

Operational Guideline for Manitoba Water Suppliers

Continuously Monitoring Chemically Assisted Filtration

Purpose

This guideline has been developed to ensure public drinking water suppliers throughout Manitoba meet their regulatory requirements with regard to online turbidity monitoring and reporting for chemically assisted filtration.

Legislation

The Drinking Water Safety Regulation requires that all surface water and ground water sources under the direct influence of surface water (GUDI) provide a minimum removal and inactivation of 3-log *Cryptosporidium* and *Giardia*, and 4-log reduction or inactivation of viruses, and specifies the physical standard (turbidity) for water treatment plants employing chemically assisted filtration.

Definitions used in this document:

“Filtration” is a physical, biological or chemical operation that separates solid matter from a mixture using a filter media such as sand. Types of chemically assisted filter media may include but are not limited to sand, quartz, anthracite, activated carbon or a combination of these.

“Turbidity” means a measurement of the clarity of the water.

“Reading” means the turbidity value collected and recorded using the shortest/smallest time increment of the instrument (ex. readings every 1 or 3 seconds) while the filter is in operation.

“Measurement” means the average of Readings that are calculated, recorded and reported in five minute intervals while the filter is in operation. This measurement is used for compliance monitoring purposes.

Readings used as measurements. Some water suppliers are collecting one reading every five minutes intervals while the filter is in operation and recording these as measurements. Recording the reading using the shortest/smallest time increment of the instrument and reporting the average every

five minutes should reduce most instrumentation-related issues. Where the average indicates a non-compliance issue, a review of the readings collected in the five minute intervals can provide valuable information to the operator in taking corrective actions.

“Daily average turbidity” means the **average** of all turbidity measurements in one day, while the filter is in operation.

“Normal Operating Standard” for chemically assisted filtration means filter effluent turbidity is less than or equal to 0.3 NTU in at least 95% of the measurements in a month or for less than 12 consecutive hours of filter operation when measured on-line.

This allows water supplies some flexibility for addressing uncertainty in turbidity measurements due to instrumentation issues (ex: air bubbles), while at the same time recognizing measurements over 0.3 NTU for more than 15 minutes (three consecutive Measurements) may indicate filter breakthrough.

“Not to exceed standard” means filter effluent turbidity is not to exceed 1.0 NTU for any measurement.

Test methods

The turbidity standard is measured in nephelometric turbidity units (NTU). The instrument used for measuring turbidity is a nephelometer or turbidimeter. Water systems can measure turbidity using handheld turbidimeters, an on-line turbidity analyser or both.

Handheld units are used to verify on-line measurements, assist in calibration of analyzers, measure raw water quality and are used in the distribution system to report turbidity as an additional water quality indicator.

On-line analyzers are used to record filter effluent on a continuous bases. Results of the readings can be used to alert operators of decreasing water quality when alarm set points are set appropriately.

Alarm set points

An online turbidity analyzer capable of sending a signal to a Supervisory control and data acquisition (SCADA) system to notify an operator of high turbidity should be set to notify the operator **before** a non-compliant condition occurs.

For example:

- If turbidity is approaching the 0.3 NTU standard, an alarm should be set below 0.3 to ensure the operator has time to take corrective action before the filter is out of compliance. Corrective actions may include chemical adjustments, manual backwashing, or directing the filter to waste until a more thorough inspection can be taken; and
- if turbidity is approaching the not to exceed standard of 1.0 NTU, the filter should automatically be programmed to filter-to-waste or shut down below the standard, for example, at 0.90 NTU.

Keep turbidity as low as reasonably achievable:

Operators are to consider the above alarm set points as general best practices. Health Canada states that filtration systems should be designed and operated to reduce turbidity levels as low as reasonably achievable and operators should strive to achieve a treated water turbidity target from individual filters of less than 0.1 NTU.

As such, normal operating turbidity levels should be considered when selecting alarm settings. If your normal operating turbidity from each filter is less than 0.1 NTU set your first alarm point at 0.15 to 0.20 NTU. Studies have shown that even a small, sustained turbidity spike can have a significant impact on the safety of your water supply.

