

### 333-061-0032

#### **Treatment Requirements and Performance Standards for Surface Water, Groundwater Under Direct Influence of Surface Water, and Groundwater**

- (1) General requirements for all public water systems supplied by a surface water source or a groundwater source under the direct influence of surface water.
  - (a) These regulations establish criteria under which filtration is required and treatment technique requirements in lieu of maximum contaminant levels for the following contaminants: *Giardia lamblia*, viruses, heterotrophic plate count bacteria, *Legionella*, *Cryptosporidium*, and turbidity. Each public water system with a surface water source or a groundwater source under the direct influence of surface water must provide treatment of that source water that complies with these treatment technique requirements. The treatment technique requirements consist of installing and properly operating water treatment processes which reliably achieve:
    - (A) At least 99.9 percent (3-log) removal and/or inactivation of *Giardia lamblia* cysts between a point where the raw water is not subject to recontamination by surface water runoff and a point downstream before or at the first customer, and
    - (B) At least 99.99 percent (4-log) removal and/or inactivation of viruses between a point where the raw water is not subject to recontamination by surface water runoff and a point downstream before or at the first customer.
    - (C) At least 99 percent (2-log) removal of *Cryptosporidium* between a point where the raw water is not subject to recontamination by surface water runoff and a point downstream before or at the first customer for filtered systems, or *Cryptosporidium* control under the watershed control plan for unfiltered systems; and
    - (D) Compliance with any applicable disinfection profiling and benchmark requirements as specified in OAR 333-061-0030(3)(b)(C) and (D) and 333-061-0060(1)(e).
    - (E) Sampling and Bin Classification for *Cryptosporidium*:
      - (i) All systems must conduct an initial and second round of source water monitoring, as prescribed in subsection 333-061-0036(5)(e) of these rules, for each plant that treats a surface water or GWUDI source to determine what level, if any, of additional *Cryptosporidium* treatment they must provide.
      - (ii) Filtered systems must determine their *Cryptosporidium* treatment bin classification as prescribed in subsection (4)(f) of this rule and provide additional treatment for *Cryptosporidium*, if required, as prescribed in subsection

(4)(g) of this rule. All unfiltered systems must provide treatment for *Cryptosporidium* as prescribed in subsections (3)(e) through (g) of this rule. Filtered and unfiltered systems must implement *Cryptosporidium* treatment according to the schedule in paragraph (1)(a)(F) of this rule.

(iii) Systems required to provide additional treatment for *Cryptosporidium* must implement microbial toolbox options that are designed and operated as prescribed in sections (13) through (17) of this rule and in OAR 333-061-0036(5)(c), OAR 333-061-0050(4) and OAR 333-061-0050(5)(k).

(F) Schedule for compliance with *Cryptosporidium* treatment requirements.

(i) Following initial bin classification as prescribed in subsection (4)(f) of this rule, filtered water systems must provide the level of treatment for *Cryptosporidium* required under subsection (4)(g) of this rule according to the schedule in paragraph (1)(a)(F)(iii) of this rule.

(ii) Following initial determination of the mean *Cryptosporidium* level under subsection (2)(d) of this rule, unfiltered water systems must provide the level of treatment for *Cryptosporidium* required under subsection (2)(d) of this rule according to the schedule in paragraph (iii) of this section.

(iii) *Cryptosporidium* treatment compliance dates. The Department may allow up to an additional two years from the date specified below for water systems making capital improvements.

(I) Water systems that serve at least 100,000 people must comply with *Cryptosporidium* treatment by April 1, 2012.

(II) Water systems that serve from 50,000 to 99,999 people must comply with *Cryptosporidium* treatment by October 1, 2012.

(III) Water systems that serve from 10,000 to 49,999 people must comply with *Cryptosporidium* treatment by October 1, 2013.

(IV) Water systems that serve fewer than 10,000 people must comply with *Cryptosporidium* treatment by October 1, 2014.

(V) State-Regulated public water systems must comply with *Cryptosporidium* treatment by October 1, 2015.

- (iv) If the bin classification for a filtered water system changes following the second round of source water monitoring as prescribed in subsection (4)(f) of this rule, the water system must provide the level of treatment for *Cryptosporidium* required by subsection (4)(g) of this rule on a schedule approved by the Department.
  - (v) If the mean *Cryptosporidium* level for an unfiltered water system changes following the second round of monitoring as prescribed in paragraph (2)(d)(A) of this rule, the water system must provide the level of *Cryptosporidium* treatment required by subsection (2)(d) of this rule due to the change, following a schedule approved by the Department.
- (b) A public water system using a surface water source or a ground water source under the direct influence of surface water is considered to be in compliance with the requirements of this rule if:
  - (A) The system meets the requirements for avoiding filtration in section (2) of this rule and the disinfection requirements in section (3) of this rule, and the disinfection benchmarking requirements of OAR 333-061-0060(1)(e); or
  - (B) The system meets the filtration requirements in section (4) of this rule and the disinfection requirements in section (5) of this rule and the disinfection benchmarking requirements of OAR 333-061-0060(1)(e).
- (c) Water systems that utilize sources that have been determined to be under the direct influence of surface water according to section (7) of this rule have 18 months to meet the requirements of sections (2) and (3) of this rule, or the requirements of sections (4) and (5) of this rule. During that time, the system must meet the following Interim Standards:
  - (A) The turbidity of water entering the distribution system must never exceed 5 NTU. Turbidity measurements must be taken a minimum of once per day. If continuous turbidimeters are in place, measurements should be taken every four hours; and
  - (B) Disinfection must be sufficient to reliably achieve at least 1.0 log inactivation of *Giardia lamblia* cysts prior to the first user. Daily disinfection "CT" values must be calculated and recorded daily, including pH and temperature measurements, and disinfection residuals at the first customer.
  - (C) Reports must be submitted to the Department monthly as prescribed in 333-061-0040.
  - (D) If these interim standards are not met, the owner or operator of the water system must notify customers of the failure as required in OAR 333-061-0042(2)(b)(A).

- (2) Requirements for systems utilizing surface water or GWUDI sources without filtration:
- (a) A public water system that uses a surface water source or a groundwater source under the direct influence of surface water must meet all of the conditions of this section.
  - (b) Source water quality conditions.
    - (A) The fecal coliform concentration must be equal to or less than 20/100 ml, or the total coliform concentration must be equal to or less than 100/100 ml in representative samples of the source water immediately prior to the first or only point of disinfectant application in at least 90 percent of the measurements made for the 6 previous months that the system served water to the public on an ongoing basis. If a system measures both fecal and total coliform, the fecal coliform criterion, but not the total coliform criterion, in this paragraph must be met. All samples must be collected as prescribed in OAR 333-061-0036(5)(a)(A).
    - (B) The turbidity level cannot exceed the maximum contaminant level prescribed in OAR 333-061-0030(3)(a)(A).
  - (c) Site-specific conditions. The public water supply must:
    - (A) Meet the disinfection requirements as prescribed in section (3) of this rule at least 11 of the 12 previous months that the system served water to the public, on an ongoing basis, unless the system fails to meet the requirements during 2 of the 12 previous months that the system served water to the public, and the Department determines that at least one of these failures was caused by circumstances that were unusual and unpredictable.
    - (B) Maintain a comprehensive watershed control program which minimizes the potential for contamination by *Giardia lamblia* cysts, *Cryptosporidium* oocysts, and viruses in the source water. For groundwater systems under the direct influence of surface water, and at the discretion of the Department, a certified drinking water protection plan (OAR 340-040-0160 to 340-040-00180) that addresses both the groundwater- and surface water components of the drinking water supply may be substituted for a watershed control program. Groundwater systems relying on a drinking water protection plan would still be subject to the requirements of subsection (c) of this rule. The watershed control program shall be developed according to guidelines in OAR 333-061-0075. The public water system must demonstrate through ownership and/or written agreements with landowners within the watershed that it can control all human activities which may have an adverse impact on the microbiological quality of the source water. The system must submit an annual

report to the Department identifying any special concerns about the watershed, the procedures used to resolve the concern, current activities affecting water quality, and projections of future adverse impacts or activities and the means to address them. At a minimum, the watershed control program must:

- (i) Characterize the watershed hydrology and land ownership;
  - (ii) Identify watershed characteristics and activities which have or may have an adverse effect on source water quality; and
  - (iii) Monitor the occurrence of activities which may have an adverse effect on source water quality.
- (C) Be subject to an annual on-site inspection of the watershed control program and the disinfection treatment process by the Department. The on-site inspection must indicate to the Department's satisfaction that the watershed control program and disinfection treatment process are adequately designed and maintained including the adequacy limiting the potential contamination by *Cryptosporidium* oocysts. The inspection must include:
- (i) A review of the effectiveness of the watershed control program;
  - (ii) A review of the physical condition of the source intake and how well it is protected;
  - (iii) A review of the system's equipment maintenance program to ensure there is low probability for failure of the disinfection process;
  - (iv) An inspection of the disinfection equipment for physical deterioration;
  - (v) A review of operating procedures;
  - (vi) A review of data records to ensure that all required tests are being conducted and recorded and disinfection is effectively practiced; and
  - (vii) Identification of any improvements which are needed in the equipment, system maintenance and operation, or data collection.
- (D) Shall not have been identified by the Department as a source of waterborne disease outbreak under the system's current configuration. If such an outbreak occurs, the system must sufficiently modify the treatment process, as determined by the Department, to prevent any future such occurrence.
- (E) Comply with the maximum contaminant level (MCL) for total coliform bacteria in OAR 333-061-0030(4) at least 11 months of the 12 previous months that the system served water to the

public on an ongoing basis, unless the Department determines that failure to meet this requirement was not caused by a deficiency in treatment of the source water.

