GUIDANCE DOCUMENT

FOR ASSISTANCE IN COMPLETING
GROUNDWATER UNDER THE DIRECT INFLUENCE OF SURFACE WATER
EXEMPTION APPLICATION

I. EXEMPTION DOCUMENTATION

All groundwater sources shall be evaluated to determine if they are under the direct influence of surface water. Groundwater sources shall have Microscopic Particulate Analysis (MPA) testing performed to assist the Division in this evaluation unless an exemption is granted. If the source has sufficient protection, application may be made by the water system to the Division for an exemption from MPA testing of that source. A completed **Exemption Application** form must be submitted to us with supporting documentation for any requested exemptions. All specifications, plans, drawings, or reports shall be stamped by a Registered Professional Engineer, signed by a professional groundwater consultant, or signed by a Vermont licensed well driller. Existing information may be submitted if it meets the documentation requirement and is appropriately stamped or signed. Submittals will be reviewed by the Division for thorough documentation of any exemptions claimed. It is imperative that all applications be organized and complete.

In order to apply for an exemption from MPA testing, the following areas of investigation need to be examined to assist in documenting any exemption criteria claimed.

A. Review of Records:
A review of existing water system records shall be conducted to accurately assess the existing conditions and likely impact of surface water on the source.

B. Site Evaluation:
The source and site shall be examined and evaluated for evidence of potential surface water influence.

C. Documentation of Hydrogeologic Conditions:
An analysis of the hydrogeologic setting along with supporting maps and a written analysis of the site conditions are to be submitted as necessary.

If, after review of the submitted **Exemption Application** form and supporting documentation, any groundwater source, which is not granted an exemption from MPA testing, may conduct this testing. MPA testing will determine if the source can be exempted from extensive source and watershed control or water treatment.

II. EXEMPTION CRITERIA

The following listed criteria (A-L) for claiming an exemption from MPA testing is to be used in conjunction with the **Exemption Application**. *Not all of the listed criteria may be applicable to the source seeking exemption. Applicable sections of this document are referenced in the* ***Exemption Application*** *for referral.* All supporting information (as described in each of the criteria below) shall be submitted with the **Exemption Application** to document the criteria claimed.

Note: If any test drilling is to be performed the holes are to be constructed and abandoned according to applicable rules to prevent potential degradation to the source aquifer (Vermont Water Supply Rule Ch. 21, Part 12).

A. The source is not a spring or infiltration gallery:
Provide documentation of source construction and delivery to distribution or storage. A spring, as defined by the Water Supply Rule, is "a ground water source entirely dependent on gravity to move water from the source to the distribution system."

B. The source location in relationship to surface water features:

Maps, construction plans, or site plans shall be submitted showing the distance separating the source from the edge of all surface water features within 150 feet. Only the nearest surface water feature needs to be located if the nearest is greater than 150 feet from the source. Surface water as described by the Water Supply Rule means "any body of surface water including rivers, streams, creeks, brooks, reservoirs, natural or artificial ponds, lakes, swamps, and marshes which have discernable edges and in which terrestrial vegetation does not grow." All distances must be taped or surveyed.

C. The source is a bedrock well, is located greater than 150 feet from surface water, and there is greater than 50 feet of watertight casing below finished grade:
Provide As-Built well construction specifications, Well Completion Report, or plans. The documents must also substantiate an appropriately grouted casing or external sanitary surface seal.

D. A confining layer exists between the surface water and the source aquifer:
Each of the following must be completed and submitted:

1. Provide geologist's or Well Completion Reports for the well indicating the presence of a confining layer.

2. Provide geologist's or Well Completion Reports for any observation or monitoring wells in the area confirming the continuity, thickness, and areal extent of the confining layer.

3. Provide geologic maps indicating the areal extent of the confining layer and geologic cross-sections depicting the subsurface geology.

4. Provide discussion describing how and why the confining layer separates the well from the surface and why surface water induction is unlikely.

5. Sources in karst terrain (limestone, marble, or dolomite bedrock which exhibits solution features) require a more comprehensive evaluation. Direct conduit type flow from surface water is possible at distances far exceeding 150 feet.

E. The source has no historical association with water-borne disease outbreaks:
Provide a review of water system records summarized in report form.

F. No total or fecal coliform violations have occurred over the most recent three year monitored period *and* the water system has not repeatedly failed to meet coliform monitoring requirements:
Provide a review of compliance records summarized in report form. If all Maximum Contaminant Level violations can be documented to be attributed to distribution network inadequacies only, then this criteria may be considered satisfied at the Division's discretion.

G. The source is not subject to surface water influx by annual flooding:
Perform a site walk over to look for evidence of flooding and secure source construction. Also evaluate local information, the topographic location, etc. and summarize all findings in a report, including source construction information.