Calibration

The online turbidity analyzer should be cleaned and calibrated based on manufacturer specifications. Cleaning and calibration must be done when the filter is not operating. Placing the analyzer on hold during filter operation to clean or calibrate is not advisable. Removing results or other data manipulation of online turbidity results is strictly prohibited.

Licence may require continuous monitoring:

If specified in the operating licence for a water system, a water supplier must install and operate continuous turbidity monitoring equipment, in accordance with the terms and conditions of the licence.

Turbidity Reporting

A monthly turbidity report generated by an online turbidity analyzer and/or SCADA must be based on the included template. Operators may be required to submit turbidity trends to the Office of Drinking water to verify compliance.

Daily confirmatory readings - At least one handheld filter effluent turbidity test must be performed daily and recorded to verify on-line turbidity analyzer readings accuracy.

Emergency Reporting

Water System Operators must immediately notify the Office of Drinking Water of any condition that may affect the ability of the water system to produce or deliver safe drinking water. Refer to Emergency Reporting Guideline (ODW-OG-04) on when to report exceedances of the applicable turbidity standards.

Office of Drinking Water

Regional [Drinking Water Officers](#) are available for operational and monitoring advice and to provide technical assistance.

After hours, please call the Environmental Emergency Response line at 204-944-4888 and ask for the on-call drinking water officer.

For more information related to Manitoba's drinking water and how it is regulated visit:

www.manitoba.ca/drinkingwater.



Monthly Turbidity Report

Water System Name: _____ Water System Code: _____

Month: _____ Year: _____

Operator-in-charge (Print): _____ Other Operators (Print): _____

Date	Time	Operator Initials	TURBIDITY, NTU											
			Raw	Filter #1						Entering Reservoir		Leaving Reservoir		
				Confirmatory *Portable	Confirmatory *Display	Avg.	Max.	# of Measurements			Avg.	Max.	Avg.	Max.
								Total	> STND	%				
1														
...														
31														
Monthly Totals														
Compliance with Turbidity Standard														

Submitted by (Print): _____ Signature: _____

Required Fields:

1. **Header:** Water System Name, Code, Month, Year, Operator-in-charge, Other Operators
2. **Date:** Day of the Month
3. **Time:** Time of day when results were taken
4. **Operator Initials:** Operator who took readings
5. **Raw:** Take and record portable measurement. Where an on-line analyzer is in place, record the read out daily and verify with handheld weekly.
6. **Filter# 1:** Information within the highlighted area must be captured for each operating filter
 - a. **Confirmatory Portable:** Take and record portable measurement
 - b. **Confirmatory Display:** Record on-line display measurement at the same time as confirmatory portable
 - c. **Avg.:** Average daily reading
 - d. **Max.:** Maximum daily reading



- e. **# of Readings:** Measurements recorded specific to the operating filter for that day
 - i. **Total:** Total number of readings recorded
 - ii. **> STND:** Number of readings that were above the normal operating standard
 - iii. **%:** Percent of readings that met the standard for that day e.g.; $\text{Total} - > \text{STND} = A, A/\text{Total} \times 100 = \%$
- 7. **Monthly Totals:** Total number of readings recorded and total number readings that were above the normal operating standard in the month for each filter
- 8. **Compliance with Turbidity Standard:** Percent of readings that met the standard for that month e.g.;
 $\text{Total} - > \text{STND} = A, A/\text{Total} \times 100 = \%$
- 9. **Signature Block:** Printed name and signature of operator submitting report.

Optional Fields:

- 1. **Entering Reservoir:** Measurement of the combined effluent
 - a. **Avg.:** Average daily reading
 - b. **Max.:** Maximum daily reading
- 2. **Leaving Reservoir:** Measurement of the treated water entering the distribution system
 - a. **Avg.:** Average daily reading
 - b. **Max.:** Maximum daily reading