CHAPTER 41
WATER SUPPLIES

[These rules transferred from Health Department, 1971 IDR (Title II, Chs 1 and 2)]
[Prior to 7/1/83, DEQ Ch 22]
[Prior to 12/3/86, Water, Air and Waste Management[900]]

567—41.1(455B) Primary drinking water regulations—coverage. 567—Chapters 40 through 44 and 83 shall apply to each public water supply system, unless the public water supply system meets all of the following conditions:

1. Consists only of distribution and storage facilities (and does not have any collection and treatment facilities);
2. Obtains all of its water from, but is not owned or operated by, a public water supply system to which such regulations apply;
3. Does not sell water to any person; and
4. Is not a carrier which conveys passengers in interstate commerce.

567—41.2(455B) Biological maximum contaminant levels (MCL) and monitoring requirements.

41.2(1) *Coliforms, fecal coliforms and E. coli.*

a. *Applicability.* These rules apply to all public water supply systems.

b. *Maximum contaminant levels (MCL) for total coliforms, fecal coliforms, and E. coli.* The MCL is based on the presence or absence of total coliforms in a sample.

(1) Nonacute coliform bacteria MCL.

1. For a system which collects 40 samples or more per month, no more than 5.0 percent of the samples collected during a month may be total coliform-positive. A nonacute total coliform bacteria MCL violation occurs when more than 5.0 percent of routine and repeat samples collected during a month are total coliform-positive, but are not fecal coliform-positive or *E. coli*-positive.

2. For a system which collects less than 40 samples per month, no more than one sample collected during a month may be total coliform-positive. A nonacute total coliform bacteria MCL violation occurs when two or more routine and repeat samples collected during a month are total coliform-positive, but are not fecal coliform-positive or *E. coli*-positive.

(2) Acute coliform bacteria MCL. Any fecal coliform-positive repeat sample or *E. coli*-positive repeat sample, or any total coliform-positive repeat sample following a fecal coliform-positive or *E. coli*-positive routine sample constitutes a violation of the MCL for total coliforms. For purposes of the public notification requirements in 567—paragraph 42.1(1)*"b,"* this is a violation that may pose an acute risk to health.

(3) MCL compliance period. Compliance of a system with the MCL for total coliforms in 41.2(1)*"b"*(1) and (2) is based on each month in which the system is required to monitor for total coliforms.

(4) Compliance determination. Results of all routine and repeat samples not invalidated by the department or laboratory must be included in determining compliance with the MCL for total coliforms. Repeat samples must be analyzed at the same laboratory as the corresponding original routine sample(s), unless written approval for use of a different laboratory is granted by the department.

c. *Monitoring requirements.*

(1) Routine total coliform monitoring.

1. Public water supply systems must collect total coliform samples at sites which are representative of water throughout the distribution system according to a written sample siting plan. The plan shall be reviewed or updated by the public water supply system every two years and shall be retained on file at the facility. Major elements of the plan shall include, but are not limited to, a map of the distribution system, notation or a list of routine sample location(s) for each sample period, resample locations for each routine sample, and a log of samples taken. The plan must be made available to the department upon request and during sanitary surveys and must be revised by the system as directed by the department.

2. The public water supply system must collect samples at regular time intervals throughout the month, except that a system which uses only groundwater (except groundwater under the direct influence

of surface water, as defined in 567—paragraph 43.5(1)*"b"*) and serves 4,900 persons or fewer, may collect all required samples on a single day if they are taken from different sites. A system that uses only groundwater and adds a chemical disinfectant or provides water with a disinfectant must measure the residual disinfectant concentration at the same points in the distribution system and at the same time as total coliform bacteria samples are collected. A system that uses surface water or IGW must comply with the requirements specified in 567—numbered paragraph 43.5(4)*"b"*(2)"2." The system shall report the residual disinfectant concentration to the laboratory with the bacteria sample, in addition to comply with the applicable reporting requirements of 567—subrule 42.4(3).

3. Community water systems. The monitoring frequency for total coliforms for community water systems and noncommunity water systems serving schools, to include preschools and day care centers, is based on the population served by the system as listed below, until June 29, 1994. Public water systems which do not collect five or more routine samples each month must undergo an initial sanitary survey by June 29, 1994. After June 29, 1994, the monitoring frequency for systems serving less than 4,101 persons shall be a minimum of five routine samples per month unless the department determines, after completing sanitary surveys (at intervals not to exceed five years), that the monitoring frequency may continue as listed below. The monitoring frequency for regional water systems shall be as listed in 41.2(1)*"c"*(1)"4" but in no instance less than that required by the population equivalent served.

TOTAL COLIFORM MONITORING FREQUENCY FOR COMMUNITY
WATER SYSTEMS AND NONCOMMUNITY (SCHOOL) WATER SYSTEMS

Population Served	Minimum Number of Samples Per Month
25 to 1,000*	1
1,001 to 2,500	2
2,501 to 3,300	3
3,301 to 4,100	4
4,101 to 4,900	5
4,901 to 5,800	6
5,801 to 6,700	7
6,701 to 7,600	8
7,601 to 8,500	9
8,501 to 12,900	10
12,901 to 17,200	15
17,201 to 21,500	20
21,501 to 25,000	25
25,001 to 33,000	30
33,001 to 41,000	40
41,001 to 50,000	50
50,001 to 59,000	60
59,001 to 70,000	70
70,001 to 83,000	80
83,001 to 96,000	90
96,001 to 130,000	100
130,001 to 220,000	120
220,001 to 320,000	150

*Includes public water supply systems which have at least 15 service connections, but serve fewer than 25 persons

320,001 to 450,000	180
450,001 to 600,000	210
600,001 to 780,000	240
780,001 to 970,000	270

4. Regional water systems. The supplier of water for a regional water system as defined in rule 567—40.2(455B) shall sample for coliform bacteria at a frequency indicated in the following chart until June 29, 1994, but in no case shall the sampling frequency for a regional water system be less than as set forth in 41.2(1)*"c"*(1)"3" based on the population equivalent served. Public water systems which do not collect five or more routine samples each month must undergo an initial sanitary survey by June 29, 1994. After June 29, 1994, the monitoring frequency of systems with less than 82 miles of pipe shall be a minimum of five routine samples per month unless the department determines, after completing sanitary surveys (at intervals not exceeding five years), that the monitoring frequency may continue as listed below. The following chart represents sampling frequency per miles of distribution system and is determined by calculating one-half the square root of the miles of pipe.

TOTAL COLIFORM MONITORING FREQUENCY FOR
REGIONAL WATER SYSTEMS

Miles of Pipe	Minimum Number of Samples Per Month
0 - 9	1
10 - 25	2
26 - 49	3
50 - 81	4
82 - 121	5
122 -169	6
170 - 225	7
226 - 289	8
290 - 361	9
362 - 441	10
442 - 529	11
530 - 625	12
626 - 729	13
730 - 841	14
842 - 961	15
962 - 1,089	16
1,090 - 1,225	17
1,226 - 1,364	18
1,365 - 1,521	19
1,522 - 1,681	20
1,682 - 1,849	21
1,850 - 2,025	22
2,026 - 2,209	23
2,210 - 2,401	24
2,402 - 2,601	25
2,602 - 3,249	28
3,250 - 3,721	30
3,722 - 4,489	33
greater than 4,489	35

5. Noncommunity water systems. The monitoring frequency for total coliforms for noncommunity water systems is as listed in the four unnumbered paragraphs below until June 29, 1999. Public water systems which do not collect five or more routine samples each month must undergo an initial sanitary survey by June 29, 1999. After June 29, 1999, the minimum number of samples shall be five routine samples per month unless the department determines, after completing sanitary surveys (at intervals not exceeding five years), that the monitoring frequency may continue as listed below.

A noncommunity water system using only groundwater (except groundwater under the direct influence of surface water, as defined in 567—paragraph 43.5(1)*"b"*) and serving 1,000 persons or fewer must monitor each calendar quarter that the system provides water to the public. Systems serving more than 1,000 persons during any month must monitor at the same frequency as a like-sized community water system, as specified in 41.2(1)*"c"*(1)"3."

A noncommunity water system using surface water, in total or in part, must monitor at the same frequency as a like-sized community water system, as specified in 41.2(1)*"c"*(1)"3," regardless of the number of persons it serves.

A noncommunity water system using groundwater under the direct influence of surface water, as defined in 567—paragraph 43.5(1)*"b,"* must monitor at the same frequency as a like-sized community water system, as specified in 41.2(1)*"c"*(1)"3," regardless of the number of persons it serves. The system must begin monitoring at this frequency beginning six months after the department determines that the groundwater is under the direct influence of surface water.

