

	OFFICE OF DRINKING WATER AND MUNICIPAL ASSISTANCE POLICY AND PROCEDURE		DEPARTMENT OF ENVIRONMENTAL QUALITY
Original Effective Date: October 2002 Revised Date:	Subject: Turbidity Requirements and Compliance Determination		Category: <input type="checkbox"/> Internal/Administrative <input type="checkbox"/> External/Noninterpretive <input checked="" type="checkbox"/> External/Interpretive
Reformatted Date: January 7, 2013	Division/Office and Program Names: ODWMA-Public Water System Supervision Program Number: ODWMA-399-018 Page: 1 of 7		

A Department of Environmental Quality (DEQ) Policy and Procedure cannot establish regulatory requirements for parties outside of the DEQ. This document provides direction to DEQ staff regarding the implementation of rules and laws administered by the DEQ. It is merely explanatory; does not affect the rights of, or procedures and practices available to, the public; and does not have the force and effect of law.

ISSUE:

This policy establishes the procedure to calculate compliance with the filtered water turbidity performance requirements and clarifies turbidity requirements for individual filters.

The surface water treatment series of rules establishes turbidity requirements for public water supplies using surface water or groundwater under the direct influence of surface water as a source. Compliance is calculated as an average of all filtered water turbidity measurements during the month.

Increased monitoring during periods of low water turbidity lowers the overall percentage of measurements that exceed the turbidity performance requirement, possibly avoiding a violation. Increased monitoring during times of high water turbidity more accurately reflects the seriousness of the event and the effectiveness of the water treatment plant processes.

This policy directs staff to allow increased monitoring and to use normalized data to calculate compliance. This practice prevents increased monitoring from masking a serious situation and also prevents violations when data shows one did not occur.

This policy replaces WD-03-018 Turbidity compliance monitoring and determination of compliance with the turbidity treatment technique standard dated October, 2002.

DEFINITIONS:

Combined Filter Effluent (CFE) – water from all (or several) individual filter effluent lines combined at a location prior to the entry into a reservoir.

Nephelometric Turbidity Unit (NTU) – standard unit of measurement for turbidity.

Subpart H System – means a public water supply using surface water or groundwater under the direct influence of surface water as a source of water. For the purpose of this policy, “water plant(s)” refers to a treatment plant required to meet Subpart H criteria.

Surface water treatment series of rules – the rules applicable to Subpart H supplies as listed in the Authority section of this policy. The turbidity performance requirements applicable to this policy are:

The turbidity at the CFE shall at no time exceed:

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- 1 NTU for conventional, direct, membrane filtration, or softening plants
- 5 NTU for slow sand or diatomaceous earth filtration plants

Not less than 95 percent of measurements each month shall be less than or equal to

- 0.3 NTU for conventional, direct, membrane filtration, or softening plants
- 1 NTU for slow sand or diatomaceous earth filtration plant

Normalized – to cause to conform to a norm or standard.

Time Weighted Average –an averaging technique used to calculate the concentration of a substance when consecutive individual measurements are taken at different durations of time.

AUTHORITY:

R 325.10605, R 325.10611 - 325.10611a, R 325.10720 - R 325.10720a, and R 325.11506 of the Administrative Rules adopted under the Safe Drinking Water Act, 1976 PA 399, as amended, covering turbidity monitoring at Subpart H water treatment plants. These rules were promulgated to adopt revisions to the National Primary Drinking Water Regulations in order to retain primary enforcement authority of the Public Water System Supervision Program.

STAKEHOLDER INVOLVEMENT:

Stakeholder input was solicited during informal meetings and public hearings held during the rule promulgation processes to adopt the surface water treatment series of rules of the National Primary Drinking Water Regulations as required by the Administrative Procedures Act, 1969 PA 306, as amended.

POLICY:

Combined Filter Effluent Point Sampling and Compliance Determination

Monitoring: Water plants are encouraged to measure turbidity at uniform intervals, throughout the entire operating period. During any episode of increased raw, applied, or filtered water turbidities, increased monitoring may be warranted, and these samples should also be collected at uniform time intervals. The filtered water turbidity measurements used for compliance are taken at the CFE point prior to the entry into a reservoir. For plants with multiple CFEs, each confluence point shall be separately monitored at the same uniform intervals. Monthly Operation Reports (MORs) must report each CFE monitoring location separately. Plant tap turbidity measurements are encouraged but will not be used for determining compliance.

