considered when addressing WQMP Questions
Volume Monitoring	Water flow	How much water is being consumed?	Feedback tied to flow /
		How much electricity is being used?	Pumps hours / System capacity
	Reservoirs	How much turnover is there?	Float adjustments / Seasonal needs
	Chemical Feed	How much chlorine is consumed?	Feedback tied to flow /
		How much fluoride is consumed?	Feedback tied to flow /
		Are other chemicals added?	
Others	Temperature	How is this monitored?	Required? / Auto / Manual / Giardia Performance Monitoring
	pH	How is this monitored?	Required? / Auto / Manual / Giardia Performance Monitoring
	Color	How is this monitored?	Required? / Auto / Manual
	%UV (Transmittance)	Where is this measured?	At intake or at UV light? / Auto
		How is this measured?	Auto / Manual / Frequency
	Visual Inspections	How often is your infrastructure inspected?	Vandalism / Wildlife / Tampering / Maintenance Access
		How often is your watershed inspected?	Protection Signs / Industrial Activity / Access
What is done when operating anomalies occur?			

#4 OPERATE ACCORDING TO YOUR CROSS CONNECTION CONTROL PROGRAM (CCCP)

The purpose of a cross connection control program is to protect the integrity of the water supply system from bacteriological, chemical and physical contamination from cross connections. A cross connection control program is an important component of due diligence performed by a water system owner.

Implementation

The water supplier and Drinking Water Officer / Public Health Inspector should:

1. Review the purpose of a Cross Connection Control Program
2. Review resources and/or web links to resources. Contact Ministry of Community Services for an example of a CCCP bylaw
3. Encourage owner/operator to attend training
4. Collaborate to develop a Cross Connection Control Program

Timelines

- The Drinking Water Officer / Public Health Inspector should set target dates in collaboration with the plan of the water supplier.

Monitoring

1. The water supplier should document the Cross Connection Control Program progress in the annual report.
2. The Drinking Water Officer / Public Health Inspector should review the program status and documentation with the water supplier on an annual basis.

References

- BCWWA Cross Connection Resource Material – <http://www.bcwwa.org/BMP/index.php#bmp1>
- Interior Health Cross Connection Control Program (CCCP) For a Small Water System HPF9090

CROSS-CONNECTION CONTROL PROGRAM (CCCP) GUIDE FOR A SMALL WATER SYSTEM

A cross-connection is: “...any actual or potential connection between a potable water system and any source of pollution or contamination “(CSA, 2003). Water suppliers have a responsibility to provide water that is usable and safe to drink. Consumers expect that water delivered to them through a small water system is safe to drink. For these reasons, each water supplier must take reasonable precautions to protect their small water system against cross-connections. An effective cross-connection control program can:

- Protect your potable water supply;
- Reduce risk of waterborne illness;
- Reduce the number of water quality complaints;
- Increase public confidence;
- Increase awareness & education about cross-connection control;
- Reduce system shut down time and cleanup costs due to backflow incidents; and,
- Reduce liability.

If a water system is not protected against backflow from a cross-connection, this becomes a potential source of contamination and therefore a significant health hazard. Water suppliers can protect against cross-connections through a Cross-Connection Control Program (CCCP), which will compliment other barriers of the multi-barrier approach to providing safe drinking water.

Program Steps

The following process may be used to develop and implement a small water system Cross-Connection Control Program (CCCP). Many of these steps are summarized from BCWWA’s Best Management Practices: Cross-Connection Control (www.bcwwa.org/BMP/index), with examples and references added.

1. Conduct Initial Research
 - a) Reference the City of Penticton’s CCCP:
www.penticton.ca/city/public_works/water/CrossConnectionControl.asp
2. Build Program Framework
 - a) Identify objectives, targets, budget and schedule
3. Obtain Support and Funding
 - a) Present program to applicable users (strata council, board members) and update them as the process develops
4. Develop a Bylaw and an Enforcement Strategy, if applicable
 - a) This will establish the water supplier’s authority for the CCCP
 - b) For more details on bylaws refer to:
 - Methodology for Setting a Cross-Connection Control Program, Section 3.1.
http://www.infraguide.ca/bestPractices/PublishedBP_e.asp

- City of Penticton's CCCP Bylaw:
www.penticton.ca/city/public_works/water/CrossConnectionControl.asp
5. Identify Staff Training Requirements and Funding Resources
 - a) Most CCCPs require the consumer to pay for the cost of the survey and hazard assessment, purchase and installation of backflow prevention devices, and regular inspection and testing.
 - b) Depending on the staff, water suppliers may choose one of the following:
 - Train staff to implement the program and complete all inspections;
 - Train staff to implement the program and complete initial inspections only and hire a certified contractor for other inspections; or
 - Train staff to implement the program only and hire a certified contractor to do all inspections.

 6. Develop Policies and Procedures or Recommended Standards
 - a) These will contain detailed program information and will include:
 - Reference to the authority for the program (ex. bylaw or ordinance)
 - Water supplier responsibilities
 - Consumer responsibilities
 - b) The following references may be helpful:
 - Methodology for Setting a Cross-Connection Control Program, Section 3.2
www.infraguide.ca/bestPractices/PublishedBP_e.asp
 - City of Penticton's CCCP
www.penticton.ca/city/public_works/water/CrossConnectionControl.asp

 7. Create a Communication Plan and Materials
 - a) Educate the consumers, board members or Strata Council and other stakeholders about what a CCCP is and what preventative measures they can practice:
 - b) The following resources may be helpful:
 - Links to educational material at the BCWWA Cross Connection Control Committee at:
www.bcwwa.org/committees/cccc/index.php
 - F-50: 50 Cross-Connection Questions and Answers:
www.wattsreg.com/default.htm?/educationalbrochures/default.htm
 - EPA: Cross-Connection Control Manual
www.epa.gov/safewater/crossconnection.html
 - c) For consumers, an effective communication plan may include brochures, water bill inserts, website and newspaper articles. On the right-hand side of the first page of BCWWA's Best Management Practices: Cross-Connection Control is a list of information links, including brochures relevant to residential consumers.

 8. Develop a Data Management System
 - a) Identify the type of data to track such as:
 - Records of cross-connection surveys and hazard assessments
 - Inspection and testing records
 - Backflow incident reports
 - Inventory of backflow prevention devices
 - List of registered testers
 - b) Develop a system to maintain the records (may be as simple as a filing system)

9. Access Certified Testers Registry
 - a) Contact the BCWWA for a list of certified testers
 - b) Research and address tester liability

10. Develop a Testing Program and Reports
 - a) Determine which devices require testing and the frequency of testing
 - b) Determine who can test
 - c) Track test results
 - d) Develop stakeholder correspondence
 - e) Evaluate and refine program (ongoing)

11. Conduct Cross-Connection Control Surveys
 - a) Identify and prioritize consumers requiring a survey. Municipal staff will likely have the knowledge to identify and prioritize (in terms of hazard levels) consumers requiring surveys. It may be a simple task of formalizing this knowledge within a CCCP.
 - b) Notify property owners of hazards and requirements for installation of backflow prevention devices
 - c) Record data
 - d) Evaluate and refine surveys (ongoing)

12. Develop Incident Response Plan
 - a) Incorporate into the existing Emergency Response Plan

Phased-In Approach

As discussed, a phased-approach to a CCCP is appropriate. Developing an effective CCCP is an ongoing process. It is recognized that some steps, such as the development of a bylaw, may require some time. Other steps, such as building the program framework and educating staff and consumers can start immediately. If, after reviewing the material and references, you have additional questions please contact your Public Health Inspector.