A noncommunity water system serving schools or daycares must monitor at the same frequency as a like-sized community water system, as specified in 41.2(1)*"c"*(1)"3."

6. If the department, on the basis of a sanitary survey or monitoring results history, determines that some greater frequency of monitoring is more appropriate, that frequency shall be the frequency required under these regulations. This frequency shall be confirmed or changed on the basis of subsequent surveys.

7. Special purpose samples, such as those taken to determine whether disinfection practices are sufficient following pipe placement, replacement, or repair, shall not be used to determine compliance with the MCL for total coliforms in 41.2(1)*"b."* Repeat samples taken pursuant to 41.2(1)*"c"*(2) are not considered special purpose samples and must be used to determine compliance with the MCL for total coliforms in 41.2(1)*"b."*

(2) Repeat total coliform monitoring.

1. Repeat sample time limit and numbers. If a routine sample is total coliform-positive, the public water supply system must collect a set of repeat samples within 24 hours of being notified of the positive result and in no case more than 24 hours after being notified by the department. A system which collects more than one routine sample per month must collect no fewer than three repeat samples for each total coliform-positive sample found. A system which collects one routine sample per month or fewer must collect no fewer than four repeat samples for each total coliform-positive sample found. The department may extend the 24-hour limit on a case-by-case basis if the system has a logistical problem in collecting the repeat samples within 24 hours that is beyond its control. In those cases, the public water supply system must report the circumstances to the department no later than the end of the next business day after receiving the notice to repeat sample and initiate the action directed by the department. In the case of an extension, the department will specify how much time the system has to collect the repeat samples.

2. Repeat sample location(s). The system must collect at least one repeat sample from the sampling tap where the original total coliform-positive sample was taken, at least one repeat sample at a tap within five service connections upstream and at least one repeat sample at a tap within five service connections downstream of the original sampling site. If a total coliform-positive sample is at the end of the distribution system, or at the first or last service connection, the system will be required to collect the repeat samples from the original sampling site and locations only upstream or downstream.

3. The system must collect all repeat samples on the same day, except that the department may allow a system with a single service connection to collect the required set of repeat samples over a four-day period. "System with a single service connection" means a system which supplies drinking water to consumers through a single service line.

4. Additional repeat sampling. If one or more repeat samples in the set is total coliform-positive, the public water supply system must collect an additional set of repeat samples in the manner specified in 41.2(1)*"c"*(2)"1" to 41.2(1)*"c"*(2)"3." The system must repeat this process until either total coliforms are not detected in one complete set of repeat samples or the system determines that the MCL for total coliforms in 41.2(1)*"b"* has been exceeded, notifies the department, and provides public notification to its users.

5. If a system collecting fewer than five routine samples per month has one or more total coliform-positive samples and the department does not invalidate the sample(s) under 41.2(1)*"c"*(3), it must collect at least five routine samples during the next month the system provides water to the public. For systems monitoring on a quarterly basis, the additional five routine samples may be required to be taken within the same quarter in which the original total coliform-positive sample occurred.

The department may waive the requirement to collect five routine samples the next month the system provides water to the public if the department has determined through an on-site visit the reason that the sample was total coliform-positive and establishes that the system has corrected the problem or will correct the problem before the end of the next month the system serves water to the public. In this case, the department must document this decision to waive the following month's additional monitoring requirement in writing, have it approved and signed by the supervisor of the water supply section and the department official who recommends such a decision, and make this document available to the EPA and public. The written documentation will generally be provided by the public water supply system in the form of a request and must describe the specific cause of the total coliform-positive sample and what action the system has taken to correct the problem. The department will not waive the requirement to collect five routine samples the next month the system provides water to the public solely on the grounds that all repeat samples are total coliform-negative. If the requirement to collect five routine samples is waived under this paragraph, a system must still take at least one routine sample before the end of the next month it serves water to the public and use it to determine compliance with the MCL for total coliforms in 41.2(1)*"b."*

(3) Invalidation of total coliform samples. A total coliform-positive sample invalidated under this subparagraph does not count towards meeting the minimum monitoring requirements of 41.2(1)*"c."* The department may invalidate a total coliform-positive sample only if one or more of the following conditions are met.

1. The laboratory establishes that improper sample analysis caused the total coliform-positive result. A laboratory must invalidate a total coliform sample (unless total coliforms are detected, in which case, the sample is valid) if the sample produces a turbid culture in the absence of gas production using an analytical method where gas formation is examined (e.g., the multiple tube fermentation technique), produces a turbid culture in the absence of an acid reaction in the presence-absence (P-A) coliform test, or exhibits confluent growth or produces colonies too numerous to count with an analytical method using a membrane filter (e.g., membrane filter technique). If a laboratory invalidates a sample because of such interference, the system must collect another sample from the same location as the original sample within 24 hours of being notified of the interference problem, and have it analyzed for the presence of total coliforms. The system must continue to resample within and have the samples analyzed until it obtains a valid result. The department may waive the 24-hour time limit on a case-by-case basis.

2. The department, on the basis of the results of repeat samples collected as required by 41.2(1)*"c"*(2)"1" to "4," determines that the total coliform-positive sample resulted from a domestic or other nondistribution system plumbing problem. "Domestic or other nondistribution system plumbing problem" means a coliform contamination problem in a public water supply system with more than one service connection that is limited to the specific service connection from which the coliform-positive sample was taken. The department will not invalidate a sample on the basis of repeat sample results unless all repeat samples collected at the same tap as the original total coliform-positive sample are also total coliform-positive, and all repeat samples collected within five service connections of the original tap are total coliform-negative (e.g., the department will not invalidate a total coliform-positive sample on the basis of repeat samples if all the repeat samples are total coliform-negative, or if the public water supply system has only one service connection).

3. The department has substantial grounds to believe that a total coliform-positive result is due to a circumstance or condition which does not reflect water quality in the distribution system. In this case, the system must still collect all repeat samples required under 41.2(1)*"c"*(2)"1" to "4," and use them to determine compliance with the MCL for total coliforms in 41.2(1)*"b."* To invalidate a total coliform-positive sample under this paragraph, the decision with the rationale for the decision must be documented in writing and approved and signed by the supervisor of the water supply section and the department official who recommended the decision. The department must make this document available to EPA and the public. The written documentation generally provided by the public water supply system in the form of a request must state the specific cause of the total coliform-positive sample, and what action the system has taken to correct this problem. The department will not invalidate a total coliform-positive sample solely on the grounds of poor sampling technique or that all repeat samples are total coliform-negative.

(4) Fecal coliforms/*Escherichia coli (E. coli)* testing.

1. If any routine or repeat sample is total coliform-positive, the system must analyze that total coliform-positive culture medium to determine if fecal coliforms are present, except that the system may test for *E. coli* in lieu of fecal coliforms.

2. The department may allow a public water supply system, on a case-by-case basis, to forego fecal coliform or *E. coli* on a total coliform-positive sample if that system assumes that the total coliform-positive sample is fecal coliform-positive or *E. coli*-positive. Accordingly, the system must notify the department as specified in 41.2(1)*"c"*(5)"1" and meet the provisions of 567—42.1(455B) pertaining to public notification.

(5) Public water supply system's response to violation.

1. A public water supply system which has exceeded the MCL for total coliforms in 41.2(1)*"b"* must report the violation to the water supply section of the department by telephone no later than the end of the next business day after it learns of the violation, and notify the public in accordance with 567—subrule 42.1(1).

2. A public water supply system which has failed to comply with a coliform monitoring requirement must report the monitoring violation to the department within ten days after the system discovers the violation and notify the public in accordance with 567—subrule 42.1(2).

3. If fecal coliforms or *E. coli* are detected in a routine or repeat sample, the system must notify the department by telephone by the end of the day when the system is notified of the test result, unless the system is notified of the result after the department office is closed, in which case the system must notify the department before the end of the next business day. If the detection of fecal coliform or *E. coli* in a sample causes a violation of the MCL, the system is required to notify the public in accordance with 567—paragraphs 42.1(1)*"a"* and *"b."*

d. Best available technology (BAT). The U.S. EPA identifies, and the department has adopted, the following as the best technology, treatment techniques, or other means available for achieving compliance with the maximum contaminant level for total coliforms in 41.2(1)*"b."*

(1) Well protection. Protection of wells from contamination by coliforms by appropriate placement and construction;

(2) Disinfectant residual. Maintenance of a disinfectant residual throughout the distribution system;

(3) Distribution system maintenance. Proper maintenance of the distribution system including appropriate pipe replacement and repair procedures, main flushing programs, proper operation and maintenance of storage tanks and reservoirs, and continual maintenance of a minimum positive water pressure of 20 psig in all parts of the distribution system at all times; and

(4) Filtration or disinfection. Filtration and disinfection of surface water or groundwater under the direct influence of surface water in accordance with 567—43.5(455B) or disinfection of groundwater using strong oxidants such as, but not limited to, chlorine, chlorine dioxide, or ozone.