- (F) Comply with the requirements for total trihalomethanes, haloacetic acids (five), bromate, chlorite, chlorine, chloramines, and chlorine dioxide as specified in OAR 333-061-0036 (4).
- (d) Determination of mean *Cryptosporidium* level.
  - (A) Unfiltered water systems must calculate the arithmetic average of all *Cryptosporidium* sample concentrations following completion of the initial and second round of source water monitoring conducted in accordance with OAR 333-061-0036(5)(e). Systems must report this value to the Department for approval no later than 6 months after the date the system was required to complete the required monitoring.
  - (B) If the frequency of monthly *Cryptosporidium* sampling varies, water systems must calculate a monthly average for each month of sampling. Systems must then use these monthly average concentrations, rather than individual sample concentrations, in the calculation of the mean *Cryptosporidium* level prescribed in paragraph (2)(d)(A) of this rule.
  - (C) The report to the Department of the mean *Cryptosporidium* levels calculated in accordance with paragraph (2)(d)(A) of this rule must include a summary of the source water monitoring data used for the calculation.
  - (D) Failure to comply with the conditions of paragraph (5)(d)(A) of this rule is a violation of the treatment technique requirement.
- (e) A public water system which fails to meet any of the criteria in section (2) of this rule is in violation of a treatment technique requirement. The Department can require filtration to be installed where it determines necessary.
- (3) Disinfection requirements for systems utilizing surface water or GWUDI sources without filtration. Each public water system that does not provide filtration treatment must provide disinfection treatment as follows:
  - (a) The disinfection treatment must be sufficient to ensure at least 99.9 percent (3-log) inactivation of *Giardia lamblia* cysts and 99.99 percent (4-log) inactivation of viruses, every day the system serves water to the public, except any one day each month. Each day a system serves water to the public, the public water system must calculate the CT value(s) from the system's treatment parameters, using the procedure specified in OAR 333-061-0036(5)(a)(C) and determine whether this value(s) is sufficient to achieve the specified inactivation rates for *Giardia lamblia* cysts and viruses. If a system uses a disinfectant other than chlorine, the system must demonstrate to the Department through the use of an approved protocol for on-site

disinfection demonstration studies or other information satisfactory to the Department that the system is achieving the required inactivation rates on a daily basis instead of meeting the "CT" values in this rule.

- (b) The disinfection system must have either:
  - (A) Redundant components, including an auxiliary power supply with automatic start-up and alarm to ensure that disinfectant application is maintained continuously while water is being delivered to the distribution system; or
  - (B) Automatic shut-off of delivery of water to the distribution system whenever there is less than 0.2 mg/l of residual disinfectant concentration in the water. If the Department determines that automatic shut-off would cause unreasonable risk to health or interfere with fire protection, the system must comply with paragraph (3)(b)(A) of this rule.
- (c) The residual disinfectant concentration in the water entering the distribution system, measured as specified in OAR 333-061-0036(5)(a)(E), cannot be less than 0.2 mg/l for more than four hours.
- (d) Disinfectant residuals in the distribution system. The residual disinfectant concentration in the distribution system, measured as total chlorine, combined chlorine, or chlorine dioxide, as specified in OAR 333-061-0036(4)(a)(F), cannot be undetectable in more than 5 percent of the samples each month, for any two consecutive months that the system serves water to the public.
- (e) Unfiltered water systems must provide the level of *Cryptosporidium* inactivation specified in this subsection, based on their mean *Cryptosporidium* levels, and determined in accordance with subsection (2)(d) of this rule and according to the schedule in subsection (1)(a) of this rule.
  - (A) Unfiltered systems with a mean *Cryptosporidium* level of 0.01 oocysts/L or less must provide at least 2-log *Cryptosporidium* inactivation.
  - (B) Unfiltered systems with a mean *Cryptosporidium* level of greater than 0.01 oocysts/L must provide at least 3-log *Cryptosporidium* inactivation.
- (f) Inactivation treatment technology requirements. Unfiltered systems must use chlorine dioxide, ozone, or UV as prescribed by 333-061-0036(5)(c) of these rules to meet the *Cryptosporidium* inactivation requirements of this section.
  - (A) Systems that use chlorine dioxide or ozone and fail to achieve the *Cryptosporidium* inactivation required in subsection (3)(e) of this rule on more than one day in the calendar month are in violation of the treatment technique requirement.

- (B) Systems that use UV light and fail to achieve the *Cryptosporidium* inactivation required in subsection (18)(c) of this rule are in violation of the treatment technique requirement.
  - (g) Use of two disinfectants. Unfiltered water systems must meet the combined *Cryptosporidium* inactivation requirements of subsection (3)(e) of this rule, and the *Giardia lamblia* and virus inactivation requirements of OAR 333-061-0036(5)(c) using a minimum of two disinfectants. Each of the two disinfectants must achieve by itself, the total inactivation required for at least one of the following pathogens: *Cryptosporidium*, *Giardia lamblia*, or viruses.
- (4) Requirements for systems utilizing surface water or GWUDI sources that provide filtration:
- (a) A public water system that uses a surface water source or a groundwater source under the direct influence of surface water, and does not meet all of the criteria in sections (1), (2), and (3) of this rule for avoiding filtration, violates a treatment technique and must provide treatment consisting of both disinfection, as specified in section (5) of this rule, and filtration treatment which complies with the requirements of either subsection (4)(b), (c), (d), or (e) of this rule by June 29, 1993 or within 18 months of the failure to meet the criteria in section (2) of this rule for avoiding filtration, whichever is later. Failure to install a required treatment by the prescribed dates is a violation of the treatment technique requirements.
  - (b) Conventional filtration treatment or direct filtration. Systems using conventional filtration treatment or direct filtration treatment shall meet the turbidity requirements as specified in OAR 333-0061-0030 (3)(b)(A)(i) and (ii).
  - (c) Slow sand filtration. Systems using slow sand filtration treatment shall meet the turbidity requirements prescribed in OAR 333-061-0030(3)(b)(B).
  - (d) Diatomaceous earth filtration. Systems using diatomaceous earth filtration treatment shall meet the turbidity requirements prescribed in OAR 333-061-0030(3)(b)(C).
  - (e) Other filtration technologies. Systems using other filtration technologies shall meet the turbidity requirements prescribed in OAR 333-061-0030(3)(b)(D).
    - (A) GWUDI systems using bank filtration as an alternate filtration technology must meet the requirements listed in section (9) of this rule.
    - (B) Systems using membrane filtration must conduct continuous indirect integrity testing and daily direct integrity testing in accordance with paragraphs 333-061-0050(4)(c)(J) and (K) of these rules.

- (f) *Cryptosporidium* Bin classification for filtered water systems. Following completion of the initial round of source water monitoring required by OAR 333-061-0036(5)(e), filtered water systems must calculate an initial *Cryptosporidium* bin concentration for each plant for which monitoring was required. Calculation of the bin concentration must be based upon the *Cryptosporidium* results reported in accordance with OAR 333-061-0036(5)(e), and must comply with paragraphs (4)(f)(A) through (F) of this rule.
- (A) For water systems that collect 48 or more samples, the bin concentration is equal to the arithmetic average of all sample concentrations.
- (B) For water systems that collect at least 24 samples, but not more than 47 samples, the bin concentration is equal to the highest arithmetic average of all sample concentrations in any 12 consecutive months during which *Cryptosporidium* samples were collected.
- (C) For water systems that serve fewer than 10,000 people and only collect *Cryptosporidium* samples for 12 months, i.e., collect 24 samples in 12 months, the bin concentration is equal to the arithmetic average of all sample concentrations.
- (D) For water systems with plants operating only part of the year, and that monitor fewer than 12 months per year as prescribed by OAR 333-061-0036(5)(e)(E), the bin concentration is equal to the highest arithmetic average of all sample concentrations during any year of *Cryptosporidium* monitoring.
- (E) If the monthly *Cryptosporidium* sampling frequency varies, water systems must first calculate a monthly average for each month of monitoring. Water systems must then use these monthly average concentrations, rather than individual sample concentrations, in the applicable calculation for bin classification of this subsection.
- (F) Filtered water systems must determine their initial bin classification from Table 9 as follows and using the *Cryptosporidium* bin concentration calculated under subsection (4)(f) of this rule:

Table 9: Bin Classification Table for Filtered Systems

Mean <i>Cryptosporidium</i> concentration*	Bin Classification
$\leq 0.075$ <i>Cryptosporidium</i> oocysts/L, including water systems serving fewer than 10,000 people and not required to monitor for <i>Cryptosporidium</i> under OAR 333-061-0036(5)(e)(A).	Bin 1
$> 0.075$ oocyst/L to $< 1.0$ oocysts/L	Bin 2
$\geq 1.0$ oocysts/L to $\leq 3.0$ oocysts/L	Bin 3

> 3.0 <i>Cryptosporidium</i> oocysts/L	Bin 4
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\*Based on calculations as prescribed by paragraphs (4)(f)(A) through (E) of this rule, as applicable.

