Massachusetts Department of Environmental Protection
Bureau of Resource Protection – Drinking Water Program

Identifying Groundwater Under the Direct Influence of Surface Water (GWUDI) And the Requirements of Microscopic Particulate Analyses (MPA)

Factsheet for Public Water Systems

INTRODUCTION

The Massachusetts Department of Environmental Protection's Drinking Water program (MassDEP/DWP) prepared this factsheet to help public water suppliers understand how the Surface Water Treatment Rule (SWTR) will affect their groundwater sources if they are classified as groundwater under the direct influence of surface water (GWUDI). Most groundwater sources are not GWUDI and the treatment requirements of the SWTR do not apply to them. In order to be considered "exempt" from treatment, a community public water system (PWS) with groundwater sources must complete an application and submit it to the MassDEP. All PWSs with groundwater sources that do not meet the application exemption criteria, must conduct microscopic particulate analyses (MPA) to determine if the groundwater source is GWUDI. Additional details are provided below.

PWSs that currently filter their groundwater sources and believe they meet the filtration treatment requirements of the SWTR must submit such documentation to MassDEP. If MassDEP determines that the SWTR filtration requirements are not met, the sources must be evaluated according to the process described in this factsheet.

CLASSIFICATION OF GROUNDWATER SOURCES

The MassDEP classifies all groundwater sources into two groups.

Group 1: Exempt

Group 1 includes all sources that meet the approved exemption criteria and do not have to undertake microscopic particulate analysis (MPA) testing in order to evaluate the need for enhanced wellhead protection or filtration. These sources are recorded in the MassDEP database, as "exempt" from further testing. The treatment requirements of the SWTR do not apply to these sources; they are not considered to be GWUDI. Note: changes in source water quality, quantity or physical surroundings, intrusions on the well or other criteria as noted by the MassDEP regional office may result in the need for MPA testing and further evaluation of the groundwater as a GWUDI source.

Community PWSs that wish to apply for an exemption must submit an application to MassDEP for review. For more information on the exemption criteria and to obtain an exemption application, visit: http://www.mass.gov/dep/water/approvals/dwsforms.htm. There are separate exemption criteria for community and non-community PWSs. Non-community PWSs must contact their regional office if they wish to apply for an exemption. The Mass DEP regional office will notify a community water supplier if their exemption application submittal is approved or denied. Non-community water suppliers are notified only if their request for exemption is denied.

Group 2: Microscopic Particulate Analysis Required

Group 2 is comprised of sources that cannot meet the exemption criteria and must undertake MPA testing in order to evaluate the need for enhanced wellhead protection, filtration, or merit an exemption based on final MPA results. If a groundwater source fails the two rounds of MPA testing, the source is placed on the list of GWUDI sources. Those sources must either meet the criteria for avoiding filtration or they must filter within 18 months. This deadline may be extended if an Administrative Consent Order specifying a compliance schedule is executed with the MassDEP. For more information on filtration avoidance criteria, view the MassDEP factsheet at: http://www.mass.gov/dep/water/drinking/systems.htm#swtrgwui

MPA Testing Requirements:

1. Those groundwater sources that cannot meet the applicable exemption criteria must undergo MPA testing twice during a twelve-month period: once between August 15 and October 15 (fall) and again between April 1 and May 30 (spring).

2. MassDEP may require non-community seasonal sources to test during alternative months.

3. Sources that are periodically flooded shall also test during an annual flood event during which their system is inundated in addition to the initial fall and spring sampling periods unless the times are synonymous.

4. Sources which already employ some form of filtration, but which do not meet the exemption criteria shall conduct MPA testing on the filtered water.

5. The MPA results should be submitted from the contracted laboratory to the MassDEP, Drinking Water Program, regional office, as well as the public water facility and must be accompanied by an explanation from the laboratory as to the score the results warrant per the EPA's risk rating scale (see Tables 2A & 2B)

6. If the MPA results warrant a low risk rating for both the spring and fall sampling rounds, the source is not required to conduct further MPA testing, implement wellhead or watershed controls, or filter (see Table 1) and is classified as exempt.

7. If either of the two rounds of the MPA sampling warrant a moderate or high rating, the source must be tested for MPA again in the following year during the season (fall or spring) which received the moderate or high rating.

8. If a high-risk rating is derived from either of the initial fall or spring samplings, the source must be tested during that same season for two pursuant years. Moderate or high ratings derived from these two pursuant samplings will trigger extensive wellhead and watershed controls and/or filtration; the source is classified as GWUDI.