H. There are no construction defects or deficiencies which could allow surface water to directly enter the source:
Provide As-Built construction details or Well Completion Report for the source, including the presence of an annular grouted seal around the well casing, or an external sanitary surface seal of high clay content surrounding the source which is sloped to direct all surficial water away from the source casing in accordance with DWGPD approved construction. Include a report on direct observation of the source construction and the state of repair with the submittal.

I. The source does not have a pumping rate of greater than 500 gallons per minute (720,000 gallons per day):

Provide a Department of Environmental Conservation (DEC) source permit or Vermont Department of Health approval letter confirming an approved pump rate, or historical documentation demonstrating the rate at which the source has historically pumped, excluding periods of time during which the source was not in use. If information is unavailable for existing sources, calculate water use by multiplying the maximum number of people served by 75 gallons per day, or the number of service connections by 450 gallons per day. Large water using activities, such as agriculture or industry, should be taken into account.

J. The source does not exhibit any other evidence of being under the direct influence of surfacewater:
Provide documentation concerning any other situation or condition that may indicate that the source is influenced by surface water. For example, any unusual water quantity fluctuations, or water quality conditions (color, turbidity, odor, etc.).

K. The top of the well screen, bottom of casing, or bedrock surface is greater than 50 feet below the ground surface:
Provide as appropriate, As-Built well construction details, Well Completion Report, or geologists' report for the well indicating the depth of the screen, casing, or bedrock surface below ground level.

L. The lack of a direct hydraulic connection between the surface water and the source withdrawal:
Each of the following must be completed:

1. Provide a flow net diagram showing groundwater flow under normal pump usage conditions and which takes seasonal water table and surface water variations into account.

2. Provide geologic cross-sections depicting the land surface, subsurface geology, groundwater table, and/or potentiometric surface as applicable.

3. Provide discussion describing how and why the source is not hydraulically connected to a surface water feature located within 150 feet.

4. Sources in karst terrain (limestone, marble, or dolomite bedrock which exhibits solution features) require a more comprehensive evaluation. Direct conduit type flow from a surface connection is possible at distances far exceeding 150 feet.

III. OPTIONS FOR NON-EXEMPT SOURCES

To avoid the necessity of conducting MPA testing, implementing extensive source and watershed control, or of meeting water treatment requirements, some options available to the water system are:

A. Reconstruction of the source(s) to meet the criteria for exemption from MPA testing (e.g. installation of sanitary surface seal). An application for a **Permit to Construct** needs to be filed with the Division, reviewed, and approved before any work is started.

B. Abandonment of non-exempt water source(s) using approved closure methods (Vt. Water Supply Rule Ch. 21, Part 12). This assumes that sufficient documented yield exists from the remaining source(s) to meet the water system demand. Documentation that a sufficient quantity of water is available must be supplied to the Division before source disconnection and abandonment.

C. Abandon non-exempt water sources using approved closure methods (Vt. Water Supply Rule Ch. 21, Part 12), disconnect, or delegate as an emergency source only. Then develop a new source that meets with the criteria for exemption from MPA testing, following all Vermont Water Supply Rules for new public water source permitting. A **Source Permit Application** form is available from the Division office.

IV. MICROSCOPIC PARTICULATE ANALYSIS (MPA)

Those public groundwater sources, which cannot satisfy the exemption from MPA testing criteria set forth in the Exemption Application, shall conduct MPA testing. If a source is determined to be under the direct influence of

surface water after conducting MPA testing, extensive source and watershed control, or water treatment will be required unless a waiver is applied for and granted.

A. All sources undertaking MPA testing shall initially collect two samples, one in the spring and the other in the fall. The source status or necessity for further testing will be determined by the Division based on the results of the initial MPA testing.

B. MPA testing shall be conducted during the periods between April 1 and June 1, and September 1 and November 1, unless otherwise approved by the Drinking Water and Groundwater Protection Division.

C. All MPA testing shall be conducted according to the appropriate schedule found in Table 1, unless otherwise directed.

D. A seasonal source shall be evaluated during the season in which it operates, with special consideration given to maintaining seasonal use, and that sampling be done at the time of greatest susceptibility of surface water influence. All other testing requirements apply.

E. Where there is no evidence of casing grout or waterproof seal, one sample shall be obtained during the time of flooding of an annually flooded source while the source is inundated, or within 24 hours following such flooding.

F. MPA results shall be assessed by the contracted laboratory using the EPA Risk Rating Scale in Table 2. The results shall be submitted to the Division in a timely manner for review. Only laboratories which use the EPA "Consensus Method For Determining Groundwater Under The Direct Influence Of Surface Water Using Microscopic Particulate Analysis (MPA)" are qualified to perform MPA evaluations for Division review.

G. If the MPA results indicate a 'low risk' rating for both of the initial sampling rounds, then the source will be considered not under the direct influence of surface water, and no further MPA testing will be required of that source.

H. If the MPA result from any of the two initial samples indicates greater than a 'low risk' of surface water influence, then the source must comply with the appropriate sampling schedule found in Table 1.