- (i) Following completion of the second round of source water monitoring required as prescribed by OAR 333-061-0036(5)(e)(B), filtered water systems must recalculate their *Cryptosporidium* bin concentration based upon the sample results reported in accordance with OAR 333-061-0036(5)(e)(B) and following the procedures specified in paragraphs (4)(f)(A) through (D) of this rule. Water systems must then re-determine their bin classification using Table 9 in paragraph (4)(f)(F) of this rule.
- (G) Filtered water systems must report their bin classification as prescribed by paragraph (4)(f)(F) of this rule to the Department for approval no later than 6 months after the system is required to complete the initial and second round of source water monitoring based on the schedule in OAR 333-061-0036(4)(e)(C).
- (H) The bin classification report to the Department must include a summary of source water monitoring data and the calculation procedure used to determine bin classification. Failure to comply with the conditions of this paragraph is a violation of treatment technique requirements.
- (g) Additional *Cryptosporidium* treatment requirements.
  - (A) Filtered water systems must provide the level of additional treatment for *Cryptosporidium* specified in Table 10 based on their bin classification as determined under subsection (4)(f) of this rule, and according to the schedule in paragraph (1)(a)(F) of this rule.

Table 10: Additional *Cryptosporidium* Treatment Requirements:

Bin Classification	Type of Filtration Treatment			
	Conventional Filtration	Direct Filtration	Slow Sand or Diatomaceous Earth Filtration	Alternative Filtration Technologies
1	No additional Treatment	No additional Treatment	No additional Treatment	No additional Treatment
2	1-log treatment	1.5-log treatment	1-log treatment	*
3	2-log	2.5-log	2-log	**

	treatment	treatment	treatment	
4	2.5-log treatment	3-log treatment	2.5-log treatment	***

\* As determined by the Department such that the total *Cryptosporidium* removal and inactivation is at least 4.0-log.

\*\* As determined by the Department such that the total *Cryptosporidium* removal and inactivation is at least 5.0-log.

\*\*\* As determined by the Department such that the total *Cryptosporidium* removal and inactivation is at least 5.5-log.

- (B) Filtered water systems must use one or more of the treatment and management options listed in section (13) of this rule, termed the microbial toolbox, to comply with the additional *Cryptosporidium* treatment required by paragraph (4)(g)(A) of this rule.
- (C) Systems classified in Bin 3 or Bin 4 must achieve at least 1-log of the additional *Cryptosporidium* treatment, as required by paragraph (4)(g)(A) of this rule, using either one or a combination of the following: bag filters, bank filtration, cartridge filters, chlorine dioxide, membranes, ozone, or UV, as described in sections (14) through (18) of this rule and in OAR 333-061-0036(5)(c).
  - (i) Failure by a water system, in any month, to achieve the treatment credit required by sections (14) through (18) of this rule and OAR 333-061-0036(5)(c) that is at least equal to the level of treatment required by paragraph (4)(g)(A) of this rule, is a violation of treatment technique requirements.
  - (ii) If the Department determines during a sanitary survey or equivalent source water assessment, that after a system completed the monitoring conducted as required by OAR 333-061-0036(5)(e)(A) or (B), significant changes occurred in the system's watershed that could lead to increased contamination of the source water by *Cryptosporidium*, the system must take action as specified by the Department to address the contamination. These actions may include additional source water monitoring and/or implementing microbial toolbox options specified in section (13) of this rule.
- (5) Disinfection requirements for systems utilizing surface water or GWUDI sources with filtration:
  - (a) The disinfection treatment must be sufficient to ensure that the total treatment processes of that system achieve at least 99.9 percent (3-log) inactivation and/or removal of *Giardia lamblia* cysts and at least

99.99 percent (4-log) inactivation and/or removal of viruses as determined by the Department.

- (b) The residual disinfectant concentration in the water entering the distribution system, measured as specified in OAR 333-061-0036(5)(b)(B), cannot be less than 0.2 mg/l for more than 4 hours.
  - (c) The residual disinfectant concentration in the distribution system, measured as total chlorine, combined chlorine, or chlorine dioxide, as specified is OAR 333-061-0036(5)(b)(C) cannot be undetectable in more than 5 percent of the samples each month, for any two consecutive months that the system serves water to the public.
- (6) Requirements for groundwater systems with significant deficiencies or source water fecal contamination. The requirements of subsections (6)(a) through (6)(i) of this rule take effect on December 1, 2009.
- (a) Groundwater systems must meet the treatment technique requirements of this rule when a significant deficiency is identified, or when a groundwater source sample collected as prescribed in OAR 333-061-0036(6)(s) is *E. coli*-positive.
  - (b) Groundwater systems with a groundwater source sample collected in accordance with OAR 333-061-0036(6)(r), (t), or (w) that is *E. coli* - positive must comply with the treatment technique requirements of this section.
  - (c) When a significant deficiency is identified at a public water system that uses both groundwater and surface water or groundwater under the direct influence of surface water, the system must comply with provisions of this section except in cases where the Department determines that the significant deficiency is in a portion of the distribution system that is served solely by surface water or groundwater under the direct influence of surface water.
  - (d) Groundwater systems must consult with the Department regarding the appropriate corrective action within 30 days of receiving written notice from the Department of a significant deficiency, written notice from a laboratory that a groundwater source sample collected in accordance with OAR 333-061-0036(6)(s) was found to be *E. coli* - positive, or direction from the Department that an *E. coli* -positive collected in accordance with OAR 333-061-0036(6)(r), (u)(A), or (w) requires corrective action.
  - (e) Within 120 days (or earlier if directed by the Department) of receiving written notification from the Department of a significant deficiency, written notice from a laboratory that a groundwater source sample collected in accordance with OAR 333-061-0036(6)(s) was found to be *E. coli* -positive, or direction from the Department that a *E. coli* - positive sample collected in accordance with OAR 333-061-036(6)(r), (t), or (w) requires corrective action, the groundwater system must either:

- (A) Have completed corrective action in accordance with applicable Department plan review processes or other Department guidance, including any Department-specified interim measures; or
- (B) Be in compliance with a Department-approved corrective action plan and schedule subject to the following conditions:
  - (i) Any subsequent modifications to an approved corrective action plan and schedule must be approved by the Department; and
  - (ii) If the Department specifies interim measures for protection of the public health pending Department approval of the corrective action plan and schedule, or pending completion of the corrective action plan, the system must comply with these interim measures as well as with any schedule specified by the Department.
- (f) Groundwater systems that meet the conditions of subsections (6)(a) or (6)(b) of this rule must implement one or more of the following corrective action alternatives:
  - (A) Correct all significant deficiencies;
  - (B) Provide an alternate source of water;
  - (C) Eliminate the source of contamination; or
  - (D) Provide treatment that reliably achieves at least 4-log inactivation, removal, or a combination of inactivation and removal of viruses before or at the first customer, for the groundwater source.
- (g) A groundwater system with a significant deficiency is in violation of treatment technique requirements if, within 120 days (or earlier if directed by the Department) of receiving written notice from the Department of the significant deficiency, the water system:
  - (A) Does not complete corrective action in accordance with applicable Department plan review processes or other Department guidance, including Department specified interim actions and measures; or
  - (B) Is not in compliance with a Department-approved corrective action plan and schedule.
- (h) A groundwater system receiving notification of an *E. coli* -positive groundwater source sample (unless the Department invalidates the sample in accordance with OAR 333-061-0036(6)(x)) is in violation of treatment technique requirements if, within 120 days (or earlier if directed by the Department), the system:
  - (A) Does not complete corrective action in accordance with any applicable Department plan review processes or other Department guidance, including Department-specified interim actions and measures; or

- (B) Is not in compliance with a Department-approved corrective action plan and schedule.
  - (i) A groundwater system, subject to the requirements of subsection (7)(b) of this rule, that fails to maintain at least 4-log treatment of viruses (using inactivation, removal, or a Department-approved combination of 4-log virus inactivation and removal) before or at the first customer for a groundwater source is in violation of treatment technique requirements if the failure is not corrected within four hours of determining the system is not maintaining at least 4-log treatment of viruses before or at the first customer.
  - (j) Systems using ground water sources shall provide continuous disinfection as prescribed in OAR 333-061-0050(5) under the following conditions:
    - (A) When there are consistent violations of the total coliform rule attributed to source water quality;
    - (B) When a potential health hazard exists as determined by the Department.
- (7) Compliance monitoring requirements for groundwater systems that provide at least 4-log treatment of viruses. Water systems must comply with the requirements of (7)(a) through (7)(c) of this rule beginning on December 1, 2009.
- (a) A groundwater system that is not required to meet the source water monitoring requirements of 333-061-0036(6)(r) through 333-061-0036(6)(u) of these rules, because it provides at least 4-log treatment of viruses (using inactivation, removal, or a Department-approved combination of 4-log virus inactivation and removal) before or at the first customer for any groundwater source, must comply with the requirements of this subsection by December 1, 2009 or within 30 days of placing the groundwater source in service, whichever is later.
    - (A) The water system must notify the Department in writing, that it provides at least 4-log treatment of viruses (using inactivation, removal, or a Department-approved combination of 4-log virus inactivation and removal) before or at the first customer for the groundwater source. Notification to the Department must include engineering, operational, or other information that the Department requests to evaluate the submission.
    - (B) The system must conduct compliance monitoring as required by subsection (7)(b) of this rule.
    - (C) The system must conduct groundwater source monitoring under OAR 333-061-0036(6) if the system subsequently discontinues 4-log treatment of viruses (using inactivation, removal, or a Department-approved combination of 4-log virus inactivation and removal) before or at the first customer for the groundwater source.