(5) Wellhead protection program. For groundwater systems, compliance with the requirements of the department's wellhead protection program.

e. Analytical methodology.

(1) Sample volume. The standard sample volume required for total coliform analysis, regardless of analytical method used, is 100 mL.

(2) Presence/absence determination. Public water supply systems shall determine the presence or absence of total coliforms. A determination of total coliform density is not required.

(3) Total coliform bacteria analytical methodology. Public water supply systems must conduct total coliform analyses in accordance with one of the analytical methods in the following table:

Organism	Methodology	Citation[1]
Total Coliforms[2]	Total Coliform Fermentation Technique[3,4,5]	9221A, B
	Total Coliform Membrane Filter Technique[6]	9222A, B, C
	Presence-Absence (P-A) Coliform Test[5,7]	9221D
	ONPG-MUG Test[8]	9223
	Colisure Test[9]	
	M*Colite Test[10]	
	m-ColiBlue24 Test[11]	

The procedures shall be done in accordance with the documents listed below. The incorporation by reference of the following documents listed in footnotes 1, 6, 8, 9, 10, and 11 was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR Part 51. Copies of the documents may be obtained from the sources listed below. Information regarding obtaining these documents can be obtained from the Safe Drinking Water Hotline at (800)426-4791. Documents may be inspected at EPA's Drinking Water Docket, 401 M Street SW, Washington, DC 20460, telephone (202)260-3027; or at the Office of Federal Register, 800 North Capitol Street NW, Suite 700, Washington, DC 20408.

[1] Methods 9221A, B; 9222A, B, C; 9221D; and 9223 are contained in Standard Methods for the Examination of Water and Wastewater, 18th edition, 1992, and 19th edition, 1995, American Public Health Association, 1015 Fifteenth Street NW, Washington, DC 20005. Either edition may be used.

[2] The time from sample collection to initiation of the analysis may not exceed 30 hours. Systems are encouraged but not required to hold samples below 10 degrees Celsius during transit.

[3] Lactose broth, as commercially available, may be used in lieu of lauryl tryptose broth, if the system conducts at least 25 parallel tests between this medium and lauryl tryptose broth using the water normally tested, and this comparison demonstrates that the false-positive rate and false-negative rate for total coliforms, using lactose broth, is less than 10 percent.

[4] If inverted tubes are used to detect gas production, the media should cover these tubes at least one-half to two-thirds after the sample is added.

[5] No requirement exists to run the completed phase on 10 percent of all total coliform-positive confirmed tubes.

6 MI agar also may be used. Preparation and use of MI agar is set forth in the article, "New medium for the simultaneous detection of total coliform and *Escherichia coli* in water," by Brenner, K.P., et al., 1993, Applied Environmental Microbiology 56:3534-3544. Also available from the Office of Water Resource Center (RC-4100), 401 M Street SW, Washington, DC 20460, EPA 600/J-99/225.

[7] Six-times formulation strength may be used if the medium is filter-sterilized rather than autoclaved.

[8] The ONPG-MUG Test is also known as the Autoanalysis Colilert System.

9 The Colisure Test may be read after an incubation time of 24 hours. A description of the Colisure Test, February 28, 1994, may be obtained from IDEXX Laboratories, Inc., One IDEXX Drive, Westbrook, ME 04092.

10 A description of the E*Colite Test, "Presence/Absence for Coliforms and *E. Coli* in Water," December 21, 1997, is available from Charm Sciences, Inc., 25 Franklin Street, Malden, MA 02148-4120.

11 A description of the m-ColiBlue24 Test, August 17, 1999, is available from the Hach Company, 100 Dayton Avenue, Ames, IA 50010.

12 The department strongly recommends that laboratories evaluate the false-positive and false-negative rates for the method(s) they use for monitoring total coliforms. It also encourages laboratories to establish false-positive and false-negative rates within their own laboratory and sample matrix (drinking water or source water) with the intent that if the method chosen has an unacceptable false-positive or false-negative rate, another method may be used. The department suggests that laboratories perform these studies on a minimum of 5 percent of all total coliform-positive samples, except for those methods for which verification/confirmation is already required, e.g., the M-Endo and LES Endo Membrane Filter Tests, Standard Total Coliform Fermentation Technique, and Presence-Absence Coliform Test. Methods for establishing false-positive and false-negative rates may be based on lactose fermentation, the rapid test for beta-galactosidase and cytochrome oxidase, multitest identification systems, or equivalent confirmation tests. False-positive and false-negative information is often available in published studies or from the manufacturer(s).

(4) Rescinded IAB 8/11/99, effective 9/15/99.

(5) Fecal coliform analytical methodology. Public water systems must conduct fecal coliform analysis in accordance with the following procedure. When the MTF Technique or presence-absence (P-A) coliform test is used to test for total coliforms, shake the lactose-positive presumptive tube or

P-A bottle vigorously and transfer the growth with a sterile 3-mm loop or sterile applicator stick into brilliant green lactose bile broth and EC medium to determine the presence of total and fecal coliforms, respectively. For EPA-approved analytical methods which use a membrane filter, transfer the total coliform-positive culture by one of the following methods: remove the membrane containing the total coliform colonies from the substrate with sterile forceps and carefully curl and insert the membrane into a tube of EC medium (the laboratory may first remove a small portion of selected colonies for verification); swab the entire membrane filter surface with a sterile cotton swab and transfer the inoculum to EC medium (do not leave the cotton swab in the EC medium); or inoculate individual total coliform-positive colonies into EC medium. Gently shake the inoculated EC tubes to ensure adequate mixing and incubate in a waterbath at 44.5 (+ or -) 0.2 degrees C for 24 (+ or -) 2 hours. Gas production of any amount in the inner fermentation tube of the EC medium indicates a positive fecal coliform test. The preparation of EC medium is described in Method 9221E (paragraph 1a) in Standard Methods for the Examination of Water and Wastewater, 18th edition, 1992, and in the 19th edition, 1995; either edition may be used. Public water supply systems need only determine the presence or absence of fecal coliforms; a determination of fecal coliform density is not required.

(6) *E. coli* analytical methodology. Public water systems must conduct analysis of *Escherichia coli (E. coli)* in accordance with one of the following analytical methods:

1. EC medium supplemented with 50 micrograms per milliliter of 4-methylumbelliferyl-beta-D-glucuronide (MUG) (final concentration). EC medium is described in Standard Methods for the Examination of Water and Wastewater, 18th edition, 1992, and in the 19th edition, 1995, Method 9221E, paragraph 1a; either edition may be used. MUG may be added to EC medium before autoclaving. EC medium supplemented with 50 micrograms per milliliter of MUG is commercially available. At least 10 mL of EC medium supplemented with MUG must be used. The inner inverted fermentation tube may be omitted. The procedure for transferring a total coliform-positive culture to EC medium supplemented with MUG shall be as specified in 41.2(1)*"e"*(5) for transferring a total coliform-positive culture to EC medium. Observe fluorescence with an ultraviolet light (366 nm) in the dark after incubating tube at 44.5 plus or minus 0.2 degrees Celsius for 24 plus or minus 2 hours.

2. Nutrient agar supplemented with 100 micrograms per mL 4-methylumbelliferyl-beta-D-glucuronide (MUG) (final concentration). Nutrient agar is described in Method 9221B (paragraph 3) in Standard Methods for the Examination of Water and Wastewater, 18th edition, 1992, and in the 19th edition, 1995; either edition may be used. This test is used to determine if a total coliform-positive sample, as determined by the Membrane-Filter Technique or any other method in which a membrane filter is used, contains *E. coli*. Transfer the membrane filter containing a total coliform colony(ies) to nutrient agar supplemented with 100 micrograms per mL (final concentration) of MUG. After incubating the agar plate at 35 degrees Celsius for 4 hours, observe the colony(ies) under ultraviolet light (366 nm) in the dark for fluorescence. If fluorescence is visible, *E. coli* are present.