Compliance Calculation: Compliance with the turbidity treatment technique standard will be determined for each CFE using the time weighted average filtered water turbidity values for each four hours or less for which the treatment facility was operating. If a plant is going to use a compliance period of less than four hours, staff should be notified so compliance can be properly calculated. All filtered water turbidity readings taken from each CFE shall be recorded and used in calculating the time weighted average value for each four hours or less of operation. Turbidity

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calculation of the daily or four-hour compliance period turbidity values. Refer to the example calculations attached in the back of this policy

Readings from continuous recording turbidimeters may substitute for grab sample monitoring of each CFE if the equipment is properly calibrated. If measurements from a continuous recording turbidimeter are used for compliance monitoring, compliance will be based on the time weighted average value for each CFE from all turbidity readings for each four-hour period or less of operation

A supply is in compliance with the turbidity performance requirement if at least 95 percent of all four hours or less normalized reporting periods are less than or equal to 0.3 NTU (1 NTU for slow sand and DE filtration plants). If one or more CFE is out of compliance with the turbidity performance requirement, the supply is out of compliance.

Reporting: Monthly reporting is required on the Monthly Operation Report (MOR) form provided by the ODWMA under R 325.11506.

Supplies report each CFE monitoring location, the daily average turbidity, the daily maximum turbidity, the total number of samples collected, and the total number of samples with a turbidity greater than 0.3 NTU, (1 NTU for slow sand and DE filtration plants). Supplies notify the ODWMA as soon as possible, but within 24 hours after knowing that a single measurement is greater than 1 NTU for conventional, direct, membrane filtration, or softening plants, or greater than 5 NTU for slow sand or diatomaceous earth filtration plants.

Data Review: If a supply requests assistance calculating compliance values or disputes a violation of the treatment technique, review the daily bench sheets (or computer data logs) with all the recorded turbidity readings. Use the individual readings to calculate compliance with the standard. If the results from a continuous recording turbidimeter are used for reporting purposes, arrange to review all records pertaining to the turbidity measurements including information stored on databases.

Individual Filter Sampling and Compliance Determination

Rule Summary: Subpart H supplies using conventional or direct filtration measure turbidity at each filter every 15 minutes when the filter is in service. If a plant has two or fewer filters, data obtained from the CFE point may be used in lieu of individual filter samples. If there is a failure in the continuous monitoring equipment, plants serving a population of 10,000 or greater must conduct grab sampling every four hours, but for no more than 5 working days. Plants serving a population of less than 10,000 people must also conduct grab samples every four hours if the continuous monitoring equipment fails, but for no more than 14 working days. Failure to restore continuous monitoring within the above time frames constitutes a treatment technique violation.

To reduce the potential for treatment technique violations, plants are strongly encouraged to have backup equipment and parts readily available. This includes not only having backup turbidimeters, but backup computers, as well. Also, plants are encouraged to backup all turbidity data daily.

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Compliance with the turbidity standards is determined at CFE points, not at individual filters. However, individual filters are subject to "performance requirements" triggers as follows:

1. Individual filter effluent greater than 1.0 NTU for two consecutive 15-minute measurements at any time during filter operation.
2. Individual filter effluent greater than 0.5 NTU for two consecutive 15-minute measurements after the first 4 hours of operation. This only applies to plants serving a population of 10,000 or greater. Also, this trigger only applies to the 15-minute readings taken at 4 hours and 4 hours and 15 minutes after the filter has been in operation. Any measurements taken before or after these times are not considered for this trigger.
3. Individual filter effluent greater than 1.0 NTU for two consecutive 15-minute measurements at any time in three consecutive months.
4. Individual filter effluent greater than 2.0 NTU for two consecutive 15-minute measurements at any time in two consecutive months.