- (b) Monitoring requirements. A groundwater system subject to the requirements of section (6) or subsection (7)(a) of this rule must monitor the effectiveness and reliability of treatment for that groundwater source before or at the first customer as follows:
- (A) Chemical Disinfection:
- (i) Groundwater systems serving greater than 3,300 people must continuously monitor the residual disinfectant concentration using analytical methods as specified in OAR 333-061-0036(1), at a location approved by the Department, and must record the lowest residual disinfectant concentration each day that water from the groundwater source is served to the public. The groundwater system must maintain the Department-determined residual disinfectant concentration every day the groundwater system serves water from the groundwater source to the public. If there is a failure in the continuous monitoring equipment, the groundwater system must conduct grab sampling every four hours until the continuous monitoring equipment is returned to service. The system must resume continuous residual disinfectant monitoring within 14 days.
  - (ii) Groundwater systems serving 3,300 or fewer people must monitor the residual disinfectant concentration using analytical methods as specified in OAR 333-061-0036(1), at a location approved by the Department, and record the residual disinfection concentration each day that water from the groundwater source is served to the public. The groundwater system must maintain the Department-determined residual disinfectant concentration every day the groundwater system serves water from the groundwater source to the public. The groundwater system must take a daily grab sample during the hour of peak flow or at another time specified by the Department. If any daily grab sample measurement falls below the Department-determined residual disinfectant concentration, the groundwater system must take follow-up samples every four hours until the residual disinfectant concentration is restored to the Department-determined level. Alternately, a groundwater system that serves 3,300 or fewer people may monitor continuously and meet the requirements of paragraph (7)(b)(A)(i) of this rule.
- (B) Membrane filtration. A groundwater system that uses membrane filtration to achieve at least 4-log removal of viruses

must monitor the membrane filtration process in accordance with all Department-specified monitoring and compliance requirements. A groundwater system that uses membrane filtration is in compliance with the requirement to achieve at least 4-log removal of viruses when:

- (i) The membrane has an absolute molecular weight cut-off (MWCO), or an alternate parameter describing the exclusion characteristics of the membrane, that can reliably achieve at least 4-log removal of viruses;
- (ii) The membrane process is operated in accordance with Department-specified compliance requirements; and
- (iii) The integrity of the membrane is intact as verified per OAR 333-061-0050(4)(c)(J).

(C) Alternative treatment. A groundwater system that uses a Department-approved alternative treatment to provide at least 4-log treatment of viruses (using inactivation, removal, or a Department-approved combination of 4-log virus inactivation and removal) before or at the first customer must:

- (i) Monitor the alternative treatment in accordance with all Department-specified monitoring requirements; and
- (ii) Operate the alternative treatment in accordance with all compliance requirements that the Department determines to be necessary to achieve at least 4-log treatment of viruses.

(c) Discontinuing treatment. A groundwater system may discontinue 4-log treatment of viruses (using inactivation, removal, or a Department-approved combination of 4-log virus inactivation and removal) before or at the first customer for a groundwater source if the Department determines, and documents in writing, that 4-log treatment of viruses is no longer necessary for that groundwater source. A system that discontinues 4-log treatment of viruses is subject to the source water monitoring requirements of OAR 333-061-0036(6).

(8) Determination of groundwater under the direct influence of surface water (GWUDI).

(a) Except as listed in (8)(b) of this rule, all Public Water Systems using groundwater as a source of drinking water must evaluate their source(s) for the potential of direct influence of surface water if the source(s) is:

(A) In proximity to perennial or intermittent surface water, the source meets one of the distance-hydrogeologic setting criteria outlined below as specified by the Source Water Assessment or other Department-approved hydrogeologic study:

- (i) 500 feet within a fractured bedrock or layered volcanic aquifer;
    - (ii) 200 feet within a coarse sand, gravel and boulder aquifer;
    - (iii) 100 feet within a sand and gravel aquifer;
    - (iv) 75 feet within a sand aquifer;
    - (v) Greater distances if geologic conditions or historical monitoring data indicate additional risk and the source.
  - (B) Has a confirmed or suspected history of coliform bacteria in the source; or
  - (C) Through the Source Water Assessment the source has been determined by the Department to be highly sensitive as a result of aquifer characteristics, vadose zone characteristics, monitoring history or well construction.
- (b) Notwithstanding the requirement given in subsection (8)(a) of this rule, systems that derive their water from wells using a hand pump only are not subject to this rule.
  - (c) Groundwater sources that meet one of the criteria in paragraph (8)(a)(A) of this rule and meet either the criteria in paragraphs (8)(a)(B) or (C) in this rule, must begin raw water (before treatment) coliform sampling of their drinking water source.
  - (d) Raw water samples must be collected monthly for a period not to exceed 12 months.
  - (e) Samples shall be marked as "special" and cannot be used in lieu of sampling required for routine coliform monitoring within the distribution system (after treatment). Nor can samples collected to satisfy routine coliform monitoring requirements be used to satisfy the requirements of this rule.
  - (f) If a raw water sample is reported as fecal or *E. coli* positive, then the system must collect five (5) additional raw water special samples within 24 hours of receiving notification from the laboratory.
  - (g) If any of the five (5) additional special samples are fecal or *E. coli* positive then the original fecal or *E. coli* positive is considered confirmed and the system must have the raw water analyzed for surface water indicators using the microscopic particulate analysis (MPA) method described in subsection (8)(o) of this rule. Systems whose raw water samples are consistently total coliform positive may be required to conduct microscopic particulate analyses at the discretion of the Department.
  - (h) A confirmed fecal or *E. coli* positive sample from the raw water in an otherwise treated water system is not considered a violation of the coliform MCL and is not subject to the public notice or direct laboratory reporting requirements.

- (i) If a water system experiences a confirmed fecal or *E. coli* positive test result of their raw water, no further monthly raw water testing is required.
- (j) Sources may be re-evaluated if geologic conditions or water quality trends change over time, as determined by the Department.
- (k) Sources that have been determined by the Source Water Assessment as not susceptible to being under the direct surface water influence are considered groundwater and do not need further evaluation.
- (l) Public water systems that are required to evaluate their source(s) for direct influence of surface water may submit results of a hydrogeological assessment to demonstrate that the source is not potentially under the direct influence of surface water. The assessment must be consistent with the Oregon State Board of Geologist Examiners "Hydrology Report Guidelines," shall be completed within a time frame specified by the Department and shall include the following:
  - (A) Well characteristics: well depth, screened or perforated interval, casing seal placement;
  - (B) Aquifer characteristics: thickness of the vadose zone, hydraulic conductivity of the vadose zone and the aquifer, presence of low permeability zones in the vadose zone, degree of connection between the aquifer and surface water;
  - (C) Hydraulic gradient: gradient between the aquifer and surface water source during pumping conditions, variation of static water level and surface water level with time;
  - (D) Groundwater flow: flow of water from the surface water source to the groundwater source during pumping conditions, estimated time-of-travel for groundwater from the surface water source to the well(s), spring(s), etc.; and
  - (E) The hydrogeologic assessment must be completed by an Oregon registered geologist or other licensed professional with demonstrated experience and competence in hydrogeology in accordance with ORS 672.505 through 672.705.
- (m) Emergency groundwater sources that meet the criteria of subsection (a) of this section can either be evaluated as prescribed in subsection (8)(c) of this rule, or the evaluation can be waived if a Tier 2 public notice prescribed in 333-061-0042 is issued each time the source is used. The notice must explain that the source has been identified as potentially under the direct influence of surface water, but has not been fully evaluated, and therefore may not be treated sufficiently to inactivate pathogens such as *Giardia lamblia* or *Cryptosporidium*.
- (n) Water systems that derive their water from a confined aquifer and have been determined to be potentially under the direct influence of surface water solely as a result of inadequate well construction under

paragraph (8)(a)(B) of this rule may choose to reconstruct their source according to construction standards as prescribed in OAR 333-061-0050.

- (o) Water system sources that have been determined to be potentially under the direct influence of surface water must conduct a minimum of two Microscopic Particulate Analyses (MPAs) according to the "Consensus Method for Determining Groundwaters under the Direct Influence of Surface Water Using Microscopic Particulate Analysis (MPA)". Both Samples are to be taken during a period of high runoff or streamflow, separated by a period of at least four weeks, or at other times as determined by the Department.
- (p) Scoring of MPAs shall be partially modified from the "Consensus Method" according to Table 11. Scoring for *Giardia*, coccidia, rotifers, and plant debris remains unchanged.
- (q) Determinations of water system source classification based on MPAs are made as follows:
  - (A) If all MPAs have a risk score of less than 10, the water system source is classified as groundwater;
  - (B) If any MPA risk score is greater than 19, or two or more are greater than 14, the water system source is classified as under the direct influence of surface water;
  - (C) If at least one MPA risk score is between 10 and 19 or both are between 10 and 15, an additional set of two MPAs must be taken. Determinations are made as follows:
    - (i) If four or all MPA risk scores are less than 15, the water system source is classified as groundwater; and
    - (ii) If two or more MPA risk scores are greater than 14, or one or more is greater than 19, the water system source is classified as under the direct influence of surface water;
    - (iii) Two additional MPAs must be taken if only one of four MPA risk scores is greater than 14. Scores will be evaluated according to subsection (8)(o) and (p) of this rule, or by further evaluation by the Department.
- (r) If an infiltration gallery, Ranney well, or dug well has been determined to be classified as groundwater under this rule, the turbidity of the source must be monitored and recorded daily and kept by the water system operator. If the turbidity exceeds 5 NTU or if the surface water body changes course such that risk to the groundwater source is increased, an MPA must be taken at that time. Re-evaluation may be required by the Department.
- (s) The Department can determine a groundwater source to be under the direct influence of surface water if the criteria in subsection (8)(a) of this rule are true and there are significant or relatively rapid shifts in

groundwater characteristics, such as turbidity, which closely correlate to changes in weather or surface water conditions.