3. Minimal Medium ONPG-MUG (MMO-MUG) Test, as set forth in the article "National Field Evaluation of a Defined Substrate Method for the Simultaneous Detection of Total Coliforms and *Escherichia coli* from Drinking Water: Comparisons with Presence-Absence Techniques" (Edberg et al.), Applied and Environmental Microbiology, Volume 55, pp. 1003-1008, April 1989. (Note: The Autoanalysis Colilert System is an MMO-MUG test.) If the MMO-MUG Test is total coliform-positive after a 24-hour incubation, test the medium for fluorescence with a 366-nm ultraviolet light (preferably with a 6-watt lamp) in the dark. If fluorescence is observed, the sample is *E. coli*-positive. If fluorescence is questionable (cannot be definitively read) after 24 hours incubation, incubate the culture for an additional 4 hours (but not to exceed 28 hours total), and again test the medium for fluorescence. The MMO-MUG Test with hepes buffer is the only approved formulation for the detection of *E. coli*.

4. The membrane filter method with MI agar, as described in footnote 6 of the Total Coliform Methodology Table in 41.2(1)*"e"*(3).

5. E*Colite Test, as described in footnote 10 of the Total Coliform Methodology Table in 41.2(1)*"e"*(3).

6. m-ColiBlue 24 Test, as described in footnote 11 of the Total Coliform Methodology Table in 41.2(1)*"e"*(3).

(7) Optional *E. coli* analytical methodology. As an option to 41.2(1)*"e"*(6) a system with a total coliform-positive, MUG-negative, MMO-MUG Test may further analyze the culture for the presence of *E. coli* by transferring a 0.1 mL, 28-hour MMO-MUG culture to EC Medium + MUG with a pipette. The formulation and incubation conditions of EC Medium + MUG and observation of the results are described in 41.2(1)*"e"*(6).

41.2(2) *Giardia.* Reserved.

41.2(3) *Heterotrophic plate count bacteria (HPC).*

a. *Applicability.* All public water systems that use a surface water source or source under the direct influence of surface water must provide treatment consisting of disinfection, as specified in 567—subrule 43.5(2), and filtration treatment which complies with 567—subrule 43.5(3). The heterotrophic plate count is an alternate method to demonstrate a detectable disinfectant residual in accordance with 567—paragraph 43.5(2)*"d."*

b. *Maximum contaminant levels.* Reserved.

c. *Monitoring requirements.* Reserved.

d. *BAT.* Reserved.

e. *Analytical methodology.* Public water systems shall conduct heterotrophic plate count bacteria analysis in accordance with 567—subrule 43.5(2) and the following analytical method. Measurements for heterotrophic plate count bacteria must be conducted by a laboratory certified by the department to do such analysis, when heterotrophic plate count bacteria are being measured in lieu of a detectable residual disinfectant pursuant to 567—paragraph 43.5(2)*"d."* In addition, the time from sample collection to initiation of analysis may not exceed eight hours, and the systems must hold the samples below 10 degrees Celsius during transit to the laboratory.

(1) Method. The heterotrophic plate count shall be performed in accordance with Method 9215B Pour Plate Method, Standard Methods for the Examination of Water and Wastewater, 18th edition, 1992, and 19th edition, 1995 (either edition may be used).

(2) Reporting. The public water system shall report the results of heterotrophic plate count in accordance with 567—subparagraph 42.4(3)*"c"*(2).

41.2(4) *Macroscopic organisms and algae.*

a. *Applicability.* These rules apply to both community and noncommunity public water supply systems using surface water or groundwater under direct influence of surface water as defined by 567—subrule 43.5(1).

b. *Maximum contaminant levels (MCLs) for macroscopic organisms and algae.* Finished water shall be free of any macroscopic organisms such as plankton, worms, or cysts. The finished water algal cell count shall not exceed 500 organisms per milliliter or 10 percent of the total cells found in the raw water, whichever is greater.

c. *Monitoring requirements.* Reserved.

d. *BAT.* Reserved.

e. *Analytical methodology.* Measurement of the algal cells shall be in accordance with Method 10200F: Phytoplankton Counting Techniques, Standard Methods for the Examination of Water and Wastewater, 18th edition, pp. 10-13 to 10-16. Such measurement shall be required only when the department determines on the basis of complaints or otherwise that excessive algal cells may be present.

567—41.3(455B) Maximum contaminant levels (MCLs) and monitoring requirements for inorganic contaminants other than lead or copper.

41.3(1) *MCLs and other requirements for inorganic contaminants.*

a. *Applicability.* Maximum contaminant levels for inorganic contaminants (IOCs) specified in 41.3(1)*"b"* apply to community water systems and nontransient noncommunity water systems as specified herein. The maximum contaminant level for arsenic applies only to community water systems and nontransient noncommunity systems which primarily serve children (daycares and schools). The maximum contaminant level specified for fluoride applies only to community water systems and nontransient noncommunity systems which primarily serve children (daycares and schools). The maximum contaminant levels specified for nitrate, nitrite, and total nitrate and nitrite apply to community, nontransient noncommunity, and transient noncommunity water systems. At the discretion of the department, nitrate levels not to exceed 20 mg/L may be allowed in a noncommunity water system if the supplier of water demonstrates to the satisfaction of the department that:

(1) Such water will not be available to children under 6 months of age; and

(2) There will be continuous posting of the fact that nitrate levels exceed 10 mg/L and the potential health effects of exposure; and

(3) The following public health authorities will be notified annually of nitrate levels that exceed 10 mg/L, in addition to the reporting requirements of 567—Chapters 41 and 42: county board of health, county health department, county sanitarian, county public health administrator, and Iowa department of public health; and

(4) No adverse health effects shall result.

The requirements also contain monitoring requirements, best available technology (BAT) identification, and analytical method requirements pursuant to 41.3(1)*"c,"* and 567—paragraphs 41.3(1)*"e"* and 43.3(10)*"b,"* respectively.

b. *Maximum contaminant levels for inorganic chemicals (IOCs).*

(1) IOC MCLs. The following table specifies the MCLs for IOCs:

Contaminant	EPA Contaminant Code	Maximum Contaminant Level (mg/L)
Antimony	1074	0.006
Arsenic	1005	0.05
Asbestos	1094	7 million fibers/liter (longer than 10 micrometers in length)
Barium	1010	2
Beryllium	1075	0.004
Cadmium	1015	0.005
Chromium	1020	0.1
Cyanide (as free Cyanide)	1024	0.2
Fluoride*	1025	4.0
Mercury	1035	0.002
Nitrate	1040	10 (as nitrogen)
Nitrite	1041	1 (as nitrogen)
Total Nitrate and Nitrite	1038	10 (as nitrogen)
Selenium	1045	0.05
Thallium	1085	0.002

*The recommended fluoride level is 1.1 milligrams per liter or the level as calculated from "Water Fluoridation, a Manual for Engineers and Technicians" Table 2-4 published by the U.S. Department of Health and Human Services, Public Health Service (September 1986). At this optimum level in drinking water fluoride has been shown to have beneficial effects in reducing the occurrence of tooth decay.

(2) Compliance calculations. Compliance with 41.3(1)*"b"*(1) shall be determined based on the analytical result(s) obtained at each source/entry point.

1. Sampling frequencies greater than annual (e.g., monthly or quarterly). For public water supply systems which are conducting monitoring at a frequency greater than annual, compliance with the maximum contaminant levels for antimony, arsenic, asbestos, barium, beryllium, cadmium, chromium, cyanide, fluoride, mercury, nickel, selenium, and thallium is determined by a running annual average at any sampling point. If the average at any sampling point is greater than the MCL, then the system is out of compliance. If any one sample would cause the annual average to be exceeded, then the system

is out of compliance immediately. Any sample below the method detection limit shall be calculated at zero for the purpose of determining the annual average.

2. Sampling frequencies of annual or less. For public water supply systems which are monitoring annually, or less frequently, the system is out of compliance with the maximum contaminant levels for antimony, arsenic, asbestos, barium, beryllium, cadmium, chromium, cyanide, fluoride, mercury, nickel, selenium, and thallium if the level of a contaminant at any sampling point is greater than the MCL. If a confirmation sample is required by the department, it must be collected as soon as possible from the same sampling location, but not to exceed two weeks, and the determination of compliance will be based on the average of the two samples.

3. Compliance calculations for nitrate and nitrite. Compliance with the maximum contaminant levels for nitrate and nitrite is determined based on one sample if the level of these contaminants is below the MCLs. If the level of nitrate or nitrite exceeds the MCLs in the initial sample, a confirmation sample may be required in accordance with 41.3(1)*"c"*(7)"2," and compliance shall be determined based on the average of the initial and confirmation samples.

(3) Additional requirements. The department may assign additional requirements as deemed necessary to protect the public health, including public notification requirements.

c. Inorganic chemicals—monitoring requirements.