9. Sources required to sample in subsequent years that encounter moderate or high scores during the same seasonal sampling will be required to implement extensive wellhead and watershed controls and/or filtration; the source is classified as GWUDI.

   Example: (Fall Year1 $\geq$= moderate rating) + (Fall Year2 = $\geq$moderate rating) = wellhead/watershed controls or filtration.

Explanation of Tables:

Table 1 provides examples of actions required based on risk ratings. The risk ratings were obtained from Tables 2A and 2B. For example: Use Table 2A to determine the contaminant level of each indicator based on the values shown in this table. Each contaminant will obtain a "letter" designation as indicated in the header of Table 2A. Therefore, Giardia levels of <1 would obtain a "NS" designation. Using Table 2B, "NS" under Giardia indicates a value of "0". Looking in the risk contamination key shown below Table 2B, a value of "0" falls in the "low risk" category since it is a value ≤ 8. If more than one indicator is detected in the source, use Table 2A to determine concentration rating and Table 2B to determine the numerical risk number. Add the risk numbers together and determine where this value falls in the "Risk of Contamination Key" in order to determine the overall risk rating for the sample.

TABLE 1: Examples of MPA Risk Ratings and Actions Required

Ex	FALL Year 1	SPRING Year 2	Comment(s)	FALL Year 2	Comment(s)	SPRING Year 3	Comment(s)
1	LOW	LOW	Exempt	NSR		NSR	
2	MOD	LOW	Further testing	MOD	WHP/WSP or Filter	NSR	
3	HIGH	LOW	Further testing	HIGH	WHP/WSP or Filter	NSR	
4	LOW	MOD	Further testing	NSR	WHP/WSP or Filter	MOD	WHP/WSP or Filter
5	MOD	MOD	Further testing	MOD	WHP/WSP or Filter	NSR	
6	HIGH	MOD	Further testing	HIGH	WHP/WSP or Filter	NSR	
7	LOW	HIGH	Further testing	NSR		High	WHP/WSP or Filter
8	MOD	HIGH	Further testing	MOD	WHP/WSP or Filter	NSR	
9	HIGH	HIGH	WHP/WSP or Filter	NSR			
10	MOD	LOW	Further testing	LOW	Exempt		
11	HIGH	LOW	Further testing	LOW	Further Testing	NSR	Source must be sampled in fall (a results > MOD will require filtration).

NSR: No Sampling Required; WSP: Watershed Protection; WHP: Well Head Protection

Table 2A: Concentration of Surface Water Indicators in MPA Sample

Indicators of surface water[1]	EH (Extremely Heavy)	H (Heavy)	M (Moderate)	R (Rare)	NS (Not Significant)
Giardia[2]	>30	16-30	6-15	1-5	<1
Coccidia[2]	>30	16-30	6-15	1-5	<1
Diatoms[3]	>150	41-149	11-40	1-10	<1
Other Algae[3]	>300	96-299	21-95	1-20	<1
Insects/Larvae	>100	31-99	16-30	1-15	<1
Rotifers	>150	61-149	21-60	1-20	<1
Plant Debris[3]	>200	71-200	26-70	1-25	<1

1. According to EPA "Guidance Manual for Compliance with the Filtration and Disinfection Requirements for Public Water Systems Using Surface Water Sources", March, 1991.
2. If Giardia cysts or coccidian are found in any sample, irrespective of volume, score as above.
3. Chlorophyll containing

Relative surface water risk factors associated with scoring of primary bio-indicators (particulate) present during MPA subsurface water sources.

Table 2B: EPA Risk Rating Scale

Indicators of Surface Water	Relative Risk Factor				
	EH (Extremely Heavy)	H (Heavy)	M (Moderate)	R (Rare)	NS (Not Significant)
Giardia	40	30	25	20	0
Coccidia	35	30	25	20	0
Diatoms	16	13	11	6	0
Other Algae	14	12	9	4	0
Insects/Larvae	9	7	5	3	0
Rotifers	4	3	2	1	0
Plant Debris	3	2	1	0	0

Risk of Contamination Key:
High Risk ≥20
Moderate Risk (9-19)
Low Risk ≤8

SITE SPECIFIC MPA SAMPLING REQUIREMENTS

A. All wells, wellfields and infiltration galleries must be pumping constantly or cycled on and off on a regular basis for at least two weeks prior to acquiring an MPA sample.