- (t) If geologic conditions, water quality trends, or other indicators change, the Department can require re-evaluation, as detailed in this section, of a source despite any data previously collected or any determination previously made.
- (u) The Department may determine that a source is not under direct influence of surface water based on criteria other than MPAs including the Source Water Assessment, source water protection, and other water quality parameters. The determinations shall be based on the criteria indicating that the water source has a very low susceptibility to contamination by parasites, including *Giardia* and *Cryptosporidium*. The Department may impose additional monitoring or disinfection treatment requirements to ensure that the risk remains low.

Indicators of Surface Water (counted per 100 gal. water)					
Diatoms		Other Algae		Insects / Larvae	
Abundance	Risk Score	Abundance	Risk Score	Abundance	Risk Score
1-10	6	1-20	4	1-15	3
11-16	7	21-32	5	16-22	4
17-22	8	33-48	6	23-30	5
23-28	9	49-64	7	31-65	6
29-34	10	65-80	8	66-99	7
35-40	11	81-95	9	100-130	8
41-100	12	96-160	10	>130	9
101-149	13	161-220	11		
150-200	14	221-299	12		
201-250	15	300-360	13		
>251	16	>360	14		

- (9) Requirements for groundwater sources under the direct influence of surface water seeking alternative filtration credit through bank filtration:
  - (a) Water systems with all MPA risk scores less than 30 may choose the option to evaluate for bank filtration credit. The water system must conduct a demonstration of performance study that includes an

assessment of the ability of the local hydrogeologic setting to provide a minimum of 2-log reduction in the number of particles and microorganisms in the *Giardia* and *Cryptosporidium* size range between surface water and the groundwater source. The bank filtration study must include the following elements or other Department approved methods:

- (A) The bank filtration study must involve the collection of data on removal of biological surrogates and particles in the *Cryptosporidium* size range of 2 – 5 microns or other surrogates approved by the Department, and related hydrogeologic and water quality parameters during the full range of operating conditions. The demonstration study methods shall be reviewed and approved by the Department prior to implementation. Final assessment of removal credit granted to the well shall be made by the Department based on the study results.
  - (b) If a GWUDI system using bank filtration as an alternative filtration technology violates the MCL for turbidity specified in OAR 333-061-0030(3)(b)(D), the water system must investigate the cause of the high turbidity within 24 hours of the exceedance. Pending the results of the investigation by the water system, the Department may require a new bank filtration study.
- (10) Disinfection Byproduct Control Requirements:
- (a) This rule establishes criteria under which community water systems and Non-transient, Non-community water systems which add a chemical disinfectant to the water in any part of the drinking water treatment process must modify their practices to meet MCLs and MRDLs in OAR 333-061-0030 and 0031, respectively. This rule also establishes the treatment technique requirements for disinfection byproduct precursors. This rule establishes criteria under which transient non-community water systems that use chlorine dioxide as a disinfectant or oxidant must modify their practices to meet the MRDL for chlorine dioxide as specified in OAR 333-061-0031.
  - (b) Compliance dates.
    - (A) Community and Non-transient Non-community water systems serving at least 10,000 people using surface water or groundwater under the direct influence of surface water must comply with the treatment technique requirements of this rule as well as monitoring and maximum contaminants requirements for disinfection byproduct control as specified in OAR 333-061-0030 and 0036, respectively beginning January 1, 2002. Those systems serving fewer than 10,000 people using surface water or groundwater under the direct influence of surface water and those systems using only groundwater not under the

direct influence of surface water must comply with the rules identified in this paragraph beginning January 1, 2004.

- (B) Transient non-community water systems serving at least 10,000 people using surface water or groundwater under the direct influence of surface water and using chlorine dioxide as a disinfectant or oxidant must comply with the requirements for chlorine dioxide in this rule and OAR 333-061-0030 and 0036 beginning January 1, 2002. Those systems serving fewer than 10,000 persons using surface water or groundwater under the direct influence of surface water and using chlorine dioxide as a disinfectant or oxidant and systems using only ground water not under the direct influence of surface water and using chlorine dioxide as a disinfectant or oxidant must comply with the requirements for chlorine dioxide in this rule and OAR 333-061-0030 and 0036 beginning January 1, 2004.
- (c) Water systems may increase residual disinfectant levels in the distribution system of chlorine or chloramines (but not chlorine dioxide) to a level and for a time necessary to protect public health, to address specific microbiological contamination problems caused by circumstances such as, but not limited to, distribution line breaks, storm run-off events, source water contamination events, or cross connection events.
- (d) Treatment technique for control of disinfection by-product precursors. Community and Non-transient Non-community water systems using conventional filtration treatment must operate with enhanced coagulation or enhanced softening to achieve the total organic carbon (TOC) percent removal levels specified in subsection (10)(e) of this rule unless the system meets at least one of the alternative compliance criteria listed in paragraph (10)(d)(A) or (10)(d)(B) of this rule.
  - (A) Alternative compliance criteria for enhanced coagulation and enhanced softening systems. Water systems may use the alternative compliance criteria in paragraphs (10)(d)(A)(i) through (vi) of this rule in lieu of complying with the performance criteria specified in subsection (e) of this section. Systems must still comply with monitoring requirements specified in OAR 333-061-0036(4)(n).
    - (i) The system's source water TOC level is less than 2.0 mg/L, calculated quarterly as a running annual average.
    - (ii) The system's treated water TOC level is less than 2.0 mg/L, calculated quarterly as a running annual average.
    - (iii) The system's source water TOC is less than 4.0 mg/L, calculated quarterly as a running annual average; the source water alkalinity is greater than 60 mg/L (as CaCO<sub>3</sub> calculated quarterly as a running annual average;

and either the TTHM and HAA5 running annual averages are no greater than 0.040 mg/L and 0.030 mg/L, respectively; or prior to the effective date for compliance, the system has made a clear and irrevocable financial commitment not later than the effective date for compliance in this rule to use of technologies that will limit the levels of TTHMs and HAA5 to no more than 0.040 mg/L and 0.030 mg/L, respectively. Systems must submit evidence of a clear and irrevocable financial commitment, in addition to a schedule containing milestones and periodic progress reports for installation and operation of appropriate technologies, to the Department for approval not later than the effective date for compliance in this rule. These technologies must be installed and operating not later than June 30, 2005. Failure to install and operate these technologies by the date in the approved schedule will constitute a violation of National Primary Drinking Water Regulations.

- (iv) The TTHM and HAA5 running annual averages are no greater than 0.040 mg/L and 0.030 mg/L, respectively, and the system uses only chlorine for primary disinfection and maintenance of a residual in the distribution system.
- (v) The system's source water SUVA, prior to any treatment and measured monthly is less than or equal to 2.0 L/mg-m, calculated quarterly as a running annual average.
- (vi) The system's finished water SUVA, measured monthly is less than or equal to 2.0 L/mg-m, calculated quarterly as a running annual average.

(B) Additional alternative compliance criteria for softening systems. Systems practicing enhanced softening that cannot achieve the TOC removals required by paragraph (10)(e)(B) of this rule may use the alternative compliance criteria in paragraphs (10)(d)(B)(i) and (ii) of this rule in lieu of complying with subsection (10)(e) of this rule. Systems must still comply with monitoring requirements in specified in OAR 333-061-0036(4)(n).

- (i) Softening that results in lowering the treated water alkalinity to less than 60 mg/L (as CaCO<sub>3</sub>), measured monthly and calculated quarterly as a running annual average.
- (ii) Softening that results in removing at least 10 mg/L of magnesium hardness (as CaCO<sub>3</sub>), measured monthly and calculated quarterly as an annual running average.

- (e) Enhanced coagulation and enhanced softening performance requirements.
  - (A) Systems must achieve the percent reduction of TOC specified in paragraph (10)(e)(B) in this rule between the source water and the combined filter effluent, unless the Department approves a system's request for alternate minimum TOC removal (Step 2) requirements under paragraph (10)(e)(C) of this rule.
  - (B) Required Step 1 TOC reductions, specified in Table 12, are based upon specified source water parameters. Systems practicing softening are required to meet the Step 1 TOC reductions in the far-right column (Source water alkalinity >120 mg/L) for the specified source water TOC:

Table 12

Step 1 Required Removal (in percent) of TOC by Enhanced Coagulation and Enhanced Softening for Systems Using Conventional Treatment<sup>1,2</sup>

Source-water TOC, mg/L	Source-water alkalinity, mg/L as CaCO <sub>3</sub>		
	0-60	61-120	>120 <sup>3</sup>
>2.0-4.0	35.0	25.0	15.0
>4.0-8.0	45.0	35.0	25.0
>8.0	50.0	40.0	30.0

<sup>1</sup> Systems meeting at least one of the conditions in paragraphs (d)(A)(i)-(vi) of this section are not required to operate with enhanced coagulation.