1. Severe Risk Connections

The initial phase should address all severe risk connections. Severe risk connections are typically from industrial, commercial, institutional and agricultural sources. A residential connection would not constitute a severe risk connection.

2. Residential

Examples of CCCP requirements for residential connections could include:

- a) Vacuum breakers installed on hose bibs;
- b) Dual-check valves on irrigation systems;
- c) Dual-check valves or reduced backflow prevention devices on boilers;
- d) Pictures of hardware are available on the City of Penticton website
http://www.penticton.ca/city/public_works/water/CrossConnectionControl2.asp
- e) Implementation of a public education program
- f) A completed survey of residential connections only if there is a real or perceived higher than normal risk to the water system from a residence

#5 PROVIDE A TURBIDITY MONITORING PROGRAM (Including continuous on-line turbidity monitoring)

The purpose of providing turbidity monitoring is to demonstrate and document the water quality within a water supply system. Turbidity monitoring shows the effectiveness of treatment and the integrity of the water supply system. Turbidity is a real time indicator of water quality and increasing turbidity is linked to increasing health risk. Turbidity monitoring of raw water is used to determine the type and level of treatment required. Turbidity monitoring of finished water is used to determine the effectiveness of the treatment and the integrity of the distribution.

Implementation

The water supplier should:

1. Review historical turbidity levels and monitoring
2. Determine the status of current monitoring
3. In collaboration with the Drinking Water Officer / Public Health Inspector, develop a turbidity monitoring program
4. Submit a construction application to the Public Health Engineer for installation of equipment
5. Implement the Interior Health turbidity education and notification campaign

Timelines

- The Drinking Water Officer / Public Health Inspector should establish a timeline for implementation giving consideration to the water supplier's budget cycles.
- Six to twelve months between discussion and implementation is considered reasonable.

Monitoring

1. The Drinking Water Officer / Public Health Inspector may conduct audit sampling
2. The water supplier must submit a summary of results in the monthly report
3. Monthly reports should include and identify the following underlying 4 question principle:
 - a) Was a monthly report submitted?
 - b) Were there anomalies reported?
 - c) Were actions taken to address anomalies?
 - d) Can trends in data be tracked?

References

- Guidelines for Canadian Drinking Water Quality Turbidity Supporting Document
- Interior Health Issue Paper - Turbidity and Public Notification
- Interior Health Turbidity Notification and Education Campaign Toolkit
- 43210 Objectives
- Interior Health Monthly Reports
- Interior Health Water Quality Monitoring Guide

4-3-2-1-0 Drinking Water Objective

Water suppliers are required to provide potable water to all users on their systems. The 4-3-2-1-0 drinking water objective provides a performance target for water suppliers to ensure the provision of microbiological safe drinking water. Interior Health supports water suppliers to meet this objective. All water should have an implementation plan to meet this as a standard.

This objective will be applied as a performance standard for all new water systems. Many existing water systems already meet most of the standard. Risk to human health is substantially reduced when water suppliers meet this objective.

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 Lamblia and Cryptosporidium
- ❑ 2 refers to two treatment processes for all surface drinking water systems
- ❑ 1 for less than 1 NTU of turbidity with a target of 0.1 NTU
- ❑ 0 total and fecal coliforms and E. Coli

Definitions:

4 log inactivation of viruses:

Viruses are easily inactivated by the use of chlorine. The common practice of maintaining 0.5 mg/L of free chlorine for 20 minutes is adequate in most cases.

3 log removal or inactivation of giardia lamblia and cryptosporidium protozoa

The 3 log removal or inactivation of these protozoa is the minimum level required of water systems that have a source that is considered “low risk” by Interior Health and have not had an outbreak of either disease. **Giardia** may be inactivated by large doses of free chlorine, ultraviolet light, ozone and chlorine dioxide, or removed by filtration. The US EPA 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. The Guidelines for Canadian Drinking Water Quality for **Cryptosporidium** have developed design guidelines to determine that the proposed treatment 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 40mj/sq. cm.

2 treatment barriers are a minimum for all surface water sources. A multiple barrier 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 barrier is not effective. A minimum dual barrier of treatment is 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 surface water supplies in order to meet the 4-3-2-1-0 performance objectives. For other sources where the turbidity standard can be met without filtration (for example, a well beside a lake), dual treatment may mean chlorination and UV light disinfection. Ground water sources that are not under the influence of surface water will be given credit for filtration.

≤1 NTU of turbidity (less than)

The Guidelines for Canadian Drinking Water Quality currently specify that the filtered treated water turbidity should have a target of less than 0.1 NTU at all times. Specific filtration technologies may have target turbidity ranges from 0.1 to 1.0 NTU. Exemptions for filtration may be considered for those systems that use two disinfectants plus maintain chlorine residual in the distribution system and can demonstrate compliance with the GCDWQ for exemption for filtration.

0 Fecal coliform or E. coli bacteria

The Drinking Water Protection Act requires water suppliers to provide water with 0 E.Coli sample results. Coliform bacteria are easily controlled with chlorine, UV light and can be reduced by filtration

#6 PROVIDE CONTINUOUS ON-LINE MONITORING OF THE WATER DISINFECTION PROCESS

The purpose of continuous on-line monitoring of the water disinfection process is to demonstrate and document the water quality within a water supply system. Chlorine monitoring shows the effectiveness of treatment and the integrity of the water distribution system. Free chlorine residual is a real time indicator of water quality. Chlorine residuals can provide an early warning of changing water quality that may lead to a threat to drinking water. Monitoring disinfection provides another barrier to water quality threats.

Implementation

The water supplier should:

1. Review historical disinfection levels and monitoring with the Drinking Water Officer / Public Health Inspector
2. Determine status of current monitoring
3. Develop a disinfection monitoring program in collaboration with the Drinking Water Officer / Public Health Inspector
4. Submit a construction application to the Public Health Engineer for installation of equipment

Timelines

- The Drinking Water Officer / Public Health Inspector should establish a timeline for implementation giving consideration to the water supplier's budget cycles.
- Six to twelve months between discussion and implementation is considered reasonable.

Monitoring

1. The Drinking Water Officer / Public Health Inspector may conduct audit sampling
2. The water supplier must submit a summary of results in the monthly report
3. Monthly reports should include and identify the following underlying 4 question principle:
 - a) Was a monthly report submitted?
 - b) Were there anomalies reported?
 - c) Were actions taken to address anomalies?
 - d) Can trends in data be tracked?

References

- Guidelines for Canadian Drinking Water Quality supporting documents
- HPF9040 43210 Objectives
- Interior Health Issue Paper – DWQIP Monthly Reports
- Interior Health Issue Paper – Drinking Water Sampling

#7 PROVIDE LONG-TERM PLANS FOR SOURCE, TREATMENT AND DISTRIBUTION SYSTEM IMPROVEMENTS

(Taking into account the goal of 43210 objectives)

Water systems are dynamic processes which require continuous operation and maintenance. To provide a plan for the future, consider financial, technical and water quality objectives for sustainable water infrastructure. Long term business plans must reflect sustainability of the water supply system to provide potable water for all users of the system.