(1) Routine IOC monitoring (excluding asbestos, nitrate, and nitrite). Community public water supply systems and nontransient noncommunity water systems shall conduct monitoring to determine compliance with the MCLs specified in 41.3(1)*"b"* in accordance with this subrule. Transient noncommunity water systems shall conduct monitoring to determine compliance with the nitrate and nitrite maximum contaminant levels in 41.3(1)*"b"* as required by 41.3(1)*"c"*(5) and (6).

(2) Department designated sampling schedules: Each public water system shall monitor at the time designated by the department during each compliance period. The monitoring protocol is as follows:

1. Groundwater sampling points. Groundwater systems shall take a minimum of one sample at every entry point to the distribution system which is representative of each well after treatment (hereafter called a source/entry point) beginning in the compliance period starting January 1, 1993. The system shall take each sample at the same sampling point unless conditions make another sampling point more representative of each source or treatment plant.

2. Surface water sampling points. Surface water systems shall take a minimum of one sample at every entry point to the distribution system after any application of treatment or in the distribution system at a point which is representative of each source after treatment (hereafter called a source/entry point) beginning in the compliance period starting January 1, 1993. (For purposes of this paragraph, surface water systems include systems with a combination of surface and ground sources.) The system shall take each sample at the same sampling point unless conditions make another sampling point more representative of each source or treatment plant.

3. Multiple sources. If a public water supply system draws water from more than one source and the sources are combined before distribution, the system must sample at an entry point to the distribution system during periods of normal operating conditions (i.e., when water is representative of all sources being used).

4. Composite sampling. The department may reduce the total number of samples which must be analyzed by the use of compositing. In systems serving less than or equal to 3,300 persons, composite samples from a maximum of five samples are allowed, provided that the detection limit of the method used for analysis is less than one-fifth of the MCL. Compositing of samples must be done in the laboratory. If the concentration in the composite sample is greater than or equal to one-fifth of the MCL of any inorganic chemical, then a follow-up sample must be taken within 14 days at each sampling point included in the composite. These samples must be analyzed for the contaminants which exceeded one-fifth of the MCL in the composite sample. If duplicates of the original sample taken from each sampling point used in the composite are available, the system may use these duplicates instead of resampling, provided the holding time of the duplicate samples is not exceeded. The duplicate must be analyzed and the results reported to the department within 14 days after completing analysis of the composite sample. If the population served by the system is greater than 3,300 persons, then

compositing may only be permitted by the department as sampling points within a single system. In systems serving less than or equal to 3,300 persons, the department may permit compositing among different systems provided the five-sample limit is maintained. Detection limits for each inorganic contaminant analytical method are contained in 41.3(1)*"e"*(1).

(3) Asbestos routine and repeat monitoring frequency. The frequency of monitoring conducted to determine compliance with the maximum contaminant level for asbestos specified in 41.3(1)*"b"* shall be conducted as follows:

1. Initial sampling frequency. Each community and nontransient noncommunity water system is required to monitor for asbestos during the first three-year compliance period of each nine-year compliance cycle beginning in the compliance period starting January 1, 1993.

2. Sampling during waiver. If the public water supply system believes it is not vulnerable to either asbestos contamination in its source water or due to corrosion of asbestos-cement pipe, or both, it may apply for a waiver of the monitoring requirement in 41.3(1)*"c"*(3)"1." If the department grants the waiver, the system is not required to monitor.

3. Bases of an asbestos waiver. The department may grant a waiver based on a consideration of potential asbestos contamination of the water source, the use of asbestos-cement pipe for finished water distribution, and the corrosive nature of the water.

4. Effect of an asbestos waiver. A waiver remains in effect until the completion of the three-year compliance period. Systems not receiving a waiver must monitor in accordance with 41.3(1)*"c"*(3)"1."

5. Distribution system vulnerability for asbestos. A public water supply system vulnerable to asbestos contamination due solely to corrosion of asbestos-cement pipe shall take one sample at a tap served by asbestos-cement pipe and under conditions where asbestos contamination is most likely to occur.

6. Source water vulnerability for asbestos. A public water supply system vulnerable to asbestos contamination due solely to source water shall monitor in accordance with the provision of 41.3(1)*"c"*(2).

7. Combined asbestos vulnerability. A public water supply system vulnerable to asbestos contamination due both to its source water supply and corrosion of asbestos-cement pipe shall take one sample at a tap served by asbestos-cement pipe and under conditions where asbestos contamination is most likely to occur.

8. Exceedance of the asbestos MCL. A public water supply system which exceeds the maximum contaminant levels as determined in 41.3(1)*"b"* shall monitor quarterly beginning in the next quarter after the violation occurred.

9. Asbestos reliably and consistently below the MCL. The department may decrease the quarterly monitoring requirement to the frequency specified in 41.3(1)*"c"*(3)"1" provided the system is reliably and consistently below the maximum contaminant level. In no case can the department make this determination unless a groundwater system takes a minimum of two quarterly samples and a surface (or combined surface/ground) water system takes a minimum of four quarterly samples.

10. Grandfathered asbestos data. If monitoring data collected after January 1, 1990, are generally consistent with the requirements of 41.3(1)*"c"*(3), then the department may allow public water supply systems to use that data to satisfy the monitoring requirement for the initial compliance period beginning January 1, 1993.

(4) Monitoring frequency for other IOCs. The frequency of monitoring conducted to determine compliance with the maximum contaminant levels in 41.3(1)*"b"* for antimony, asbestos, barium, beryllium, cadmium, chromium, cyanide, fluoride, mercury, nickel, selenium, and thallium shall be as follows:

1. IOCs sampling frequency. Groundwater systems shall take one sample at each sampling point once every three years. Surface water systems (or combined surface/groundwater systems) shall take one sample annually at each sampling point.

2. IOC sampling waiver. The public water supply system may apply for a waiver from the monitoring frequencies specified in 41.3(1)*"c"*(4)"1."

3. IOC sampling during a waiver. A condition of the waiver shall require that a public water supply system shall take a minimum of one sample while the waiver is effective. The term during which the waiver is effective shall not exceed one compliance cycle (i.e., nine years).

4. Bases of an IOC waiver and grandfathered data. The department may grant a waiver provided surface water systems have monitored annually for at least three years and groundwater systems have conducted a minimum of three rounds of monitoring. (At least one sample shall have been taken since January 1, 1990.) Both surface and groundwater systems shall demonstrate that all previous analytical results were less than the maximum contaminant level. Systems that use a new water source are not eligible for a waiver until three rounds of monitoring from the new source have been completed. Systems may be granted a waiver for monitoring of cyanide, provided that the department determines that the system is not vulnerable due to lack of any industrial source of cyanide.

5. Bases of the IOC sampling frequency during a waiver. In determining the appropriate reduced monitoring frequency, the department will consider: reported concentrations from all previous monitoring; the degree of variation in reported concentrations; and other factors which may affect contaminant concentrations such as changes in groundwater pumping rates, changes in the system's configuration, changes in the system's operating procedures, or changes in stream flows or characteristics.

6. Effect of an IOC waiver. A decision to grant a waiver shall be made in writing and shall include the basis for the determination. The determination may be initiated by the department or upon an application by the public water supply system. The public water supply system shall specify the basis for its request. The department may review and, where appropriate, revise its determination of the appropriate monitoring frequency when the system submits new monitoring data or when other data relevant to the system's appropriate monitoring frequency become available.

7. Exceedance of an IOC MCL. Public water supply systems which exceed the maximum contaminant levels as calculated in 41.3(1)*"b"* shall monitor quarterly beginning in the next quarter after the violation occurred.

8. IOCs reliably and consistently below the MCL. The department may decrease the quarterly monitoring requirement to the frequencies specified in 41.3(1)*"c"*(4)"1" and "3" provided it has determined that the public water supply system is reliably and consistently below the maximum contaminant level. In no case can the department make this determination unless a groundwater system takes a minimum of two quarterly samples and a surface water system takes a minimum of four quarterly samples.

(5) Routine and repeat monitoring frequency for nitrates. All public water supply systems (community; nontransient noncommunity; and transient noncommunity systems) shall monitor to determine compliance with the maximum contaminant level for nitrate in 41.3(1)*"b."*

1. Initial nitrate sampling. Community and nontransient noncommunity water systems served by groundwater systems shall monitor annually beginning January 1, 1993; systems served by surface water shall monitor quarterly beginning January 1, 1993. Transient noncommunity water systems shall monitor annually beginning January 1, 1993.

2. Groundwater repeat nitrate sampling frequency. For community and noncommunity water systems, the repeat monitoring frequency for groundwater systems shall be:

- Quarterly for at least one year following any one sample in which the concentration is greater than or equal to 5.0 mg/L as N. The department may allow a groundwater system to reduce the sampling frequency to annually after four consecutive quarterly samples are reliably and consistently less than 5.0 mg/L as N.
- Monthly for at least one year following any nitrate MCL exceedance.