<sup>2</sup> Softening systems meeting one of the alternative compliance criteria in paragraph (d)(B) of this section are not required to operate with enhanced softening.

<sup>3</sup> Systems practicing softening must meet the TOC removal requirements in this column.

- (C) Water systems that cannot achieve the Step 1 TOC removals required by paragraph (10)(e)(B) of this rule due to water quality parameters or operational constraints must apply to the Department, within three months of failure to achieve the TOC removals required by paragraph (10)(e)(B) of this rule, for approval of alternative minimum TOC (Step 2) removal requirements submitted by the water system. If the Department approves the alternative minimum TOC removal (Step 2) requirements, the Department may make those requirements retroactive for the purposes of determining compliance. Until the Department approves the alternate minimum TOC removal (Step 2) requirements, the water system must meet the Step 1 TOC removals contained in paragraph (10)(e)(B) of this rule.

- (D) Alternate minimum TOC removal (Step 2) requirements. Applications made to the Department by enhanced coagulation systems for approval of alternative minimum TOC removal (Step 2) requirements under paragraph (10)(e)(C) of this rule must include, as a minimum, results of bench-scale or pilot-scale testing conducted under paragraph (10)(e)(D)(i) of this rule. The submitted bench-scale or pilot scale testing must be used to determine the alternate enhanced coagulation level.
- (i) Alternate enhanced coagulation level is defined as coagulation at a coagulant dose and pH as determined by the method described in paragraphs (10)(e)(D)(i) through (v) of this rule such that an incremental addition of 10 mg/L of alum (or equivalent amount of ferric salt) results in a TOC removal of less than or equal to 0.3 mg/ L. The percent removal of TOC at this point on the "TOC removal versus coagulant dose" curve is then defined as the minimum TOC removal required for the system. Once approved by the Department, this minimum requirement supersedes the minimum TOC removal required by the Table 12 in paragraph (10)(e)(B) of this rule. This requirement will be effective until such time as the Department approves a new value based on the results of a new bench-scale and pilot-scale test. Failure to achieve Department-set alternative minimum TOC removal levels is a violation.
  - (ii) Bench-scale or pilot-scale testing of enhanced coagulation must be conducted by using representative water samples and adding 10 mg/L increments of alum (or equivalent amounts of ferric salt) until the pH is reduced to a level less than or equal to the enhanced coagulation Step 2 target pH as specified in Table 13

Table 13: Enhanced Coagulation Step 2 Target pH

Alkalinity (mg/L as CaCO <sub>3</sub> )	Target pH
0-60	5.5
>60-120	6.3
>120-240	7.0
>240	7.5

- (iii) For waters with alkalinities of less than 60 mg/L for which addition of small amounts of alum or equivalent addition of iron coagulant drives the pH below 5.5 before significant TOC removal occurs, the system must add

necessary chemicals to maintain the pH between 5.3 and 5.7 in samples until the TOC removal of 0.3 mg/L per 10 mg/L alum added (or equivalent addition of iron coagulant) is reached.

- (iv) The system may operate at any coagulant dose or pH necessary, consistent with these rules to achieve the minimum TOC percent removal approved under paragraph (10)(e)(C) of this rule.
  - (v) If the TOC removal is consistently less than 0.3 mg/L of TOC per 10 mg/L of incremental alum dose at all dosages of alum (or equivalent addition of iron coagulant), the water is deemed to contain TOC not amenable to enhanced coagulation. The water system may then apply to the Department for a waiver of enhanced coagulation requirements.
- (f) Compliance calculations.
- (A) Water systems other than those identified in paragraphs (10)(d)(A) or (d)(B) of this rule must comply with requirements contained in paragraph (10)(e)(B) or (C) of this rule. Systems must calculate compliance quarterly, beginning after the system has collected 12 months of data, by determining an annual average using the following method:
    - (i) Determine actual monthly TOC percent removal, equal to:  $\{1 - (\text{treated water TOC} / \text{source water TOC})\} \times 100$
    - (ii) Determine the required monthly TOC percent removal (from either Table 9 in paragraph (10)(e)(B) of this rule or from paragraph (10)(e)(C) of this rule).
    - (iii) Divide the value in paragraph (10)(f)(A)(i) of this rule by the value in paragraph (10)(f)(A)(ii) of this rule.
    - (iv) Add together the results of paragraph (10)(f)(A)(iii) of this rule for the last 12 months and divide by 12.
    - (v) If the value calculated in paragraph (10)(f)(A)(iv) of this rule is less than 1.00, the water system is not in compliance with the TOC percent removal requirements.
  - (B) Water systems may use the provisions in paragraphs (10)(f)(B)(i) through (v) of this rule in lieu of the calculations in paragraph (10)(f)(A)(i) through (v) of this rule to determine compliance with TOC percent removal requirements.
    - (i) In any month that the water system's treated or source water TOC level is less than 2.0 mg/L, the water system may assign a monthly value of 1.0 (in lieu of the value calculated in paragraph (10)(f)(A)(iii) of this rule) when calculating compliance under the provisions of paragraph (10)(f)(A) of this rule.

- (ii) In any month that a system practicing softening removes at least 10 mg/L of magnesium hardness (as CaCO<sub>3</sub>), the water system may assign a monthly value of 1.0 (in lieu of the value calculated in paragraph (10)(f)(A)(iii) of this rule) when calculating compliance under the provisions of paragraph (10)(f)(A) of this rule.
      - (iii) In any month that the water system's source water SUVA, prior to any treatment is less than or equal to 2.0 L/mg-m, the water system may assign a monthly value of 1.0 (in lieu of the value calculated in paragraph (10)(f)(A)(iii) of this rule) when calculating compliance under the provisions of paragraph (10)(f)(A) of this rule.
      - (iv) In any month that the water system's finished water SUVA is less than or equal to 2.0 L/mg-m, the system may assign a monthly value of 1.0 (in lieu of the value calculated in paragraph (10)(f)(A)(iii) of this rule) when calculating compliance under the provisions of paragraph (10)(f)(A) of this rule.
      - (v) In any month that a system practicing enhanced softening lowers alkalinity below 60 mg/L (as CaCO<sub>3</sub>), the water system may assign a monthly value of 1.0 (in lieu of the value calculated in paragraph (10)(f)(A)(iii) of this rule) when calculating compliance under the provisions of paragraph (10)(f)(A) of this rule.
    - (C) Water systems using conventional treatment may also comply with the requirements of this section by meeting the criteria in paragraph (10)(d)(A) or (B) of this rule.
  - (g) Treatment technique requirements for DBP precursors. Treatment techniques to control the level of disinfection byproduct precursors in drinking water treatment and distribution systems are recognized by the Department for water systems using surface water or groundwater under the direct influence of surface water using conventional treatment as enhanced coagulation or enhanced softening.
- (11) Requirements for Water Treatment Plant Recycled Water
- (a) Any water system using surface water or groundwater under the direct influence of surface water that uses conventional filtration treatment or direct filtration treatment and that recycles spent filter backwash water, thickener, supernatant, or liquids from dewatering processes must meet the requirements of subsections (10)(b) and (c) of this rule and OAR 333-061-0040(2)(i).
  - (b) A water system must notify the Department in writing by December 8, 2003 if that water system recycles spent filter backwash water, thickener supernatant, or liquids from dewatering processes. This

notification must include, at a minimum, the information specified in paragraphs (10)(b)(A) and (B) of this rule.

- (A) A water treatment plant schematic showing the origin of all flows which are recycled (including, but not limited to, spent filter backwash water, thickener supernatant, and liquids from dewatering processes), the hydraulic conveyance used to transport them, and the location where they are re-introduced back into the water treatment plant.
  - (B) Typical recycle flow in gallons per minute (gpm), the highest observed water treatment plant flow experienced in the previous year (gpm), the design flow for the water treatment plant (gpm), and the operating capacity of the water treatment plant (gpm) that has been determined by the Department where the Department has made such determinations.
  - (c) Any water system that recycles spent filter backwash water, thickener supernatant, or liquids from dewatering processes must return these flows through the processes of a system's existing conventional filtration treatment plant or direct filtration treatment plant as defined by these rules or at an alternate location approved by the Department by June 8, 2004. If capital improvements are required to modify the recycle location to meet this requirement, all capital improvements must be completed no later than June 8, 2006.
- (12) Water systems using uncovered finished water storage facilities must comply with the conditions of either subsections (12)(a) or (b) of this rule for each uncovered finished water storage facility, or be in compliance with a Department-approved schedule to meet these conditions no later than April 1, 2009.
- (a) Water systems must cover any uncovered finished water storage facility; or
  - (b) Treat the discharge from the uncovered finished water storage facility into the distribution system to achieve at least 4-log virus, 3-log *Giardia lamblia*, and 2-log *Cryptosporidium* inactivation or removal using a protocol approved by the Department.
  - (c) Failure to comply with the requirements of this section is a violation of the treatment technique requirement.
- (13) Summary and General Requirements of Microbial toolbox options for meeting *Cryptosporidium* treatment requirements. Filtered water systems are eligible for the treatment credits listed in Table 14 of this section by meeting the conditions for microbial toolbox options described in sections (14) through (18) of this rule and in OAR 333-061-0036(5)(c). Unfiltered water systems are eligible only for the treatment credits specified as inactivation toolbox options in Table 14. Water systems apply these treatment credits to meet the requirements of subsections (2)(d) or (4)(g) of this rule, as applicable.