Implementation

The water supplier should:

1. Review the Drinking Water Source to Tap Screening
2. Review the Comprehensive Source to Tap Assessment with the Drinking Water Officer / Public Health Inspector
3. Develop a long term plan
4. Review list of priorities for improvements in collaboration with the Drinking Water Officer / Public Health Inspector
5. Provide Interior Health with copies of funding applications for water infrastructure improvements
6. Include long term plans for water infrastructure in capital expenditure plan
7. Include long term plans for water infrastructure in financial business plan

Timelines

The water supplier, in collaboration with the Drinking Water Officer / Public Health Inspector:

1. Sets dates to submit long term plans
2. Sets dates to meet 43210 objectives

Monitoring

1. The water supplier should document a summary of long term plans each year in the annual report
2. The Drinking Water Officer / Public Health Inspector should annually review the long term plans with the water supplier

References

- Interior Health HPF9040 43210 Definitions
- BCWWA Best Management practices <http://www.bcwwa.org/BMP/index.php>
- Ministry of Health Services Drinking Water Source to Tap Screening Tool
- Comprehensive assessment tool

#8 REVIEW AND UPDATE EMERGENCY RESPONSE PLANS ANNUALLY

It is important to be aware of potential emergencies and to develop appropriate response plans. Emergency Response plans should be revised annually and updated as appropriate to keep plans current. Threats to water quality may be managed with an emergency response plan. They provide guidance for actions during disruptions to water quality or water supply.

Implementation

The water supplier should:

1. Review existing Emergency Response Plans
2. Refer to Best Management Practices for emergency response planning
3. Review regulatory requirements and examples/templates of Emergency Response Plans
4. Identify situations that would constitute an emergency including deviations from normal operating conditions
5. Develop an appropriate response and list of contacts for each type of emergency
6. Develop a communication plan with sample public notices
7. Prepare a system distribution map including location of works (pump houses, valves, access roads)
8. Submit the plan to Drinking Water Officer / Public Health Inspector for review and comment
9. Circulate plan and map to appropriate personnel
10. Practise plan, document results, and revise plan accordingly

Timelines

- The water supplier must submit a current version of the Emergency Response Plan to the Drinking Water Officer / Public Health Inspector for review on an annual basis

Monitoring

1. The water supplier should ensure that the last revision date of the Emergency response plan summary is documented each year in the annual report
2. The water supplier should ensure that a summary of the Emergency Response and Contingency Plan is accessible to the users of the water system (DWPR Section 13)
3. The Drinking Water Officer / Public Health Inspector should annually review and comment on the Emergency Response Plan

References

- Drinking Water Protection Act Section 10
- Drinking Water Protection Regulation Section 13
- BCWWA Best Management Practices link: <http://www.bcwwa.org/BMP/index.php>
- Ministry of Health Emergency Response Plan
<http://www.healthservices.gov.bc.ca/protect/publications.html#waterpub>
- Turbidity Notification and Education Campaign

#9 PROVIDE MONTHLY REPORTS AND AN ANNUAL SUMMARY

The purpose of monthly reporting and annual summaries is to build consumer confidence in water quality. Reporting enhances communication of pertinent information regarding operations and maintenance and provides regular updates of the ongoing monitoring associated with water quality, quantity, and significant changes to the water system.

Implementation

The water supplier should:

1. Collaborate with the Drinking Water Officer / Public Health Inspector on format and content for monthly and annual reports
2. Collect and report data
3. Submit reports to the Drinking Water Officer / Public Health Inspector for review

• Monthly Report

Should include summary information for the Water Quality Monitoring Program, Turbidity Monitoring Program and water disinfection process. The report **may include** daily water consumption, pH, temperature, UV transmittance, Giardia performance monitoring, comments on source, treatment and distribution maintenance and significant events.

Where summary information is provided, it should address the following questions:

- a) Were there anomalies in monitored data?
- b) Were appropriate actions taken to address anomalies?
- c) Can trends in data be tracked?

• Annual Report

Should include summary information for source protection, operator certification, Water Quality Monitoring Program, Cross Connection Control Program, Turbidity Monitoring Program, water disinfection processes, long term plans for system improvements, Emergency Response Plan revision dates and trends identified in monthly reports. The report **may include** upgrades to the infrastructure that have occurred in the previous year, plans for the next year, and long term plans for the water system, operator education and training that has occurred in the previous year, provide a summary of the years' process monitoring and identify any emergency situations or events that occurred in the previous year.

Timelines

1. Annual reports must be made public by the water supplier within six months of the end of the calendar year (DWPR Section 11)
2. Water supplier monthly reports are due by the 15th of the following month to the Drinking Water Officer / Public Health Inspector

Monitoring

The water supplier will:

1. Provide monthly report to Drinking Water Officer / Public Health Inspector by the 15th of the following month
2. Provide an annual report to Drinking Water Officer / Public Health Inspector within six months of the end of the calendar year

References

Drinking Water Protection Regulation Section 11

TYPICAL CONDITIONS ON OPERATING PERMIT - REFERENCE LINKS

- Ministry of Health Services Drinking Water Source-to-Tap Screening Tool – <http://www.bcwwa.org/source-to-tap/index.php>
- Comprehensive S2T Draft doc – <http://www.bcwwa.org/source-to-tap/index.php>
- Ministry of Environment Well Protection Toolkit – http://www.env.gov.bc.ca/wat/gws/well_protection/wellprotect.html
- Environmental Operators Certification Program – <http://www.eocp.org>
- University of British Columbia Pathology and Laboratory Medicine List of laboratories approved by the Provincial Health Officer Bacteriological Analysis – http://www.pathology.ubc.ca/education/Certificate_Programs/Enhanced_Water_Quality_Assurance/PHO_-_Approved_Laboratory_List.htm
- CAEAL – Canadian Association for Environmental Analytical Laboratories Chemical Analysis – <http://www.caeal.ca/>
- BCWWA Cross Connection Resource Material – <http://www.bcwwa.org/BMP/index.php#bmp1>
- BCWWA Best Management Practices link - <http://www.bcwwa.org/BMP/index.php>
- Ministry of Health Emergency Response Plan link - <http://www.healthservices.gov.bc.ca/protect/publications.html#waterpub>



DWQIP - SUMMARY SHEET

Name of Water System	
Site Address	
Date	DWO/PHI
Attendees	
1.	5.
2.	6.
3.	7.
4.	8.
Water Sources	
Source Water Protection Program	

EOCP Water Treatment System Classification:	
Water Treatment Process	

Water Treatment Operator(s) – Certification Level	
1. _____	
2. _____	
3. _____	
4. _____	
EOCP Water Distribution System Classification	
Water Distribution Operator(s) – Certification Level	
1. _____	
2. _____	
3. _____	
4. _____	
Cross-Connection Control Program	

<hr/> <hr/> <hr/> <hr/>
Distribution Sampling (bacteriological and chemical water quality) <hr/> <hr/>
System Monitoring (turbidity, chlorination etc.) <hr/> <hr/> <hr/> <hr/>
Giardia / Cryptosporidium (removal / activation) <hr/> <hr/>
Emergency Response and Contingency Plan (WQA and BWN notification) <hr/> <hr/> <hr/> <hr/>
Financial Plan (Funding for upgrades / training) <hr/> <hr/>
Comments <hr/> <hr/> <hr/> <hr/> <hr/>
Future meeting plans (follow-up by Interior Health with water system to discuss Conditions of Operating Permit, tours etc) <hr/> <hr/> <hr/> <hr/>

Direction for Source Water Protection – A Discussion Framework

Interior Health - Drinking Water Program

Direction for Source Water Protection

A Discussion Framework

Introduction:

This document provides background for the development of Interior Health's short and long-term goals for source water protection. While the authority to engage in activities that provide source protection for drinking water exists in the Drinking Water Protection Act, the methodology has not been developed. The purpose of this document is to propose guiding principles that are considered in setting Interior Health's goals for drinking water protection. The intent is to work with other Ministries, Institutions and Industry in establishing a course of action.

Vision: Healthy People, Healthy Places

For the Drinking Water Program, we view "Healthy Places" to include "healthy" watersheds and aquifers. Our vision goes beyond looking at raw water in an intake pipe, to looking at all aspects that influence the raw water before it reaches the intake.