3. Surface water repeat nitrate sampling frequency. For community and noncommunity water systems, the department may allow a surface water system to reduce the sampling frequency to:

- Annually if all analytical results from four consecutive quarters are less than 5.0 mg/L as N.
- Quarterly for at least one year following any one sample in which the concentration is greater than or equal to 5.0 mg/L as N. The department may allow a surface water system to reduce the sampling

frequency to annually after four consecutive quarterly samples are reliably and consistently less than 5.0 mg/L as N.

- Monthly for at least one year following any nitrate MCL exceedance.

4. Scheduling annual nitrate repeat samples. After the initial round of quarterly sampling is completed, each community and nontransient noncommunity system which is monitoring annually shall take subsequent samples during the quarter(s) which previously resulted in the highest analytical result.

(6) Routine and repeat monitoring frequency for nitrite. All public water supply systems (community; nontransient noncommunity; and transient noncommunity systems) shall monitor to determine compliance with the maximum contaminant level for nitrite in 41.3(1)*"b."*

1. Initial nitrite sampling. All public water systems shall take one sample at each sampling point in the compliance period beginning January 1, 1993, and ending December 31, 1995.

2. Nitrite repeat monitoring. After the initial sample, systems where an analytical result for nitrite is less than 0.5 mg/L as N shall monitor at the frequency specified by the department.

3. Nitrite increased monitoring. For community, nontransient noncommunity, and transient noncommunity water systems, the repeat monitoring frequency for any water system shall be:

- Quarterly for at least one year following any one sample in which the concentration is greater than or equal to 0.5 mg/L as N. The department may allow a system to reduce the sampling frequency to annually after determining the system is reliably and consistently less than 0.5 mg/L.
- Monthly for at least one year following any nitrite MCL exceedance.

4. Scheduling of annual nitrite repeat samples. Systems which are monitoring annually shall take each subsequent sample during the quarter(s) which previously resulted in the highest analytical result.

(7) Confirmation sampling.

1. Deadline for IOCs confirmation samples. Where the results of an analysis for antimony, arsenic, asbestos, barium, beryllium, cadmium, chromium, cyanide, fluoride, mercury, nickel, selenium, or thallium indicate an exceedance of the maximum contaminant level, the department may require that one additional sample be collected as soon as possible after the initial sample was taken (but not to exceed two weeks) at the same sampling point.

2. Deadline for nitrate and nitrite confirmation samples. Where nitrate or nitrite sampling results indicate an exceedance of the maximum contaminant level and the sampling frequency is quarterly or annual, the system shall take a confirmation sample within 24 hours of the system's receipt of notification of the analytical results of the first sample. Public water supply systems unable to comply with the 24-hour sampling requirement must immediately notify the consumers served by the area served by the public water system in accordance with 567—42.1(455B) and complete an analysis of a confirmation sample within two weeks of notification of the analytical results of the first sample. Where the sampling frequency is monthly, a confirmation sample will not be used to determine compliance with the MCL.

3. Deadline for VOC and SOC confirmation samples. Where the results of an analysis for any VOC or SOC indicate an exceedance of the maximum contaminant level, the department may require that one or more additional samples be collected as soon as possible after the initial sample was taken, but not to exceed two weeks, at the same sampling point.

4. Compliance calculations and confirmation samples. If a required confirmation sample as collected within the time specified in 41.3(1)*"c"*(7)"1" is taken for any contaminant, then the results of the initial and confirmation sample shall be averaged. The resulting average shall be used to determine the system's compliance in accordance with 41.3(1)*"b."* The department has the discretion to invalidate results of obvious sampling errors.

(8) Designation of increased sampling frequency. The department may require more frequent monitoring than specified in 41.3(1)*"c"*(3) through (6) or may require confirmation samples for positive and negative results at its discretion. Public water supply systems may apply to conduct more frequent monitoring than the minimum monitoring frequencies specified in this subrule. Any increase or decrease in monitoring under this subparagraph will be designated in an operation permit or administrative order. To increase or decrease such frequency, the department shall consider the following factors:

1. Reported concentrations from previously required monitoring,
2. The degree of variation in reported concentrations,

3. Blending or treatment processes conducted for the purpose of complying with a maximum contaminant level, treatment technique, or action level, and

4. Other factors include changes in pumping rates in groundwater supplies or significant changes in the system's configuration, operating procedures, source of water and changes in streamflows.

(9) Grandfathered data. For the initial analysis required by 41.3(1)*"c,"* data for surface waters acquired within one year prior to the effective date and data for groundwaters acquired within three years prior to the effective date of 41.3(1)*"c"* may be substituted at the discretion of the department.

d. Best available treatment technologies (BATs) for IOCs. Rescinded IAB 8/11/99, effective 9/15/99.

e. Analytical methodology.

(1) Analytical methods for IOCs. Analysis for the listed inorganic contaminants shall be conducted using the following methods, or their equivalent as determined by EPA. Criteria for analyzing arsenic, barium, beryllium, cadmium, chromium, copper, lead, nickel, selenium, sodium, and thallium with digestion or directly without digestion, and other analytical test procedures are contained in Technical Notes on Drinking Water Methods, EPA-600/R-94-173, October, 1994. This document is available from the National Technical Information Service, NTIS PB95-104766, U.S. Department of Commerce, 5285 Port Royal Road, Springfield, VA 22161. The toll-free number is (800)553-6847.

INORGANIC CONTAMINANTS ANALYTICAL METHODS

Contaminant	Methodology[15]	EPA	ASTM [3]	SM [4]	Other	Detection Limit, mg/L
Antimony	Atomic absorption; furnace			3113B		0.003
	Atomic absorption; platform	200.9[2]				0.0008[12]
	ICP-Mass spectrometry	200.8[2]				0.0004
	Atomic absorption; hydride		D3697-92			0.001
Arsenic[16]	Inductively coupled plasma	200.7[2]		3120B		
	ICP-Mass spectrometry	200.8[2]				
	Atomic absorption; platform	200.9[2]				
	Atomic absorption; furnace		D2972-93C	3113B		
	Atomic absorption; hydride		D2972-93B	3114B		
Asbestos	Transmission electron microscopy	100.1[9]				0.01 MFL
	Transmission electron microscopy	100.2[10]				
Barium	Inductively coupled plasma	200.7[2]		3120B		0.002
	ICP-Mass spectrometry	200.8[2]				
	Atomic absorption; direct			3111D		0.1
	Atomic absorption; furnace			3113B		0.002
Beryllium	Inductively coupled plasma	200.7[2]		3120B		0.0003
	ICP-Mass spectrometry	200.8[2]				0.0003
	Atomic absorption; platform	200.9[2]				0.00002[12]
	Atomic absorption; furnace		D3645-93B	3113B		0.0002
Cadmium	Inductively coupled plasma	200.7[2]				0.001
	ICP-Mass spectrometry	200.8[2]				
	Atomic absorption; platform	200.9[2]				
	Atomic absorption; furnace			3113B		0.0001
Chromium	Inductively coupled plasma	200.7[2]		3120B		0.007
	ICP-Mass spectrometry	200.8[2]				
	Atomic absorption; platform	200.9[2]				
	Atomic absorption; furnace			3113B		0.001
Cyanide	Manual distillation (followed by one of the following analytical methods:)		D2036-91A	4500-CN-C		
	Spectrophotometric; amenable[14]		D2036-91B	4500-CN-G		0.02