If a trigger is exceeded, supplies report monthly the date(s), filter number, and turbidity measurements. Supplies are required to be able to track these numbers over a three-month period and retain all the individual filter turbidity records for three years.

Staff Guidance: For operational purposes, allow supplies to set the individual filter turbidimeters to record the turbidity more frequently than every 15 minutes. Use only the turbidity measurements taken at the 15-minute intervals to determine if a trigger has been exceeded.

PROCEDURES:

WHO	DOES WHAT
District Staff	Incorporate this policy and procedure as part of the MOR review process to determine compliance with Act 399.

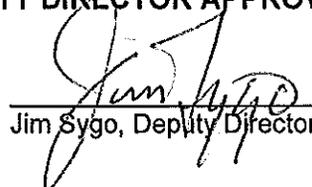
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1/7/2013
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Example Turbidity Calculations

Example No. 1 - Supply uses a compliance period of four (4) hours for reporting purposes and collects a grab sample or reads the continuous recording turbidimeter at the CFE every four hours (plants operates 24 hours a day).

Time	CFE NTU	Time weighted 4 hr average
12:00 AM	0.13	0.13
4:00 AM	0.05	0.05
8:00 AM	0.07	0.07
12:00 PM	0.18	0.18
4:00 PM	0.11	0.11
8:00 PM	0.09	0.09
new day		

The time weighted average in this case is the actual measurement of the grab sample since there was only one sample collected during each 4-hour period.

Add the six readings from the last column, divide by 6 to get NTU = 0.105,
or rounding off = 0.1 NTU

0.1 NTU is the number to be entered on the MOR for that day.

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Example No. 2 - same as Example No. 1 only the supply collects a grab sample or reads the continuous recording turbidimeter at the CFE every hour.

Time	CFE NTU	Time weighted 4 hr average
12:00 AM	0.12	
1:00 AM	0.09	
2:00 AM	0.11	
3:00 AM	0.21	0.13
4:00 AM	0.09	
5:00 AM	0.17	
6:00 AM	0.22	
7:00 AM	0.19	0.17
8:00 AM	0.14	
9:00 AM	0.12	
10:00 AM	0.09	
11:00 AM	0.11	0.11
12:00 PM	0.08	
1:00 PM	0.23	
2:00 PM	0.16	
3:00 PM	0.09	0.14
4:00 PM	0.05	
5:00 PM	0.15	
6:00 PM	0.17	
7:00 PM	0.09	0.11
8:00 PM	0.11	
9:00 PM	0.13	
10:00 PM	0.18	
11:00 PM	0.07	0.12
new day		

The time weighted average in this case is the average of the hourly measurements in each 4-hour compliance period since they were collected at equal time intervals (1 hour).

Add the six readings from the last column, divide by 6 to get NTU = 0.13
or rounding off = **0.1 NTU**

0.1 NTU is the number to be entered on the MOR for that day.

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Example No. 3 - same as Example No. 2 only the supply experiences high raw water turbidities starting around 8:00 am until about noon. During that time, the supply collects extra grab samples from the CFE at unequal time intervals.

Below are the calculations in determining the time weighted average (TWA) during the four-hour period when samples were collected at unequal time frequencies.

$$TWA = (C_1T_1 + C_2T_2 + \dots + C_nT_n)/(T_1+T_2+ \dots +T_n)$$

- TWA = time weighted average
- C= concentration of substance
- T= time between measurements

Time	CFE NTU (C)	Time duration since previous measurement (T=min)	C x T
8:00	0.19	*	*
8:15	0.21	15	3.15
8:45	0.28	30	8.4
9:00	0.31	15	4.65
9:20	0.38	20	7.6
9:40	0.41	20	8.2
10:00	0.34	20	6.8
10:10	0.37	10	3.7
10:30	0.42	20	8.4
11:00	0.31	30	9.3
11:15	0.25	15	3.75
11:30	0.15	15	2.25
11:45	0.05	15	0.75
		total time = 240	total CxT = 66.95

TWA = 66.95/240 = **0.28** NTU. This number will then be placed in the Time weighted 4-hour average column.

The number placed on the MOR would then be the average of the six, Time weighted 4-hour average numbers similar to Example No. 2.