Guiding Principles:

- ◆ Drinking water is a public health issue. Source protection is an integral part of providing potable water. Watershed protection is an important component of providing high quality safe drinking water.
- ◆ When drinking water quality is not threatened and threats are managed effectively the multiple use of watersheds for resource development, extraction and recreational purposes is encouraged. Determinants of health include social and economic conditions, as well as physical environment
- ◆ Health objectives for watershed management should be evidence based and related to health risks of water users. Objectives should be consistent with out-come based measures.
- ◆ Population health principles will be used to set priorities for action.
- ◆ Watershed management does not replace the need for surface water treatment.
- ◆ Surface water treatment does not replace the need for watershed management.
- ◆ Interior Health will lead in the goal of improving source water protection within our boundary.

Interior Health Goals:

Long Term:

- ◆ To make evidence-based management decisions regarding watershed and aquifer activities and their impact on the health of drinking water sources.
- ◆ To seek technical expertise and support from other Ministries with responsibility for activities that may have an impact on drinking water.
- ◆ To establish an inter-Agency technical advisory committee to identify the best science and markers of watershed and aquifer health.
- ◆ To develop processes to review and respond to management practices in watersheds

Short Term:

- ◆ To seek support for the Interior Health approach from other Ministries, institutions and industry with responsibility for maintaining drinking water quality, quantity and duration of flow.
- ◆ To seek a Memorandum of Understanding with the Inter-Agency Management Committee for the purpose of enforcement of the Drinking Water Protection Act with Interior Health as the Lead Agency.
- ◆ Seek commitments from Inter-Agency Management Committee members for setting objectives in keeping with drinking water source protection guiding principles.
- ◆ To identify high priority watersheds and aquifers in keeping with a population health approach, and further additional areas that could be considered high risk, or priorities in the community watersheds already identified.
- ◆ To recognize and promote the concept that source protection is one step in the source-to-tap multi-barrier approach to providing potable drinking water.
- ◆ To establish a committee to develop a clear picture of a healthy watershed or aquifer with natural variations. This committee would investigate methods of maintaining or improving the current state of watersheds and aquifers, using HACCP concepts.
- ◆ To provide contact information for the Senior Drinking Water Officers who will provide the point of contact for Interior Health on regional source protection issues.
- ◆ To establish an inventory of issues at a local level through the Senior Drinking Water Officers.

References:

- ◆ IH Mission statements
- ◆ Drinking Water Protection Act
- ◆ Provincial Terms of Reference for Inter-Agency Management Committees
September 2003
- ◆ Drinking Water Action Plan 2002
- ◆ Provincial Health Officer's Annual Report 2000
- ◆ BC Auditor Generals Report 1999
- ◆ Drinking Water Protection Act Policies and Procedures Handbook - Draft
2004

Prepared by: Elizabeth Sigalet, Manager, Drinking Water
Reviewed by: Interior Health Drinking Water Officers Team
Approved by:



Issue Paper Drinking Water Supply System Monthly Reports

Name of Issue: Guidance for monthly reports for the Drinking Water Quality Improvement Program – for larger systems (DWQIP).

Background:

The DWQIP was initiated as a pilot project in the Okanagan HSDA. Monthly reports were received in a number of different formats. The initial reports were used to see what kind of information the water suppliers would provide about their systems. As comfort levels grew, advice was provided to each water supply system individually for required reporting.

As the DWQIP is expanded to other Health Service Areas, and as the Public Health Inspectors are taking on the responsibility of implementing the program, there is a need for a consistent approach to the operating permit condition that requires a monthly report.

Allowing a water supplier to provide the information that they feel is appropriate leads to some concerns. In some cases, the reports may contain too much information to be appropriately reviewed. There may be a false sense of security that Interior Health is identifying health concerns from the data, and is then responsible for taking action. In other cases, we may not get information that would give us data required to assess water system operations.

Issue Analysis:

Monthly reports provide us with verification that there is appropriate operation of the water supply system. Of the operator, we want to know

- ◆ Are monitoring records being kept and reviewed?
- ◆ Were there anomalies in monitored data?
- ◆ Were appropriate actions taken to address anomalies?
- ◆ Can trends in data be tracked?

Each water supply system will have different monitoring requirements. The monthly report format needs to be flexible to allow for different systems. A checklist of things to be considered in a monitoring program is attached. The monthly report does not have to include all of these items. It should provide a summary of information that the PHI wants to review. For example, a summary of daily average readings where there is on-line monitoring. Perhaps the number of bacteriological samples tested.

Anomaly reporting may also depend on the system being considered. For surface water systems, it may be periods when turbidity exceeds 5 NTU. In chlorinated systems it could be unusual chlorine demand. Identifying anomalies is the first step; the next is ensuring that appropriate action has been taken.

Drinking Water Officers or Public Health Inspectors can require more information than indicated above if there is something they want investigated in more depth.

Details of monthly reports can be requested periodically to determine how the operator reports the summary information.

WATER QUALITY MONITORING PROGRAM (WQMP) GUIDE

Type of Monitoring	Issues	Questions that should be addressed by WQMP	Things that should be considered when addressing WQMP questions
Biological Monitoring	<ul style="list-style-type: none"> • Cryptosporidium • Giardia • Total Coliform • Fecal Coliform • E. coli • HPC (heterotrophic plate count) 	What lab is being used?	PHO Certified / Internal / BCCDC / costs
		Who is responsible?	Management / maintenance staff
		How often?	Number and type of test
		Sample locations?	Raw water / treatment process / pressure zones / dead ends / location of low water use / watershed / complaints / large reservoirs with low turnover
		Who is notified of results?	Covered in emergency response plan / public health / public users
		How are results reported?	Automated / internet / fax
		Who trains staff?	
Chemical Monitoring	<ul style="list-style-type: none"> • THM (trihalomethane) • TOC • Routine chemical • Historical problems • Daily quality control • Fluoride 	What lab is being used?	Certified / internal / costs
		Frequency?	Historical problems / watershed
		Who is responsible?	Management / maintenance staff
		Sample locations?	Raw water / treatment process
		Complaints?	How to respond
		Who compares with guidelines?	Internal / help from health protection
		Who is notified of results?	Covered in Emergency Response Plan / public health / public users
		How are results reported?	Automated / internet / fax
		What is done when operating anomalies occur?	Covered in Emergency Response Plan
Real Time Monitoring	Chlorine	Where is the monitor located?	Treatment / distribution system / free Cl or total Cl
		Does monitoring regulate chlorine injection?	Feed back on flow / feed back on residuals
		How often is the data checked?	SCADA feed back / data recording / manual daily check
		How often is the system maintained?	Calibration checks
		What is done when operating anomalies occur?	Covered in Emergency Response Plan / automatic system shutdown
		Who is notified of results?	Covered in Emergency Response Plan / public health / public users
		Rate on consumption?	Form / stock on hand / length of supply / shelf life
	Turbidity	Where is the monitor located?	Raw / treatment / distribution system
		How often is the data checked?	SCADA feedback / data recording / manual daily check
		How often is the system maintained?	Calibration checks
		What is done when operating anomalies occur?	Covered in Emergency Response Plan / automatic system shutdown
		Who is notified of the results?	Covered in Emergency Response Plan
	Pressure	Where is the monitor located?	Pre/post filter / PRV stations
		How often is the pressure checked?	
		How often is the system maintained?	
What is done when operating anomalies occur?			
		Who is notified of the results?	