Contaminant	Methodology[15]	EPA	ASTM[3]	SM[4]	Other	Detection Limit, mg/L
	Spectrophotometric; manual[13]		D2036-91A	4500-CN-E	I-3300-85[5]	0.02
	Spectrophotometric; semi-automated[13]	335.4[6]				0.005
	Selective electrode[13]			4500-CN-F		0.05
Fluoride	Ion chromatography	300.0[6]	D4327-91	4110B		
	Manual distillation; colorimetric; SPADNS			4500F-B,D		
	Manual electrode		D1179-93B	4500F-C		
	Automated electrode				380-75WE[11]	
	Automated alizarin			4500F-E	129-71W[11]	
Magnesium	Atomic absorption; direct		D511-93B	3111B		
	ICP	200.7[1]		3120B		
	Complexation Titrimetric Methods		D511-93A	3500-MgE		
Mercury	Manual, cold vapor	245.1[2]	D3223-91	3112B		0.0002
	Automated, cold vapor	245.2[1]				0.0002
	ICP-Mass spectrometry	200.8[2]				
Nickel	Inductively coupled plasma	200.7[2]		3120B		0.005
	ICP-Mass spectrometry	200.8[2]				0.0005
	Atomic absorption; platform	200.9[2]				0.0006[12]
	Atomic absorption; direct			3111B		
	Atomic absorption; furnace			3113B		0.001
Nitrate	Ion chromatography	300.0[6]	D4327-91	4110B	B-1011[8]	0.01
	Automated cadmium reduction	353.2[6]	D3867-90A	4500-NO_3-F		0.05
	Ion selective electrode			4500-NO_3-D	601[7]	1
	Manual cadmium reduction		D3867-90B	4500-NO_3-E		0.01
Nitrite	Ion chromatography	300.0[6]	D4327-91	4110B	B-1011[8]	0.004
	Automated cadmium reduction	353.2[6]	D3867-90A	4500-NO_3-F		0.05
	Manual cadmium reduction		D3867-90B	4500-NO_3-E		0.01
	Spectrophotometric			4500-NO_2-B		0.01
Selenium	Atomic absorption; hydride		D3859-93A	3114B		0.002
	ICP-Mass spectrometry	200.8[2]				
	Atomic absorption; platform	200.9[2]				
	Atomic absorption; furnace		D3859-93B	3113B		0.002
Sodium	Inductively coupled plasma	200.7[2]				
	Atomic absorption; direct			3111B		
Thallium	ICP-Mass spectrometry	200.8[2]				
	Atomic absorption; platform	200.9[2]				0.0007[12]

[1] “Methods for Chemical Analysis of Water and Wastes,” EPA-600/4-79-020, March 1983. Available at NTIS, PB84-128677. Also available from US EPA, EMSL, Cincinnati, OH 45268.

[2] “Methods for the Determination of Metals in Environmental Samples—Supplement I,” EPA-600/R-94-111, May 1994. Available at NTIS, PB94-184942.

[3] Annual Book of ASTM Standards, 1994, Vols. 11.01 and 11.02, American Society for Testing and Materials (ASTM). Copies may be obtained from the American Society for Testing and Materials, 101 Barr Harbor Drive, West Conshohocken, PA 19428.

[4] 18th and 19th editions of Standard Methods for the Examination of Water and Wastewater, 1992 and 1995, respectively, American Public Health Association; either edition may be used. Copies may be obtained from the American Public Health Association, 1015 Fifteenth Street NW, Washington, DC 20005.

[5] Techniques of Water Resources Investigation of the U.S. Geological Survey, Book 5, Chapter A-1, 3rd edition, 1989, Method I-3300-85. Available from Information Services, U.S. Geological Survey, Federal Center, Box 25286, Denver, CO 80225-0425.

[6] “Methods for the Determination of Inorganic Substances in Environmental Samples,” EPA-600-R-93-100, August 1993. Available at NTIS, PB94-120821.

[7] The procedure shall be done in accordance with the Technical Bulletin 601, "Standard Method of Test for Nitrate in Drinking Water," July 1994, PN221890-001, Analytical Technology, Inc. This incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR Part 51, effective January 4, 1995. Copies may be obtained from ATI Orion, 529 Main Street, Boston, MA 02129. Copies may be inspected at EPA's Drinking Water Docket, 401 M Street SW, Washington, DC 20460; or at the Office of the Federal Register, 800 North Capitol Street NW, Suite 700, Washington, DC.

[8] Method B-1011, "Waters Test Method for Determination of Nitrite/Nitrate in Water Using Single Column Ion Chromatography." Copies may be obtained from Waters Corporation, Technical Services Division, 34 Maple Street, Milford, MA 01757.

[9] Method 100.1, "Analytical Method for Determination of Asbestos Fibers in Water," EPA-600/4-83-043, EPA, September 1983. Available at NTIS, PB83-260471.

[10] Method 100.2, "Determination of Asbestos Structure Over 10 Microns in Length in Drinking Water," EPA-600/R-94-134, June 1994. Available at NTIS, PB94-201902.

[11] Industrial Method No. 129-71W, "Fluoride in Water and Wastewater," December 1972, and Method No. 380-75WE, "Fluoride in Water and Wastewater," February 1976, Technicon Industrial Systems. Copies may be obtained from Bran & Luebbe, 1025 Busch Parkway, Buffalo Grove, IL 60089.

[12] Lower MDLs are reported using stabilized temperature graphite furnace atomic absorption.

[13] Screening method for total cyanides.

[14] Measures "free" cyanides.

[15] Because MDLs reported in EPA Methods 200.7 and 200.9 were determined using a 2X preconcentration step during sample digestion, MDLs determined when samples are analyzed by direct analysis (i.e., no sample digestion) will be higher. For direct analysis of cadmium and arsenic by Method 200.7, and arsenic by Method 3120B, sample preconcentration using pneumatic nebulization may be required to achieve lower detection limits. Preconcentration may also be required for direct analysis of antimony and thallium by Method 200.9, and antimony by Method 3113B, unless multiple in-furnace depositions are made.

[16] If ultrasonic nebulization is used in the determination of arsenic by Method 200.7, 200.8, or SM 3120B, the arsenic must be in the pentavalent state to provide uniform signal response. For Methods 200.7 and 3120B, both samples and standards must be diluted in the same mixed acid matrix concentration of nitric and hydrochloric acid with the addition of 100 μL of 30 hydrogen peroxide per 100 mL of solution. For direct analysis of arsenic with Method 200.8 using ultrasonic nebulization, samples and standards must contain 1 mg/L of sodium hypochlorite.

(2) Sampling methods for IOCs. Sample collection for antimony, asbestos, barium, beryllium, cadmium, chromium, cyanide, fluoride, mercury, nickel, nitrate, nitrite, selenium, and thallium under this subparagraph shall be conducted using the sample preservation, container, and maximum holding time procedures specified in the table below:

SAMPLING METHODS FOR IOCs

Contaminant	Preservative[1]	Container[2]	Time[3]
Antimony	HNO_3	P or G	6 months
Asbestos	4 degrees C	P or G	48 hours for filtration[5]
Barium	HNO_3	P or G	6 months
Beryllium	HNO_3	P or G	6 months
Cadmium	HNO_3	P or G	6 months
Chromium	HNO_3	P or G	6 months
Cyanide	4 degrees C, NaOH	P or G	14 days
Fluoride	None	P or G	1 month
Mercury	HNO_3	P or G	28 days
Nickel	HNO_3	P or G	6 months
Nitrate[4]	4 degrees C	P or G	48 hours
Nitrate-Nitrite[4]	H_2SO_4	P or G	28 days
Nitrite[4]	4 degrees C	P or G	48 hours
Selenium	HNO_3	P or G	6 months
Thallium	HNO_3	P or G	6 months

[1] When indicated, samples must be acidified at the time of collection to pH < 2 with concentrated acid, or adjusted with sodium hydroxide to pH > 12. Samples collected for metals analysis may be preserved by acidification at the laboratory, using a 1:1 nitric acid solution (50 percent by volume), provided the shipping time and other instructions in Section 8.3 of EPA Methods 200.7, 200.8, and 200.9 are followed. When chilling is indicated, the sample must be shipped and stored at 4 degrees C or less.

[2] P: plastic, hard or soft; G: glass, hard or soft.

[3] In all cases, samples should be analyzed as soon after collection as possible. Follow additional (if any) information on preservation, containers, or holding times that is specified in the method.

[4] Nitrate may only be measured separate from nitrite in samples that have not been acidified. Measurement of acidified samples provides a total nitrate (sum of nitrate plus nitrite) concentration. Acidification of total nitrate (nitrate plus nitrite) samples must be done in the field at the time of sample collection.

[5] Instructions for containers, preservation procedures, and holding times as specified in Method 100.2 must be adhered to for all compliance analyses, including those conducted with Method 100.1.

f. *Unregulated inorganic chemicals.*

ANALYTICAL METHODS FOR UNREGULATED INORGANIC CONTAMINANTS

Contaminant	EPA Contaminant Code	Methodology	EPA	ASTM[1]	SM[2]
Sulfate	1055	Ion Chromatography	300.0[3]	D4327-91	4110
		Automated Methylthymol Blue	375.2[3]		4500-SO_4-F
		Gravimetric			4500-SO_4-C,D

The procedures shall be done in accordance with the documents listed below. The incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR Part 51, effective January 4, 1995. Contact the Safe Drinking Water Hotline at (800)426-4791 to obtain information about these documents. Documents may be inspected at EPA's Drinking Water Docket, 401 M Street SW, Washington, DC 20460 (telephone: (202)260-3027); or at the Office of the Federal Register, 800 North Capitol Street NW, Suite 700, Washington, DC.