B. Independent gravel packed or developed wells located within 100 feet of one another and screened in the same geologic deposit:

1. Only the well closest to the surface water feature must be sampled, or
2. If any one well pumps significantly more water than the others (1.5 times the average of the next most productive well or greater), it must be sampled.
3. It is imperative that all wells are shown on the site plan and justification is provided when only sampling a single source.

C. Gravel packed or developed wells connected to a single header:

1. One sample must be collected after all source water has been blended.

D. Tubular wellfields (many interconnected small diameter wells) must pursue one of two options:

1. The well located closest to the surface water source shall be separated from the tubular system and pumped independently prior to collecting the MPA sample, or
2. The system must undertake two years of MPA testing to meet the sampling requirements.

SAMPLE ACQUISITION PROTOCOLS AND RECOMMENDATIONS

A. Sampling apparatus accompanied by instructions concerning sample acquisition and required shipping and analyses times should be provided by the contracted laboratory.

B. The filter housing or canister should be covered during sample acquisition so as not to allow light penetration. Light penetration can allow for rapid propagation of any algae present within the canister, skewing sample results

and causing artificially high risk scores and possibly an unnecessary filtration requirement. The filter should be iced in a darkened cooler immediately after sampling is complete. The filter including water remaining in the housing should be shipped in a sealed zip-lock type bag.

C. The sampling apparatus intake hose should be attached to the source's raw water tap prior to any form of treatment.

D. The sampling period is 24 hours. The flow-limiting device on the sampling apparatus should be calibrated to allow one gallon per minute through the system. It is important that 1,400-1,500 gallons of water pass through the filter during the 24-hour sampling period. The minimum amount of water that can be used is 500 gallons.

E. 50-100 gallons of source water should be passed through the sampling apparatus at each source being tested prior to installing the filter into the filter housing.

F. Water pressure on the filter during sample acquisition should not exceed 10 psi. Pressures exceeding 10 psi can force particulates larger than one micron through the filter and invalidate sample results. Water pressure should be checked and recorded at the beginning, midpoint, and end of the sampling period.

G. It is imperative that organisms identified during the MPA as blue-green algae are not in reality a form of iron bacteria. Iron bacteria warrant no points on the risk rating scale whereas blue-green algae warrant 10, automatically placing a source in the moderate risk category.

MPA DATA SUBMITTAL

A. MPA data results shall be sent to the MassDEP regional contact (listed below) after each sampling round. Accompanying the MPA water quality results must be a score based on the EPA risk rating scale (see Table 2B) and a discussion as to how the score was derived. It is imperative that this data be promptly submitted to the MassDEP after each round of sampling so that MassDEP can consider when to terminate the MPA sampling requirement for the source in question.

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B. Suppliers undertaking MPA testing will be notified by the Boston Office when a determination has been made (based on Table 1) as to whether wellhead and watershed protection or filtration is necessary and the source is classified as GWUDI or not GWUDI.

NEW SOURCES

A. New public water system wells that meet approved exemption criteria are not required to conduct MPA testing or filter.

B. A new public water system well that otherwise meets exemption criteria but that does not have three years of bacteria testing results for source water, must test the source water twice annually for bacteria (spring and fall) for

three years. If there are no total or *E.Coli* present over the three year period, the source will be considered to have met the exemption criteria and will not be required to conduct MPA testing or filter.

C. Any new test well or production well that has total or *E.Coli* in the source water during the pumping test is ineligible for exemption consideration unless the bacteria is determined to be a result of sample acquisition or linked to well construction.

ADDITIONAL INFORMATION

MassDEP has compiled a list of laboratories that are capable of MPA (see below). The list is updated annually.

Acceptable MPA Laboratories:

Analytical Services, Inc.
P.O. Box 515
50 Allen Brook Lane
Williston, VT 05495
(800) 723-4432 or (802) 878-5138

CHA Diagnostic
2210 Empire Avenue
Loveland, CO 80538
(303) 677-9789

Environmental Associates
1185 East Main Street
Bradford, PA 16701
(814) 368-3990 or (716) 925-8971

Environmental Associates Ltd.
24 Oak Brook Drive
Ithaca, NY 14850
(607) 272-8902

Morrell Associates
P.O. Box 268
1661 Ocean Street
Marshfield, MA 02050
(781) 837-1395

Clancy Environmental Consultants
P.O. Box 314
St. Albans, VT 05478
(802) 527-2460, FAX (802) 524-3909

IEA Analysis
P.O. Box 626
Essex Junction, VT 05452
(800) 723-4432 or (802) 878-5138

EDM Consulting Services LLC
P.O. Box 271
231 Main Street
Enosburg Falls, Vermont 05450
(802) 933-6529