Type of Monitoring	Issues	Questions that should be addressed by a WQMP	Things that should be considered when addressing WQMP Questions
Volume Monitoring	Water flow	How much water is being consumed?	Feedback tied to flow /
		How much electricity is being used?	Pumps hours / System capacity
	Reservoirs	How much turnover is there?	Float adjustments / Seasonal needs
	Chemical Feed	How much chlorine is consumed?	Feedback tied to flow /
		How much fluoride is consumed?	Feedback tied to flow /
		Are other chemicals added?	
Others	Temperature	How is this monitored?	Required? / Auto / Manual / Giardia Performance Monitoring
	pH	How is this monitored?	Required? / Auto / Manual / Giardia Performance Monitoring
	Color	How is this monitored?	Required? / Auto / Manual
	%UV (Transmittance)	Where is this measured?	At intake or at UV light? / Auto
		How is this measured?	Auto / Manual / Frequency
	Visual Inspections	How often is your infrastructure inspected?	Vandalism / Wildlife / Tampering / Maintenance Access
		How often is your watershed inspected?	Protection Signs / Industrial Activity / Access
What is done when operating anomalies occur?			

4-3-2-1-0 Drinking Water Objectives



Health Protection

Water Quality

4-3-2-1-0 Drinking Water Objective Handout

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HP-WQ-9004 January 2006

Laboratories Approved for Drinking Water Microbiology Testing

**LABORATORIES APPROVED BY B.C. PROVINCIAL HEALTH OFFICER
FOR
DRINKING WATER MICROBIOLOGY TESTING
AT APRIL 6, 2006**

NAME	ADDRESS	PHONE	FAX	APPROVED FOR	Approval Period
ALS ENVIRONMENTAL - CALGARY, ALBERTA	#2-21 HIGHFIELD CIRCLE SE, CALGARY, AB CANADA T2G 5N6	403-214-5431	403-214-5430	TOTAL COLIFORM AND E. coli	To May 31, 2007
ALS ENVIRONMENTAL - FORT St. JOHN, BRITISH COLUMBIA	#2-8820 100TH STREET, FORT St. JOHN, BC V1J 3W9	250-785-8281	250-785-8286	TOTAL COLIFORM AND E. coli	To June 16, 2007
ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA	1986 TRIUMPH STREET, VANCOUVER BC V5L 1K5	(604) 253-4188	(604) 253-6700	TOTAL COLIFORM, FECAL COLIFORM AND E. coli	To June 8, 2006
BCCDC ENVIRONMENTAL MICROBIOLOGY LABORATORY	655 WEST 12TH AVENUE, VANCOUVER BC V5Z 4R4	(604) 660-1753	(604) 660-6073	TOTAL COLIFORM, FECAL COLIFORM AND E. coli	To December 31, 2007
CANTEST LTD - BURNABY, BRITISH COLUMBIA	4606 CANADA WAY, BURNABY BC V5G 1K5	(604) 734-2776	(604) 731-2386	TOTAL COLIFORM, FECAL COLIFORM AND E. coli	To November 25, 2007
CANTEST LTD - VICTORIA, BRITISH COLUMBIA	1104 - 4464 MARKHAM STREET, VICTORIA BC V8Z 7X3	(250) 385-6112	(250) 382-6384	TOTAL COLIFORM, FECAL COLIFORM AND E. coli	To September 15, 2007
CARO ENVIRONMENTAL SERVICES	102 - 5677 HIGHWAY 97N, KELLOWNA BC V1X 5C3	(250) 766-9646	(250) 765-3893	TOTAL COLIFORM, FECAL COLIFORM AND E. coli	To December 31, 2007
C R D WATER SERVICES LABORATORY*	479 ISLAND HIGHWAY, VICTORIA BC V8B 1H7	(250) 474-9680	(250) 474-9691	TOTAL COLIFORM, FECAL COLIFORM AND E. coli	To December 31, 2007
ECO TECH LABORATORY LTD.	1034 DALLAS DRIVE, KAMLOOPS BC V2C 6T4	(250) 573-5700	(250) 573-4357	TOTAL COLIFORM, FECAL COLIFORM AND E. coli	To February 28, 2007
G V R D WATER LABORATORY	4330 KINGSWAY, VANCOUVER BC V5G 4G8	(604) 451-6001	(604) 451-6019	TOTAL COLIFORM, FECAL COLIFORM AND E. coli	To December 31, 2007
IG MICROMEID ENVIRONMENTAL INC	190 - 12860 CLARKE PLACE, RICHMOND BC V6V 2H1	(604) 279-9666	(604) 279-9663	TOTAL COLIFORM, FECAL COLIFORM AND E. coli	To June 6, 2006
MB LABORATORIES LTD	2062 HENRY AVENUE WEST, SIDNEY BC V8L 5Y1	(250) 656-1334	(250) 656-0443	TOTAL COLIFORM, FECAL COLIFORM AND E. coli	To January 14, 2008
NORTH ISLAND LABORATORIES	2755 D MORAY AVE, COURTENAY BC V9N 8M9	(250) 338-7786	(250) 338-7553	TOTAL COLIFORM, FECAL COLIFORM AND E. coli	To December 9, 2007
NORTHERN LABORATORIES LTD	251 KAIEEN ROAD, PRINCE RUPERT BC V9J 4B7	(250) 627-1906	(250) 627-8214	TOTAL COLIFORM, FECAL COLIFORM AND E. coli	To December 31, 2007
NORWEST LABS	104 - 19575 - 55A AVENUE, SURREY BC V3S 8P8	(604) 514-3322	(604) 514-3323	TOTAL COLIFORM, FECAL COLIFORM AND E. coli	To June 15, 2006
MAXXAM ANALYTICS INC.	8577 COMMERCE COURT, BURNABY BC V5A 4N5	(604) 444-4808	(604) 444-4511	TOTAL COLIFORM, FECAL COLIFORM AND E. coli	To August 24, 2006
PROVINCIAL LABORATORY FOR PUBLIC HEALTH (MICROBIOLOGY) - CALGARY	3030 HOSPITAL DRIVE NW, CALGARY, AB T2N 4W4	(403) 944-4563	(403) 270-2216	TOTAL COLIFORM, FECAL COLIFORM AND E. coli	To June 1, 2006
PROVINCIAL LABORATORY FOR PUBLIC HEALTH (MICROBIOLOGY) - EDMONTON	8440 - 112 STREET, EDMONTON, AB T6G 2J2	(780) 407-2699	(780) 407-8964	TOTAL COLIFORM, FECAL COLIFORM AND E. coli	To June 1, 2006

*CRD Water Services Laboratory does not accept any external water samples for testing.

Issue Paper – Drinking Water Sampling



Issue Paper – Drinking Water Sampling

Date: September 10, 2004

Title: Definition of appropriate levels of bacteriological sampling and results collection for Interior Health: Number of sampling sites, location of sites, and frequency of sampling

Recommendation:

Each water supply system (called a facility in Hedgehog) should have a minimum of one sample site taken within the distribution system. Additionally, for smaller WS2 systems (roughly with populations of fewer than 500) a sample site should also be identified for the main source and after treatment. For larger WS2 (roughly with populations of more than 500) and WS1 systems a sample site should be identified for each water source, for each change in water treatment, and in the distribution system near the first and last points of use. Additional sampling sites can be set as the Public Health Inspector (PHI) feels necessary and must be based on risk factors of the water supply systems. These additional sampling sites may be identified by the PHI when they set up the minimum data set, and be entered after the initial data entry for the water module. Note that although sampling sites are identified, they do not all have to have the same sampling frequency. For example, raw source water samples do not have to be taken at the same frequency as distribution system samples.

It is the intent of Interior Health to move towards water supply systems taking responsibility for sampling to meet the Drinking Water Protection Act (DWPA). However there is a period of transition required to allow the water systems to adjust.