I. The Division will provide public water systems with the final determination of whether each groundwater source is under the direct influence of surface water or not.

V. SOURCE SPECIFIC MPA SAMPLING GUIDE

A. All sources, except free flowing springs, shall be pumped constantly or cycled on and off on a regular basis at the actual or proposed usage rate for at least two weeks prior to acquiring an MPA sample.

B. All spring sources shall be individually sampled for MPA because of the wide variation in spring source characteristics.

C. For wells developed in unconsolidated deposits which are located within 100 feet of one another and screened in the same geologic unit or aquifer:

1. Only the well closest to the surface water feature will be required to sample, or:

2. If any one well pumps significantly more water than the others (1.5 times the average of the next most productive well), it will also be required to sample.

3. Supporting documentation shall be provided to the Division with the MPA sampling proposal for sampling only the single source.

4. If individual wells connected to a single header in a well field cannot be isolated in a reasonable manner, then the MPA sample shall be taken from the blended source water for 4 consecutive sampling periods.

VI. MPA SAMPLE ACQUISITION

A. Sampling apparatus should be provided by the contracted laboratory accompanied by thorough instructions concerning sample acquisition, required shipping, and other protocols. NOTE: The laboratories instructions shall take preference over any conflicting instructions contained in this Guidance Document.

B. The sampling apparatus intake hose shall be attached to the source's raw water tap at a juncture prior to any form of water treatment, storage, or directly from the source, unless otherwise approved by the Division.

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

D. The sampling period is 9-16 hours. The flow limiting device on the sampling apparatus should be calibrated to allow 1 gallon per minute through the system (for a total of 500-1000 gallons). A sample volume of about 1000 gallons is preferable.

E. Water pressure on the filter during sample acquisition should not exceed 10 psi. Pressures exceeding 10 psi can force particulates larger than 1 micron through the filter invalidating sample results. Water pressure should be checked and recorded at the beginning, midpoint, and end of the sampling period.

F. The filter should always be covered to prevent light penetration during sampling and shipping to restrict propagation of any algae present, or development of chlorophyll pigmentation.

G. Package and transport the sample per the laboratory instructions.

H. Sample contamination, error, or any other reason for sample invalidation will necessitate complete resampling for that period.

Table 1.

Microscopic Particulate Analysis Testing Schedule

The following schedule indicates the two initial sampling periods and the potential additional sampling dates, pending the various results of the initial samples.

Sampling Periods*

First Spring**	**First Fall**	**Second Spring**	**Second Fall**	**Third Spring**	**Third Fall**	**Source Status**
Low**	Low					**Exempt**
High or Moderate	High or Moderate					Not Exempt
High or Moderate	Low	High or Moderate				Not Exempt
Low	High or Moderate	(Pass)	High or Moderate			Not Exempt
High or Moderate	Low	Low	(Pass)	Low		**Exempt**
High or Moderate	Low	Low	(Pass)	High or Moderate		Not Exempt
Low	High or Moderate	(Pass)	Low	(Pass)	Low	**Exempt**
Low	High or Moderate	(Pass)	Low	(Pass)	High or Moderate	Not Exempt

* Spring – Between April 1 and June 1

* Fall – Between September 1 and November 1

** Sampling may begin in the fall and the second sample taken in the spring.

*** EPA Risk Rating of Contamination – See EPA Risk Rating Scale Table 2.

TABLE 2.

EPA RELATIVE RISK TABLES

Table A. Numerical range of each bio-indicator based on numbers counted per 100 gallons filtered water*

Indicators of Surface Water*	Extremely Heavy	Heavy	Moderate	Rare	None Found
Giardia**	>30	16-30	6-15	1-5	0
Coccidia**	>30	16-30	6-15	1-5	0
Diatoms	>150	41-149	11-40	1-10	0
Other Algae	>300	96-299	21-95	1-20	0
Insects/Larvae	>100	31-99	16-30	1-15	0
Rotifers	>150	61-149	21-60	1-20	0
Plant Debris	>200	71-200	26-70	1-25	0

Table B. Relative surface water risk factors associated with scoring of bio-indicators present during MPA of subsurface water sources.

	Relative Risk Factor***				
Particulates Indicative of Surface Water*	Extremely Heavy***	Heavy	Moderate	Rare	None Found
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

Table C. Risk of Groundwater Contamination by Surface Water Influence

RISK OF GROUNDWATER CONTAMINATION	
≥20****	High Risk
10-19	Moderate Risk
≤ 9	Low Risk

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* According to EPA "Guidance Manual for Compliance with the Filtration and Disinfection Requirements for Public Water Systems Using Surface Water Sources," March, 1991 ed.

** If Giardia cysts or other coccidia are found in any sample, irrespective of volume, score as above.

*** Refer to Table A for range of indicators counted per 100 gallons under 100X.

**** Refer to Table B for numerical relative risk factor.