Table 14: Microbial Toolbox Options

Toolbox Option	Crypto treatment credit with design and implementation criteria summary
Source Protection and Management Toolbox Options	
Watershed Control Program	0.5-log credit for Department-approved program including the required elements, an annual program status report to the Department, and regular watershed surveys. Specific criteria are in subsection (14)(a) of this rule.
Alternative source/intake management	No prescribed credit. Systems must conduct simultaneous monitoring for treatment bin classification at alternative intake locations or using alternative intake management strategies. Specific criteria are in subsection (14)(b) of this rule.
Pre Filtration Toolbox Options	
Presedimentation basin with coagulation	0.5-log credit during any month that presedimentation basins achieve a monthly mean 0.5-log or greater reduction of turbidity, or alternative Department-approved performance criteria. To be eligible, basins must be operated continuously with coagulant addition and all plant flow must pass through the basins. Specific criteria are in subsection (15)(a) of this rule.
Two-stage lime softening	0.5-log credit for two-stage softening where chemical addition and hardness precipitation occur in both stages. All plant flow must pass through both stages. Single-stage softening is credited as equivalent to conventional treatment. Specific criteria are in subsection (15)(b) of this rule.
Bank filtration	0.5-log credit for 25-foot setback; 1.0-log credit for 50-foot setback; aquifer must be unconsolidated sand containing at least 10 percent fines; average turbidity in wells must be less than 1 NTU. Water systems using wells followed by filtration must sample at the well to determine bin classification when conducting source water monitoring, and are not eligible for additional credit. Specific criteria are in subsection (15)(c) of this rule.

Treatment Performance Toolbox Options	
Combined filter performance	0.5-log credit for combined filter effluent turbidity less than or equal to 0.15 NTU in at least 95 percent of measurements each month. Specific criteria are in

	subsection (16)(a) of this rule.
Individual filter performance	0.5-log credit if individual filter effluent turbidity is less than or equal to 0.15 NTU in at least 95 percent of samples each month in each filter and is never greater than 0.3 NTU in two consecutive measurements in any filter. This credit is cumulative to the 0.5-log combined filter performance credit. Specific criteria are in subsection (16)(b) of this rule.
Demonstration of performance	Credit awarded to unit process or treatment train based on a demonstration to the Department with a Department-approved protocol. Specific criteria are in subsection (16)(c) of this rule.
<b>Additional Filtration Toolbox Options</b>	
Bag or cartridge filters (individual filters)	Up to 2-log credit based on the removal efficiency demonstrated during challenge testing with a 1.0-log factor of safety. Specific criteria are in subsection (17)(a) of this rule.
Bag or cartridge filters (in series)	Up to 2.5-log credit based on the removal efficiency demonstrated during challenge testing with a 0.5-log factor of safety. Specific criteria are in subsection (17)(a) of this rule.
Membrane filtration	Log credit equivalent to removal efficiency demonstrated in challenge test for device if supported by direct integrity testing. Specific criteria are in subsection (17)(b) of this rule.
Second stage filtration	0.5-log credit for second separate granular media filtration stage if treatment train includes coagulation prior to first filter. Specific criteria are in subsection (17)(c) of this rule.
Slow sand filters	2.5-log credit as a secondary filtration step; 3.0-log credit as a primary filtration process. No prior chlorination for either option. Specific criteria are in subsection (17)(d) of this rule.
<b>Inactivation Toolbox Options</b>	
Chlorine dioxide	Log credit based on measured CT in relation to CT table. Specific criteria in OAR 333-061-0036(5)(c).
Ozone	Log credit based on measured CT in relation to CT table. Specific criteria in OAR 333-061-0036(5)(c).
UV	Log credit based on validated UV dose in relation to UV dose table; reactor validation testing required to establish UV dose and associated operating conditions. Specific criteria in OAR 333-061-0036(5)(c).

- (14) Source toolbox components for meeting *Cryptosporidium* treatment requirements.
- (a) Watershed control program. Water systems receive 0.5-log *Cryptosporidium* treatment credit for implementing a watershed control program that meets the requirements of this subsection.
    - (A) Water systems must notify the Department of the intent to apply for the watershed control program credit no later than two years prior to the treatment compliance date applicable to the system in subsection (1)(a) of this rule.
    - (B) Water systems must submit a proposed watershed control plan to the Department no later than one year before the applicable treatment compliance date in subsection (1)(a) of this rule. The Department must approve the watershed control plan for the water system to receive the applicable treatment credit. The watershed control plan must include the following elements:
      - (i) Identification of an area of influence, outside of which the likelihood of *Cryptosporidium* or fecal contamination affecting the treatment plant intake is not significant. This is the area to be evaluated in future watershed surveys under paragraph (14)(a)(E)(ii) of this rule;
      - (ii) Identification of both potential and actual sources of *Cryptosporidium* contamination, and an assessment of the relative impact of these contamination sources on the water system's source water quality;
      - (iii) An analysis of the effectiveness and feasibility of control measures that could reduce *Cryptosporidium* loading from sources of contamination to the system's source water; and
      - (iv) A statement of goals and specific actions the system will undertake to reduce source water *Cryptosporidium* levels. The plan must explain how the actions are expected to contribute to specific goals, identify watershed partners and their roles, identify resource requirements and commitments, and include a schedule for plan implementation with deadlines for completing specific actions identified in the plan.
    - (C) Water Systems with existing watershed control programs are eligible to seek this credit, but must meet the requirements prescribed in paragraph (14)(a)(B) of this rule, and must specify ongoing and future actions that will reduce source water *Cryptosporidium* levels.
    - (D) If the Department does not respond to a water system regarding approval of a watershed control plan submitted in accordance with this section, and the system meets the other requirements

of this section, the watershed control program will be considered approved and a 0.5 log *Cryptosporidium* treatment credit will be awarded unless the Department subsequently withdraws such approval.

- (E) Water systems must complete the actions specified in this paragraph to maintain the 0.5-log credit.
  - (i) Water systems must submit an annual watershed control program status report to the Department. The status report must describe the water system's implementation of the approved plan, and assess the adequacy of the plan to meet its goals. It must explain how the water system is addressing any deficiencies in plan implementation, including those previously identified by the Department, or as the result of the watershed survey conducted in accordance with paragraph (14)(a)(E)(ii) of this rule. The watershed control program status report must also describe any significant changes that have occurred in the watershed since the last watershed sanitary survey.
  - (ii) Water systems must undergo a watershed sanitary survey every three years for community water systems and every five years for non-community water systems and submit the survey report to the Department. The survey must be conducted according to Department guidelines and by persons the Department approves.
    - (I) The watershed sanitary survey must meet the following criteria: encompass the region identified in the Department approved watershed control plan as the area of influence; assess the implementation of actions to reduce source water *Cryptosporidium* levels; and identify any significant new sources of *Cryptosporidium*.
    - (II) If the Department determines that significant changes may have occurred in the watershed since the previous watershed sanitary survey, water systems must undergo another watershed sanitary survey by a date determined by the Department regardless of the regular date specified in paragraph (14)(a)(E)(ii) of this rule.
  - (iii) The water system must make the watershed control plan, annual status reports, and watershed sanitary survey reports available to the public upon request. These documents must be in a plain language style and include criteria by which to evaluate the success of the program in achieving plan goals. The Department may approve

withholding portions of the annual status report, watershed control plan, and watershed sanitary survey from the public based on water supply security considerations.

- (F) If the Department determines that a water system is not implementing the approved watershed control plan, the Department may withdraw the watershed control program treatment credit.
  - (G) If a water system determines, during implementation, that making a significant change to its approved watershed control program is necessary, the system must notify the Department prior to making any such changes. If any change is likely to reduce the level of source water protection, the system must notify the Department of the actions the water system will take to mitigate this effect.
- (b) Alternative source. A water system may conduct source water monitoring that reflects a different intake location (either in the same source or from an alternate source), or a different procedure for the timing or level of withdrawal from the source. If the Department approves, a system may determine its bin classification under subsection (4)(f) of this rule based on the alternative source monitoring results.
- (A) If a water system conducts alternative source monitoring as prescribed by this subsection, the water system must also monitor their current plant intake concurrently as prescribed by OAR 333-061-0036(5)(e).
  - (B) Alternative source monitoring as prescribed by this subsection must meet the requirements for source monitoring to determine bin classification, as described in OAR 333-061-0036(5)(e) and OAR 333-061-0040(1)(m). Water systems must report the alternative source monitoring results to the Department, including supporting information that documents the operating conditions under which the samples were collected.
  - (C) If a system determines its bin classification according to subsection (4)(f) of this rule using alternative source monitoring results that reflect a different intake location or a different procedure for managing the timing or level of withdrawal from the source, the system must relocate the intake or permanently adopt the withdrawal procedure, as applicable, no later than the applicable treatment compliance date in subsection (1)(a) of this rule.
- (15) Pre-filtration treatment toolbox components for meeting *Cryptosporidium* treatment requirements.

