MAINE CDC DRINKING WATER PROGRAM
Department of Health & Human Services

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UV POLICY

IMPORTANT NOTIFICATION:

The EPA Ground Water Rule (GWR) which took effect in 2009 requires ground water systems with E. coli present in the raw water to install treatment capable of 4-log inactivation or removal of viruses. Currently available UV treatment equipment may not meet this level of virus inactivation unless **several** units are installed in series, which is a very expensive method of maintaining GWR compliance. Chlorination systems on the other hand, can be modified to meet the GWR virus inactivation requirement by simply increasing the chlorine dose or providing more contact time, both of which will likely be less expensive than providing 4-log virus inactivation with a UV disinfection system. Therefore, **when evaluating UV disinfection as an alternative, please be aware that after a UV system is installed and approved per this policy, the presence of E. coli may require the subsequent installation of a continuous chlorination system or substantial additional UV disinfection equipment in order to meet the requirements of the GWR.**

PURPOSE:

This policy is written to specify the requirements for installing ultraviolet disinfection for a small ground water public drinking water source.

SCOPE:

This policy is applicable for small ground water sources only. For large ground water sources and all surface water sources, consult the EPA Ultraviolet Disinfection Guidance Manual. This policy applies when disinfection is mandated by the DWP, considered to be "required treatment"* by the DWP (including when UV Treatment is installed to resolve a Level I or II Assessment), and when UV treatment is installed voluntarily. UV systems installed in a Public Water System (PWS) must be reviewed and approved as treatment per the Maine Rules Relating to Drinking Water, Section 3: Facilities Approval, Submission of Engineering Plans.

* See Treatment Review Policy & Procedure (DWP0161) for the definition of "required treatment" and additional clarification in Appendix P of that document.

ORIGINATOR: Nathan Saunders

OWNER: Engineering

DEFINITIONS:

- **Small ground water source** is generally defined as a system obtaining drinking water from one to three, six inch diameter bedrock wells or similar sized gravel pack wells that are not considered GUI (ground water under the influence of surface water). For this policy, a public water system with a small ground water source serves a population of 500 people or less. Any system that does not fit this basic description of a small ground water source should refer to the EPA Ultraviolet Disinfection Guidance Manual for applicable guidance.
- **Raw water:** water coming directly from the well, before any treatment.

RESPONSIBILTIES:

The Engineering Team reviews and approves UV disinfection systems with input from a Rule Specialist.

INTRODUCTION:

Ultra Violet (UV) Light treatment devices may be used to treat bacteriologically unsafe groundwater from drinking water wells. However, the DWP expects water system owners to take all steps possible to obtain a naturally safe water source before considering treatment. A naturally safe water source provides the best long-term public health protection and there is no reliance on a treatment device to assure safe water. There must be a determination that the bacteriologically unsafe water is not due to the influence of surface water.

Recent research has demonstrated the effectiveness of UV as a primary disinfectant. While this policy statement does not specifically cover UV treatment for surface water or groundwater under the direct influence of surface water (GUI), it is not the intent of this policy to discourage such use. Please refer to the EPA UV Disinfection Guidance Manual and contact the DWP when investigating the use of UV disinfection on a surface water or GUI source.

When a naturally safe groundwater source is not available, or the system owner wishes to provide UV treatment for other reasons, the following criteria shall apply. Supplemental disinfection to provide a residual in the water distribution system may be required by the DWP. When UV light treatment devices are used for non-drinking water related purposes (such as process water used in a fish processing plant), the UV device must be approved by the appropriate state or federal agency.

PROCEDURE:

UV TREATMENT SYSTEM STARTUP REQUIREMENTS

1. System specifications and schematics shall be submitted to the DWP using the Change Application process, for review and approval prior to system installation.

2. Before startup of a UV treatment system:

    - The water system should be thoroughly disinfected (shock chlorinated).

    - The system must be inspected and approved by the DWP. Final inspection will be completed by the PWS Inspector and should take place with the installer present to ensure adequate description of the installation and functionality of the UV unit.