Some definitions for clarity:

- An **audit sample** is a sample intended to verify and validate samples taken by the water supplier.
- A **routine sample** is a sample intended to satisfy the regulatory requirements of the Drinking Water Protection Act.

For audit samples, the following sampling frequency is recommended:

Water System Category	Number of samples	Frequency of sampling
Large WS1 (roughly serving populations of more than 50,000)	10% of the number required by regulation	Quarterly
Small WS1 (roughly serving populations of fewer than 50,000)	Minimum of 3	Quarterly
Large WS2 (roughly serving populations of more than 500)	Minimum of 3	Quarterly
Small WS2 (roughly serving populations of fewer than 500)	Minimum of 2 with groundwater source, or 3	Semi-annually (twice a year)
WS3	Minimum of 1	Annually

The DWPA Regulation specifies the sampling frequency for routine samples:

WS1 Systems: with the application of the Drinking Water Quality Improvement program and consistent conditions on Operating Permits, WS1's are being required to meet the DWPA requirements for sampling within their own budgets. By March 2005 PHI's should not be issuing requisitions and submitting samples to meet the routine sampling requirements for WS1's.

WS2 Systems: will require 4 samples monthly to meet the DWPA Regulations. Current levels of sampling should be maintained with the transition to Hedgehog. Based on historic practice this is approximately one sample per month.

WS3 Systems: will require 4 samples monthly to meet the DWPA Regulations. This level of sampling is currently under regulatory review. Current levels of sampling should be maintained with the transition to Hedgehog, as resources permit. Based on historic practice this is approximately one sample per month.

PHIs have the discretion to set up more sample sites than the minimum, based on a risk assessment, however, the intent of audit sampling is not to take on the routine sampling responsibilities of the water supplier and resources may limit the number of extra samples that can be taken. Raw water samples should not be necessary for audit sampling.

Chemical sampling will be conducted on an ad hoc basis. If possible, chemical sampling sites should have the same naming conventions as bacteriological sites for identification of the source. Chemical samples should be taken from the raw water sampling sites.

History:

Sampling in BC used to be carried out by the Province or by Health Authorities or Health Units. Responsibility for sampling was transferred to water purveyors to differing degrees prior to the DWPA. With the DWPA the responsibility for sampling is clearly the responsibility of the water suppliers. The challenge has always been to ensure that water suppliers comply with the recommended sampling requirements. If a water supplier does not collect the samples, regulators lose confidence that public safety is achieved. Hence, for some systems IHA continues to collect samples, or provide sampling bottles, transportation and laboratory testing for the water suppliers.

It is the intent of Interior Health to move towards water supply systems taking responsibility for sampling to meet the DWPA. However there is a period of transition required to allow the water systems to adjust.

To develop the water-sampling module of Hedgehog the number, the location and frequency of sampling must be determined for each water system.

Discussion:

The review of sampling frequency has been prompted by the change from several database systems to the use of the Hedgehog Public Health Information Management program. All water supply systems that we are aware of should now be recorded in Hedgehog. The next step is to make the drinking water sampling process consistent throughout IH in the same manner. Several processes are occurring at the same time:

- Adjustment from the Safe Drinking Water Regulation to the Drinking Water Protection Act,
- Shifting the role of public health inspectors from being responsible for water sampling to auditing water monitoring programs,
- Transferring the method of sample requisition and data management from regional Healthspace and WSACs databases, and
- Corresponding business changes (e.g. the methods of collecting samples).

Some definitions for clarity:

- An *audit sample* is a sample intended to verify and validate samples taken by the water supplier.
- A *routine sample* is a sample intended to satisfy the regulatory requirements of the Drinking Water Protection Act.

Our goal is that IH will only collect and submit audit samples for analysis. A minimum set would be completed for all prescribed water supply systems. Additional audit samples would be collected and analyzed where the PHI feels necessary. The ability to meet the minimum level of data collection will be determined by the availability of resources.

Currently, a varying level of sampling is conducted in different areas and depending on the size of water supply systems. Typically, if a water supply system is collecting their own samples IH is not regularly collecting audit samples. For many WS2 and WS3 systems, IH provides laboratory requisitions, and sends samples collected by water suppliers for analysis. In some areas (mostly for WS3 systems), IH collects the only samples submitted for analysis. The frequency of sampling (for systems that are not WS1's) is typically once per month, not meeting the minimum regulatory requirement of 4 times per month.

A complicating factor is that the Ministry of Health Services is reviewing the definition of the prescribed water supply systems. It is possible that WS3's may be defined as "micro-systems" and be removed from the description of prescribed water supply systems. As such, they would have different monitoring requirements, or no defined sampling requirements.

The result is that different transition steps are required for each size classification of water supply system in Hedgehog.

1. For WS1's the transition is well defined. It is our goal to have all WS1s in the Drinking Water Quality Improvement program by April 2005. There is a typical condition on Operating Permits that relates to sampling programs. It identifies that the water supplier is responsible for testing required under the DWPA and specifies monthly reporting to IHA. There is a requirement for PHI's to develop audit sample programs.
2. For WS2's the transition process will vary depending on the current situation. Initially, the current level of service should continue. Larger systems with capacity should be encouraged to undertake their own sampling programs to meet their legislated regulatory requirements. On a case-by-case basis, PHI's will be required to assess the ability of WS2's to undertake their own sampling programs, and a reasonable timeline to accomplish the requirement. A timeline should be developed which will indicate how long IH will continue to provide routine sampling and as an alternative then provide only transportation for the water supplier's routine sampling. The final timeline objective should be the discontinuation of IH assistance. Audit sampling should be initiated when the water supply system takes on the sample collection.
3. For WS3's the current level of service should continue until the Ministry of Health Services has clarified the regulatory requirements of sampling.

For the purpose of setting up the sampling module, a minimum number of sample sites must be determined for each water supply system (identified as a facility in Hedgehog). Basic information for assessment includes the following comparison of factors:

- Raw or treated water (source or distribution system),
- Surface water, groundwater or combined water, and
- Infrastructure works that may change the water quality.

Two approaches can be considered when establishing sampling sites.

1. The first, which is appropriate for simple systems, includes 3 sites, one at each of the following locations:
 - Source
 - Treatment, and
 - Distribution system

A sampling point will not be required after treatment if the source is groundwater.

2. For more complex systems, additional factors may warrant consideration:
 - Each source,
 - Each change of water quality or treatment, and
 - Within the distribution system: near the first user, near the last user, and mid system.

For the Hedgehog minimum dataset, it is suggested that each facility should have a minimum of one sample site taken within the distribution system. Additionally, for small WS2 systems (roughly with populations of fewer than 500), a sample site should also be identified for the main source and after treatment. Likewise, for systems with populations of more than about 500 (WS2's and WS1's), sample sites should be identified for each water source, for each change in water treatment (for e.g., different pressure zones, reservoirs with mixed sources, or different levels of treatment), and in the distribution system near the first and last points of use. Additional sampling sites can be set as the PHI feels necessary and based on risk factors of the water supply systems. These sampling sites may be identified by the PHI when they set up the minimum data set, and be entered after the initial data entry for the water module. Additional sampling sites do not need to correspond with sampling frequencies. For example raw water samples do not need to be sampled with the same frequency as distribution systems.

Justification:

Minimum datasets for Hedgehog data entry must reflect business changes related to the move from IH providing routine sampling to audit sampling, but must allow for a transition period.

The purpose of IH providing audit samples is to accomplish the need for general oversight and trust in drinking water supplies. Audit samples are not intended to meet the legislated regulatory requirements of water sampling. Larger water supply systems are fewer in number, but warrant a level of audit sampling to reflect a statistically representative sample set. Correspondingly, they also require a larger number of representative sample sites.