- (a) Presedimentation. Systems receive 0.5-log *Cryptosporidium* treatment credit for a presedimentation basin during any month the process meets the criteria specified in this paragraph:
  - (A) The presedimentation basin must be in continuous operation, and must treat the entire plant flow taken from a surface water or GWUDI source;
  - (B) The water system must continuously add a coagulant to the presedimentation basin; and
  - (C) The presedimentation basin must achieve the performance criteria specified in this paragraph.
    - (i) The basin must demonstrate at least 0.5-log mean reduction of influent turbidity. This reduction must be determined using daily turbidity measurements of the presedimentation process influent and effluent, and must be calculated as follows:  $\log_{10}(\text{monthly mean of daily influent turbidity}) - \log_{10}(\text{monthly mean of daily effluent turbidity})$ .
    - (ii) The basin must also comply with Department-approved performance criteria that demonstrates at least 0.5-log mean removal of micron-sized particulate material through the presedimentation process.
- (b) Two-stage lime softening. Systems receive an additional 0.5-log *Cryptosporidium* treatment credit for a two-stage lime softening plant if chemical addition and hardness precipitation occur in two separate and sequential softening stages prior to filtration. Both softening stages must treat the entire plant flow taken from a surface water or GWUDI source.
- (c) Bank filtration. Water systems receive *Cryptosporidium* treatment credit for bank filtration that serves as pretreatment to a filtration plant by meeting the criteria specified in this section. Water systems using bank filtration when they begin source water monitoring according to OAR 333-061-0036(5)(e) must collect samples as prescribed by OAR 333-061-0036(5)(g) and are not eligible for this credit.
  - (A) Wells with a groundwater flow path of at least 25 feet receive 0.5-log treatment credit. Wells with a groundwater flow path of at least 50 feet receive 1.0-log treatment credit. The groundwater flow path must be determined as specified in paragraph (D) of this subsection.
  - (B) Only wells in granular aquifers are eligible for treatment credit. Granular aquifers are those comprised of sand, clay, silt, rock fragments, pebbles or larger particles, and minor cement. A water system must characterize the aquifer at the well site to determine aquifer properties.

- (i) Water systems must extract a core from the aquifer and demonstrate that in at least 90 percent of the core length, grains less than 1.0 mm in diameter constitute at least 10 percent of the core material.
- (C) Only horizontal and vertical wells are eligible for treatment credit.
- (D) For vertical wells, the groundwater flow path is the measured distance from the edge of the surface water body under high flow conditions (as determined by the 100 year floodplain elevation boundary or by the floodway, as defined in Federal Emergency Management Agency flood hazard maps) to the well screen. For horizontal wells, the groundwater flow path is the measured distance from the bed of the river under normal flow conditions to the closest horizontal well lateral screen.
- (E) Water systems must monitor each wellhead for turbidity at least once every four hours while the bank filtration process is in operation. If monthly average turbidity levels, based on daily maximum values in the well, exceed 1 NTU, the system must report this result to the Department and conduct an assessment within 30 days to determine the cause of the high turbidity levels in the well. If the Department determines that microbial removal has been compromised, the Department may revoke treatment credit until the water system implements Department-approved corrective actions to remediate the problem.
- (F) Springs and infiltration galleries are not eligible for treatment credit under this section, but are eligible for a treatment credit in accordance with subsection (16)(c) of this rule.
- (G) Bank filtration demonstration of performance. The Department may approve *Cryptosporidium* treatment credit for bank filtration based on a demonstration of performance study that meets the criteria in this paragraph. This treatment credit may be greater than 1.0-log and may be awarded to bank filtration that does not meet the criteria in (15)(c)(A) through (E) of this rule.
  - (i) The study must follow a Department-approved protocol, and must include the collection of data on the removal of *Cryptosporidium* or a surrogate for *Cryptosporidium* and related hydrogeologic and water quality parameters during the full range of operating conditions.
  - (ii) The study must include sampling from both the production well(s) and monitoring wells that are screened and located along the shortest flow path between the surface water source and the production well(s).

- (16) Treatment performance toolbox components for meeting *Cryptosporidium* treatment requirements.
- (a) Combined filter performance. Water systems using conventional filtration treatment or direct filtration treatment receive an additional 0.5-log *Cryptosporidium* treatment credit during any month that the water system meets the criteria in this subsection. Combined filter effluent (CFE) turbidity must be less than or equal to 0.15 NTU in at least 95 percent of the measurements. Turbidity must be measured as described in OAR 333-061-0036(5)(a)(B).
  - (b) Individual filter performance. Water systems using conventional filtration treatment or direct filtration treatment receive 0.5-log *Cryptosporidium* treatment credit, which can be in addition to the 0.5-log credit under subsection (16)(a) of this rule, during any month the system meets the criteria in this subsection. Compliance with this criteria must be based on individual filter turbidity monitoring as described in OAR 333-061-0036(5)(d).
    - (A) The filtered water turbidity for each individual filter must be less than or equal to 0.15 NTU in at least 95 percent of the measurements recorded each month.
    - (B) No individual filter may have a measured turbidity greater than 0.3 NTU in two consecutive measurements taken 15 minutes apart.
    - (C) Any system that has received treatment credit for individual filter performance and fails to meet the requirements of paragraphs (16)(b)(A) or (B) of this rule, during any month, is in violation of treatment technique requirements as prescribed by subsection (4)(g) of this rule unless the Department determines the following:
      - (i) The failure was due to unusual and short-term circumstances that could not reasonably be prevented through optimizing treatment plant design, operation, or maintenance; and
      - (ii) The system has experienced no more than two such failures in any calendar year.
  - (c) Demonstration of performance. The Department may approve *Cryptosporidium* treatment credit for water treatment processes based on a demonstration of performance study that meets the criteria in this subsection. This treatment credit may be greater than or less than the prescribed treatment credits in subsection (4)(g) or sections (15) through (18) of this rule and may be awarded to treatment processes that do not meet the criteria for the prescribed credits.
    - (A) Water systems cannot receive the prescribed treatment credit for any toolbox option in sections (15) through (18) of this rule, if that toolbox option is included in a demonstration of

performance study for which treatment credit is awarded under this subsection.

- (B) The demonstration of performance study must follow a Department-approved protocol, and must demonstrate the level of *Cryptosporidium* reduction achieved by the treatment process under the full range of expected operating conditions for the water system.
- (C) Approval by the Department must be in writing, and may include monitoring and treatment performance criteria that the system must demonstrate and report on an ongoing basis to remain eligible for the treatment credit. The Department may require such criteria where necessary to verify that the conditions under which the demonstration of performance credit was approved are maintained during routine operation.

(17) Additional filtration toolbox components for meeting *Cryptosporidium* treatment requirements.

- (a) Bag and cartridge filters. Systems receive *Cryptosporidium* treatment credit of up to 2.0-log for individual bag or cartridge filters and up to 2.5-log for bag or cartridge filters operated in series by meeting the requirements in OAR 333-061-0050(4)(c)(L). To be eligible for this credit, water systems must report to the Department, the results of challenge testing conducted in accordance with OAR 333-061-0050(4)(c)(L). The filters must treat the entire plant flow.
- (b) Membrane filtration. Systems receive *Cryptosporidium* treatment credit for membrane filtration that meets the requirements of this paragraph. Membrane cartridge filters that meet the definition of membrane filtration in OAR 333-061-0020(115) are eligible for this credit. The level of treatment credit a system receives is equal to the lower of the values determined under OAR 333-061-0050(4)(c)(H)(i) and (ii).
- (c) Second stage filtration. Water systems receive 0.5-log *Cryptosporidium* treatment credit for a separate second stage of Department-approved filtration that consists of sand, dual media, GAC, or other fine grain media following granular media filtration. To be eligible for this credit, the first stage of filtration must be preceded by a coagulation step and, both filtration stages must treat the entire plant flow taken from a surface water or GWUDI source. The Department must assign the treatment credit based on an assessment of the design characteristics of the filtration process. A cap (added layer of filter media), such as GAC, on a single stage of filtration is not eligible for this credit.
- (d) Slow sand filtration (as secondary filter). Water systems are eligible to receive 2.5-log *Cryptosporidium* treatment credit for a slow sand filtration process that follows a separate stage of filtration if both

filtration stages treat the entire plant flow taken from a surface water or GWUDI source, and no disinfectant residual is present in the influent water to the slow sand filtration process. The Department must assign the treatment credit based on an assessment of the design characteristics of the filtration process. This subsection does not apply to treatment credit awarded to slow sand filtration used as a primary filtration process.

- (18) Inactivation toolbox components for meeting *Cryptosporidium* treatment requirements.
- (a) If Chlorine Dioxide is used, CT values in Table 35 must be met.
  - (b) If Ozone is used, CT values in Table 36 must be met.
  - (c) To receive treatment credit for UV light, water systems must treat at least 95 percent of the water delivered to the public during each month by UV reactors operating within validated conditions for the required UV dose, as prescribed by OAR 333-061-0036(5)(c)(D) and OAR 333-061-0050(5)(k)(I). Systems must demonstrate compliance with this condition by the monitoring required in OAR 333-061-0036(5)(c)(D)(ii)