3. The system shall be installed by a licensed plumber as specified on the Change Application.

4. Approval requires demonstration that the system meets the criteria included in this policy.

I. UV TREATMENT INSTALLED FOR THE DISINFECTION OF DRINKING WATER DUE TO A MANDATE FROM THE DWP OR IF IT MEETS THE DEFINITION OF "REQUIRED TREATMENT" IN THE TREAMENT REVIEW AND APPROVAL POLICY & PROCEDURE (DWP0161).

A. CRITERIA FOR UV WATER TREATMENT DEVICES

1. UV water treatment devices must be ANSI/NSF Standard 55 - Ultraviolet Microbiological Water Treatment System certified.
2. The design and installation of the UV reactor shall ensure that the manufacturer's maximum rated flow and pressure cannot be exceeded. Flow restriction may be accomplished by installing a flow

meter as a controlling device, by installing a flow restricting orifice, or by another method that satisfies this requirement.

3. The UV assemblies shall be accessible for visual observation, cleaning and replacement of the lamp, lamp jackets, and sensor window/lens.
4. An automatic shutdown valve shall be installed in the water supply line after each UV treatment system that will be activated whenever the water treatment system loses power or is tripped by a monitoring device when the dosage is below its alarm point of 40 mJ/cm^2. When power is not being supplied to the UV unit the valve shall be in a closed (fail-safe) position. Without a redundant UV unit, this will result in a complete water system shutdown unless a bypass is used per section A.5 below. A sufficient number (required number plus one) of parallel UV treatment systems can be provided to assure a continuous water supply when one unit is out of service.
5. A bypass may be installed but may only be used if an approved disinfection alternative is in use, or a Boil Water Order is issued. A durable plastic instruction tag shall be securely attached to the by-pass valve stating this requirement and that the Maine Drinking Water Program must be called before using the bypass. For further guidance on operating in bypass mode, please contact DWP Public Water System Inspector by e-mail or by phone at 207-287-2070.
6. All water from the well shall be treated. The well owner may request a variance to treat only that portion of the water supply that is used for potable purposes provided that the daily average and peak water use is determined and signs are posted at all non-potable water supply outlets. See A.5 above on the use of a by-pass.
7. The well or booster pump(s) shall have adequate pressure capability to maintain minimum water system pressure after the water treatment devices.
8. Sampling taps shall be installed before and after the UV unit. A receptacle for the connection of portable power is recommended.

B. PRETREATMENT

A 5 micron filter should be provided as minimum pretreatment.

C. PROCESS CONTROL WATER QUALITY MONITORING

Total coliform monitoring and other parameters required by the DWP will be used to evaluate UV treatment effectiveness. The minimum monitoring frequency will be as follows:

1. Startup - one raw and one treated sample.
2. Monthly thereafter - treated water, not eligible for quarterly sampling.
3. Monitoring for additional parameters or total coliform on an increased frequency may be required by the DWP.

D. ONLINE MONITORING, REPLACEMENT PARTS

UV light intensity of each installed unit shall be monitored continuously. Treatment units and the water system shall automatically shut down if the UV dosage falls below the required output of 40 mJ/cm^2. Each owner shall have available on site at least one replacement sleeve, lamp, a 5 micron filter, and any other components necessary to keep the treatment system in service. A maintenance agreement can substitute for having replacement components on hand. The maintenance agreement shall be made available for inspection by the DWP upon request.

E. SEASONAL OPERATIONS

UV water treatment devices that are operated on a seasonal basis shall be inspected and cleaned prior to use at the start of each operating season. The UV water treatment system including the filters shall be disinfected prior to placing the water treatment system back into operation. A procedure for shutting

down and starting up the UV treatment system shall be developed for or by each owner based upon manufacturer recommendations.

F. RECORD KEEPING AND ACCESS

A record shall be kept of the water quality test data, dates of lamp replacement and cleaning, when the device was shut down and the reason for shutdown, and the dates of prefilter replacement. The DWP shall have access to the UV water treatment system and records.