Maintaining current levels of sampling frequency for WS2's and WS3's allows for the transition period to be accomplished after the go-live date for Hedgehog.

Chemical sampling is not required by regulation and will be collected on an ad hoc basis.

Funding Source:

Enclosures:

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Reviewed by: HPIS Core Team, IH Public Health Inspectors
Approved by:

Issue Paper – Public Notification Related to Turbidity



ISSUE PAPER: PUBLIC NOTIFICATION RELATED TO TURBIDITY

Name of Issue: Guidance for Public Notification Related to Turbidity for Water Supply Systems using Surface Water.

Background and Issue Analysis:

Water supply systems in the Okanagan began routinely monitoring turbidity levels in surface water sources as part of the Drinking Water Improvement Program. This included WS1 systems and some of the larger WS2 systems. One of the outcomes of this practice has been the identification of the need for filtration. Even with Giardia performance monitoring, elevated levels of turbidity represent a health risk significant enough to warrant public notification. Past practice recognized different treatment capabilities and public notification was issued at different levels of turbidity (referred to as deviation response plans). Deviation response plans were developed in consultation with Public Health Engineers. This was an accepted interim practice in the face of inadequate treatment of upland surface water sources.

IH has established treatment goals that are referred to as “43210 objectives”. Public notification and deviation response plans do not remove the need for treatment, and in most cases filtration, to meet 43210 dual treatment objectives.

The Drinking Water Quality Improvement Program has been extended to include all water supply systems in IH that have more than 300 connections, and will eventually include most water supply systems that serve more than 500 people per day. The goal is that all large systems in IH will be collecting turbidity information.

A public notification term “Water Quality Advisory” that allows for informing the public of low risk or potential health risks related to drinking water has been introduced by Interior Health.

There is a need to establish a consistent approach with water supply systems that are included in the IH Drinking Water Quality Improvement Program for the following:

- Guidelines for implementing Water Quality Advisories and Boil Water Notices in response to turbidity levels.
- Rationale for setting thresholds for initiating Water Quality Advisories and Boil Water Notices

Discussion:

The Guidelines for Canadian Drinking Water Quality: Supporting Documentation (GCDWQ:SD) for Turbidity, Protozoa and Trihalomethanes are used as the primary references to establish the following points for surface water.

- There is increasing health risk with increasing turbidity
- Protozoa are associated with turbidity
- High turbidity can lead to an increase in the amount of disinfection by-products in water

- Health risks from disinfection by-products are much less than the risks of consuming water that has not been disinfected
- Treatment should attempt to maintain low and fairly constant levels of turbidity over time
- Supplementary treatment should be considered as an interim measure until treatment to meet turbidity guidelines is in place

A study conducted in Vancouver (where there is a protected watershed and turbidity is typically less than 5 NTU) showed a broad correlation between increasing enteric illness and increasing turbidity. In Kamloops, before the surface water was filtered, there was a decrease in physician services for enteric illness by approximately 25% after the implementation of the turbidity based daily water quality advisory.

Drinking water taken from “pristine sources” (as referred to in the GCDWQ:SD) may consider an exemption from filtration requirements by meeting specific criteria including disinfection, turbidity and source protection (GCDWQ:SD).

While the GCDWQ:SD and other studies are helpful in establishing the above bullet points, they are not helpful for establishing thresholds for health risks related to turbidity for the following reasons:

- Pathogens are not accurately measurable and are *assumed* to be present with indicators such as turbidity, e.coli or faecal coliforms
- Protozoa are *assumed* to be ubiquitous in surface water sources
- Turbidity can be used as a health parameter to indicate the safety of water leaving a filtration system. The GCDWQ thresholds applying to treated water are not an appropriate measure for raw water.

Nevertheless, we are challenged to identify levels of turbidity that would justify public notification of an increased health risk. The supporting document does indicate **one** of the criteria for exemption for filtration:

“Average daily source water turbidity levels measured at equal intervals (at least every 4 hours), immediately prior to where the disinfectant is applied, are around 1.0 NTU but do not exceed 5.0 NTU for more than 2 days in a 12-month period. Source water turbidity also does not show evidence of protecting microbiological contaminants.”

Following the recommendations of the Canadian Guidelines, a Drinking Water Officer may reasonably request public notification related to turbidity in water systems using unfiltered surface water. Given a water supply system is planning towards the 43210 dual treatment goals, one of the interim measures they could take is public notification in the form of a Water Quality Advisory or if warranted, a Boil Water Notice. Interior Health recently introduced the Water Quality Advisory terminology, and several water suppliers used that form of public notification during the 2005 spring freshet. There have been some requests for a consistent threshold for implementing the Water Quality Advisories.

Using the Supporting Document for the Turbidity as guidance for surface water that is not filtered, water suppliers should be advised to issue public notification in the form of a Water Quality Advisory when turbidity exceeds 1 NTU at the point of disinfection. Water suppliers

that face fluctuating levels of turbidity due to spring freshet should consider an on-going public notification that indicates increasing health risk with increasing turbidity and the daily readings of turbidity when they cannot maintain turbidity lower than 1 NTU. Water Suppliers should be advised to make public notification in the form of a Boil Water Notice when turbidity exceeds 5 NTU.

Interior Health can reinforce this by providing public education clearly stating that there is increased health risk with increased turbidity in surface water. Further, where there are elevated turbidity readings, there is a demonstrated need for improvement to the existing treatment infrastructure. There is precedent for this approach related to the action taken in Kamloops before the membrane filtration plant was in operation. An updated version of that Water Quality Advisory approach is provided in Appendix A.

The message that there is increasing risk with increasing turbidity is valid for all sizes of water supply systems. Our requirement for Water Quality Advisories related to turbidity is limited by the capacity of water suppliers to measure and report turbidity at an appropriate frequency.

Justification:

- The responsibility for operation, maintenance, monitoring and reporting water quality for drinking water rests with the water supplier
- Section 8 of the Drinking Water Protection Act states that if the Drinking Water Officer considers that further information is necessary to determine whether the water system meets requirements set by the standards established by regulations or by operating permit, they may order the water supplier to undertake additional monitoring or testing and report the results as directed by the officer.
- Section 6 of the Drinking Water Protection Act requires that a water supply system must provide potable water, and must meet any requirements established by its operating permit.
- The Drinking Water Quality Improvement Program requires turbidity monitoring and updated Emergency Response plans as typical conditions on operating permits. Updated Emergency Response plans should include public notification related to turbidity.

Recommendation:

Water suppliers that have un-filtered surface water supplies use the supporting documents on turbidity in the Guidelines for Canadian Drinking Water Quality for guidance. These water suppliers should be advised to make public notification in the form of a Boil Water Notice when turbidity exceeds a four hour average reading of 5 NTU at the point of disinfection in the absence of compelling reasons otherwise. Water suppliers that face continually fluctuating levels of turbidity due to spring freshet (or other causes) implement an on-going public notification in the form of a water quality advisory. This notification could be similar to an Air Quality or Pollen Index but would show the daily readings of turbidity when they cannot be maintained lower than 1 NTU. The associated message would warn of increasing health risk with increasing turbidity.

The following recommendations apply to water suppliers that currently monitor turbidity levels on surface water

- Water suppliers that typically cannot meet turbidity readings of 1 NTU issue Water Quality Advisories in the form of daily posting of turbidity readings and the associated health risks.
- Water suppliers with Deviation Response Plans discuss with their Drinking Water Officer / Public Health Inspector a threshold for public notification in the form of Boil Water Notice with respect to turbidity.
- Without evidence to suggest alternatives, Drinking Water Officers / Public Health Inspectors will consider 5 NTU as a threshold for unfiltered surface water to require public notification in the form of a Boil Water Notice recommending boiling water for one minute at a rolling boil as a precaution.

Note that the public notification process for turbidity does not remove the need for infrastructure, such as filtration, as a requirement to meet 43210 treatment goals.

Implementation:

1. Existing Deviation Response plans in the Okanagan identify the threshold for increased response to health risk, and identify the point where the old public notification “Boil Advisory” was issued. These would be reviewed annually as part of the Drinking Water Quality Improvement Program and as a minimum, updated to reflect the new terminology of “Boil Water Notice”. Deviation Response Plans that have different thresholds for Boil Water Notice are relevant because of the different measures of supplementary treatment they can achieve on their systems.
2. The Drinking Water Quality Improvement Program requires turbidity monitoring and updated Emergency Response plans as typical conditions on operating permits. Updated Emergency Response plans would include public notification related to turbidity. A transition period while water suppliers start to collect turbidity information is expected.
3. A communication plan with public health messages related to turbidity will be developed. Initially the health risk message will be used in the Okanagan. As systems develop their turbidity monitoring programs the health message will be used throughout IH. **Note that material provided in Appendix A has been replaced by the Turbidity Education and Notification Campaign Toolkit developed in March 2006**

References:

Guidelines for Canadian Drinking Water Quality - Supporting documents can be located on the web in the following locations:

Protozoa

<http://www.hc-sc.gc.ca/hecs-sesc/water/publications/protozoa/toc.htm>

Turbidity

<http://www.hc-sc.gc.ca/hecs-sesc/water/publications/turbidity/toc.htm>

Trihalomethanes: the consultation document can be found on this page:

http://www.hc-sc.gc.ca/hecs-sesc/water/consult_intro.htm

Aramini, J., McLean, M., Wilson, J., Holt, J., Copes, R., Allen, B. and Sears, W. Drinking water quality and health care utilization for gastrointestinal illness in Greater Vancouver. Canada Communicable Disease Report 26-24. Health Canada, Ottawa, 15 December (2000).

Lu, J., Hu, W., Fisk, B., Christian, K., Hamdi, R., Vander Kuyl, W. Drinking Water Turbidity and Gastrointestinal Illness: Using Routinely Collected Health Service Utilization Data to Assess Population Health and Support Public Health Intervention, Canadian Public Health Association, Annual Conference 2004, Poster

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Reviewed by: Drinking Water Officers Team, Okanagan Water Suppliers June 30, 2005

Revised and Reviewed by: Drinking Water Officers February 2006

Approved by:

TURBIDITY DRINKING WATER QUALITY ADVISORY

What is turbidity and how is it measured?

Turbidity is a water quality term that refers to the cloudy appearance of water and is caused by suspended matter such as clay, silt, organic and inorganic matter, plankton and other microscopic organisms. Turbidity measurements are reported as Nephelometric Turbidity Units (NTU). Turbidity events are generally associated with storms, low-level snow melt (January to March) and spring runoff (April to June). At turbidity levels above 5 NTU water becomes visibly cloudy indicating deteriorating water quality.

Can turbid water make you sick?

Recent studies have shown that elevated turbidity levels may be associated with increased physician visits for gastrointestinal illness. Particles in turbid water interfere with the disinfection process because the turbidity particles shield contaminants such as viruses, bacteria and protozoa from destruction by chlorine. Turbidity has also been related to trihalomethane formation in chlorinated water. These are some of the reasons the Guidelines for Canadian Drinking Water Quality previously set a Maximum Acceptable Concentration of 1 NTU for turbidity and now recommends filtration on all surface water sources. 1 NTU cannot be met in many communities using surface water supplies without conventional water treatment (e.g. sedimentation, coagulation, filtration) prior to disinfection. Turbidity levels in some interior water sources exceed 5 NTU 30 to 40 percent of the time. It is recommended that infants (0 - 6 months) and immunocompromised individuals (persons with HIV, undergoing cancer chemotherapy, or other

medical treatments which significantly compromise the immune system) consume boiled water at all times.

What can you do about high turbidity?

In order to help protect the health of its citizens your water supplier can continuously monitor turbidity and implemented a water quality index. At 1 NTU (taken at the point of disinfection every 4 hours), the water supplier can issue a WATER QUALITY ADVISORY informing users that turbidity has increased and so has the risk of illness (see reverse). At 5 NTU all users wishing additional protection should consume boiled water (one minute at a rolling boil and store in a clean, covered container in the refrigerator) or secure an alternate source of drinking water. It is not necessary to boil water for dishwashing, coffee making, teeth brushing or washing of fruits or vegetables.

This drinking Water Quality Advisory is similar to the air quality index used during episodes of poor air quality, but is not the same as a Boil Water Notice issued because of a confirmed water-borne disease outbreak. In the past several years there have been a number of disease outbreaks in the province caused by organisms such as Campylobacter, Giardia (Beaver Fever) and most recently Cryptosporidium. Some of these outbreaks occurred in cities with chlorinated but unfiltered surface water supplies.

Your water supplier will be studying ways to minimize turbidity. Reducing turbidity will also reduce trihalomethane levels as less chlorine will be added to the supply.

FOR MORE INFORMATION, PLEASE CONTACT YOUR WATER SUPPLIER OR PUBLIC HEALTH OFFICE

DRINKING WATER QUALITY ADVISORY

Average Daily Source Water Turbidity	< 1 NTU	1 - 5 NTU	> 5 NTU
	Good	Fair	Poor

=INCREASING HEALTH RISK=>

Good Newborns (0 - 6 months) and the immunocompromised (persons with HIV, undergoing cancer chemotherapy, or other medical treatments which significantly compromise the immune system) are advised to consume boiled water.

Fair Newborns (0 - 6 months) and the immunocompromised (persons with HIV, undergoing cancer chemotherapy, or other medical treatments which significantly compromise the immune system) are advised to consume boiled water. As turbidity increases through the range, disinfection with chlorine becomes more difficult and trihalomethane production may increase. Increased turbidity also increases the potential of Giardia and Cryptosporidia to be present in the water. If afflicted by water-borne disease, preschool children and the elderly may be at greater risk of complications such as dehydration.

Poor Newborns (0 - 6 months) and the immunocompromised (persons with HIV, undergoing cancer chemotherapy, or other medical treatments which significantly compromise the immune system) are advised to consume boiled water. Water starts to become visibly cloudy. The potential for trihalomethane production increases with increased use of chlorine. Turbidity events often occur several times per year either during freshet (spring runoff) or after an extreme weather event. Disinfection is compromised and risk of illness is increased. All users wishing additional protection should boil their drinking water or use an alternate supply.

NOTE: *Turbidity is a reading taken at a minimum every 4 hours at the point prior to disinfection. Water suppliers may report this in the form of daily averages.*



Health Protection

DRINKING WATER QUALITY IMPROVEMENT PROGRAM

Addressing public health priorities and striving for the highest quality drinking water

CITY OF WONDER WATER SYSTEM

Meets Interior Health's expectation for continued improvement of water quality through the attention to the following **Conditions on Operating Permit**

- Provide a source protection plan for each water source
- Provide a certified operator to operate the system
- Operate according to your Water Quality Sampling Program
- Operate according to your Cross Connection Control Program
- Provide a Turbidity Monitoring Program – including continuous on-line turbidity monitoring
- Provide continuous on-line monitoring of the water disinfection process
- Provide long-term plans for source, treatment and distribution system improvements taking into account the goal of 43210 objectives
- Review and update Emergency Response Plans annually
- Provide monthly reports and an annual summary

Viruses	Protozoa	Treatment barriers	Turbidity	Bacteria
				