G. WATER QUALITY CHARACTERISTICS

The water supply entering the UV unit should be analyzed for water quality parameters and the results shall be included in the UV application. Pretreatment may be necessary for UV installations if the water quality exceeds maximum limits. When an initial sample exceeds a maximum limit, a check sample should be taken and analyzed. For all UV units certified to ANSI/NSF Standard 55, pre-installation water quality parameters specified by the manufacturer are acceptable. If no water quality parameters are specified by the manufacturer, the following water quality parameters are required:

Parameter	Maximum (Minimum)
UV 254nm Transmittance	(80 percent)
Dissolved Iron	0.3 mg/L
Dissolved Manganese	0.05 mg/L
Hardness	120 mg/L*
Hydrogen sulfide (if odor is present)	Non-Detectable
Iron Bacteria	None
pH	6.5 to 9.5
Suspended Solids	10 mg/L
Turbidity	1 .0 NTU
Total Coliform	1,000/100 ML
E. coli	**

* A higher hardness may be acceptable if experience with similar water quality and reactors shows there are no treatment problems or excessive maintenance required.

** These organisms may indicate that the source is either a surface water or ground water under the direct influence of surface water and may require additional filtration pretreatment. Consult the DWP for guidance.

Water quality entering the UV unit should be evaluated and pretreatment equipment should be designed to handle water quality changes. Variable turbidity caused by rainfall events is of special concern.

Maine DWP UV System Approval Checklist

PWS Name: _____ PWSID# _____

PWS Inspector: _____ Date: _____

UV Mgfr _____ Model _____ S/N _____

1. UV unit has been installed by a licensed plumber ☐
2. Water system has been thoroughly disinfected (shock chlorinated) ☐
3. ANSI/NSF Standard 55 Certified [UV A.1] ☐
4. Flow will shut down upon UV unit failure [UV A.4, UV A.4] ☐
5. Instruction tag present on bypass valve/device. [UV A.5] ☐
6. All water from well is treated, unless variance provided by DWP [UV A.6] ☐
7. Well or booster pump(s) providing min. system pressure required [UV A.7] ☐
8. For required disinfection, sampling taps installed before and after UV unit [UV A.8] ☐
9. Water quality monitoring set up per UV policy [UV C] ☐
10. Replacement lamp(s) and filter (if filter is installed) present or maintenance agreement in place [UV D] ☐
11. Record keeping for water quality, lamp replacement, shutdowns etc. [UV F] ☐

UV system approved? Yes ☐ No ☐

II. UV TREATMENT INSTALLED VOLUNTARILY* FOR DISINFECTING DRINKING WATER (*SEE DWP0161)

A. UV Treatment requires NSF 55 certification

B. Monitoring: Monthly - treated water, not eligible for quarterly sampling.

ASSOCIATED DOCUMENTS:

- EPA Ultraviolet Disinfection Guidance Manual
- Treatment Review and Approval – Policy and Procedure (DWP0161)

SUPERCEDED DOCUMENTS: None

RETENTION: This document is retained per the DWP Documentation Control Procedure.

REVISION LOG

Section	Page	Rev.	Date	Description Of Change	Approved by:
All	All	G	12/26/08	Re-write to reduce requirements	Roger Crouse
All	All	H	1/10/17	Changes related to the DWP Reorganization	Nathan Saunders
H	5	J	1/11/19	Manufacture specific water quality parameters are acceptable for NSF 55 certified UV units.	Nathan Saunders
Most	Most	K	9-24-2021	Modified document to cover UV Treatment mandated by the DWP, defined as “required” (see DWP0161), as a result of a Level 1 or 2 Assessment, or voluntarily. Updated monitoring requirements. Removed approval letter due to redundancy with Treatment Approval letter.	Nathan Saunders
All	All	NA	4/23/2024	Formatting corrections only; no content was revised. -PB	