[1] Annual Book of ASTM Standards, 1994, Vols. 11.01 and 11.02, American Society for Testing and Materials. Copies may be obtained from the American Society for Testing and Materials, 101 Barr Harbor Drive, West Conshohocken, PA 19428.

[2] 18th edition of Standard Methods for the Examination of Water and Wastewater, 1992, American Public Health Association. Copies may be obtained from the American Public Health Association, 1015 Fifteenth Street NW, Washington, DC 20005.

[3] "Methods for the Determination of Inorganic Substances in Environmental Samples," EPA-600/R-93-100, August 1993. Available at NTIS, PB94-121811.

41.3(2) *Other inorganic chemical contaminants.* Reserved.

The procedures shall be done in accordance with the documents listed below. The incorporation by reference of the following documents was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR Part 51, effective January 4, 1995. Copies of the documents may be obtained from the sources listed below. Contact the Safe Drinking Water Hotline at (800)426-4791 to obtain information about these documents. Documents may be inspected at EPA's Drinking Water Docket, 401 M Street SW, Washington, DC 20460 (telephone: (202)260-3027); or at the Office of Federal Register, 800 North Capitol Street NW, Suite 700, Washington, DC.

567—41.4(455B) Lead, copper, and corrosivity.

41.4(1) *Lead, copper, and corrosivity regulation by the setting of a treatment technique requirement.* The lead and copper rules do not set an MCL, although this could be changed in the future. The rules set two enforceable action levels, which trigger tap monitoring, corrosion control, source water treatment, lead service line replacement, and public education if exceeded.

a. *Applicability.* Unless otherwise indicated, each of the provisions of this subrule applies to community water systems and nontransient noncommunity water systems (hereinafter referred to as "water systems" or "systems").

b. *Action levels.*

(1) Lead action level. The lead action level is exceeded if the concentration of lead in more than 10 percent of tap water samples collected during any monitoring period conducted in accordance with 41.4(1)*"c"* is greater than 0.015 mg/L (i.e., if the "90th percentile" lead level is greater than 0.015 mg/L).

(2) Copper action level. The copper action level is exceeded if the concentration of copper in more than 10 percent of tap water samples collected during any monitoring period conducted in accordance with 41.4(1)*"c"* is greater than 1.3 mg/L (i.e., if the "90th percentile" copper level is greater than 1.3 mg/L).

(3) Calculation of 90th percentile. The 90th percentile lead and copper levels shall be computed as follows:

The results of all lead or copper samples taken during a monitoring period shall be placed in ascending order from the sample with the lowest concentration to the sample with the highest concentration. Each sampling result shall be assigned a number, ascending by single integers beginning with the number 1 for the sample with the lowest contaminant level. The number assigned to the sample with the highest contaminant level shall be equal to the total number of samples taken.

The number of samples taken during the monitoring period shall be multiplied by 0.9.

The contaminant concentration in the numbered sample yielded by this calculation is the 90th percentile contaminant level.

For water systems serving fewer than 100 people that collect five samples per monitoring period, the 90th percentile is computed by taking the average of the highest and second highest concentrations.

c. Lead and copper tap water monitoring requirements.

(1) Sample site selection.

1. General. Public water supply systems shall complete a materials evaluation of their distribution systems by the date indicated in 41.4(1)*"c"*(4) in order to identify a pool of sampling sites that meets the requirements of this subrule, and which is sufficiently large to ensure that the water system can collect the number of lead and copper tap samples required in 41.4(1)*"c"*(3). All sites from which first-draw samples are collected shall be selected from this pool of targeted sampling sites. Sampling sites may not include faucets that have point-of-use or point-of-entry treatment devices designed to remove inorganic contaminants.

2. Information sources. A public water supply system shall use the information on lead, copper and galvanized steel that it is required to collect under 41.4(1)*"f"* as part of its responsibility for the special monitoring for corrosivity characteristics when conducting a materials evaluation. When an evaluation of the information collected is insufficient to locate the requisite number of lead and copper sampling sites that meet the targeting criteria in 41.4(1)*"c"*(1), the water system shall review all plumbing codes, permits, and records in the files of the building department(s) which indicate the plumbing materials that are installed within publicly and privately owned structures connected to the distribution system; all inspections and records of the distribution system that indicate the material composition of the service connections that connect a structure to the distribution system; and all existing water quality information, which includes the results of all prior analyses of the system or individual structures connected to the system, indicating locations that may be particularly susceptible to high lead or copper concentrations. In addition, the system shall seek to collect such information where possible in the course of its normal operations (e.g., checking service line materials when reading water meters or performing maintenance activities).

3. Tier 1 community sampling sites. The sampling sites selected for a community water system's sampling pool ("tier 1 sampling sites") shall consist of single-family structures that contain copper pipes with lead solder installed after 1982 or contain lead pipes; or are served by a lead service line. When multiple-family residences comprise at least 20 percent of the structures served by a water system, the system may include these types of structures in its sampling pool.

4. Tier 2 community sampling sites. Any community water system with insufficient tier 1 sampling sites shall complete its sampling pool with "tier 2 sampling sites," consisting of buildings, including multiple-family residences that contain copper pipes with lead solder installed after 1982 or contain lead pipes; or are served by a lead service line.

5. Tier 3 community sampling sites. Any community water system with insufficient tier 1 and tier 2 sampling sites shall complete its sampling pool with "tier 3 sampling sites," consisting of single-family structures that contain copper pipes with lead solder installed before 1983.

6. Tier 1 NTNC sampling sites. The sampling sites selected for a nontransient noncommunity water system ("tier 1 sampling sites") shall consist of buildings that: contain copper pipes with lead solder installed after 1982 or contain lead pipes; or are served by a lead service line.

7. Other NTNC sampling sites. A nontransient noncommunity water system with insufficient tier 1 sites that meet the targeting criteria in 41.4(1)*"c"*(1)"6" shall complete its sampling pool with sampling sites that contain copper pipes with lead solder installed before 1983.

8. Reporting of sample site selection criteria. Any public water supply system whose sampling pool does not consist exclusively of tier 1 sites shall demonstrate in a letter submitted to the department why a review of the information listed in 41.4(1)*"c"*(1)"2" was inadequate to locate a sufficient number

of tier 1 sites. Any community water system which includes tier 3 sampling sites in its sampling pool shall demonstrate in such a letter why it was unable to locate a sufficient number of tier 1 and tier 2 sampling sites. Any public water supply system whose distribution system contains lead service lines shall draw 50 percent of the samples it collects during each monitoring period from sites that contain lead pipes, or copper pipes with lead solder, and 50 percent of those samples from sites served by a lead service line. A water system that cannot identify a sufficient number of sampling sites served by a lead service line shall demonstrate in a letter to the department why the system was unable to locate a sufficient number of such sites. Such a water system shall collect first-draw samples from all of the sites identified as being served by such lines.

(2) Sample collection methods.

1. Tap samples for lead and copper collected in accordance with this subparagraph, with the exception of lead service line samples collected under 567—subrule 43.7(4), shall be first-draw samples.

2. First-draw tap samples for lead and copper shall be one liter in volume and have stood motionless in the plumbing system of each sampling site for at least six hours. First-draw samples from residential housing shall be collected from the cold-water kitchen tap or bathroom sink tap. First-draw samples from a nonresidential building shall be collected at an interior tap from which water is typically drawn for consumption. First-draw samples may be collected by the system or the system may allow residents to collect first-draw samples after instructing the residents of the sampling procedures specified in this paragraph. To avoid problems of residents handling nitric acid, acidification of first-draw samples may be done up to 14 days after the sample is collected. If the sample is not acidified immediately after collection, then the sample must stand in the original container for at least 28 hours after acidification. If a system allows residents to perform sampling, the system may not challenge, based on alleged errors in sample collection, the accuracy of sampling results.

3. Service line samples collected to determine if the service line is directly contributing lead (as described in 567—subrule 43.7(4)) shall be one liter in volume and have stood motionless in the lead service line for at least six hours and be collected at the tap after flushing the volume of water between the tap and the lead service line. The volume of water shall be calculated based on the interior diameter and length of the pipe between the tap and the lead service line; tapping directly into the lead service line; or if the sampling site is a building constructed as a single-family residence, allowing the water to run until there is a significant change in temperature which would be indicative of water that has been standing in the lead service line.

4. A public water supply system shall collect each first-draw tap sample from the same sampling site from which it collected a previous sample. If, for any reason, the water system cannot gain entry to a sampling site in order to collect a follow-up tap sample, the system may collect the follow-up tap sample from another sampling site in its sampling pool as long as the new site meets the same targeting criteria, and is within reasonable proximity of the original site.

(3) Number of samples. Water systems shall collect at least one sample during each monitoring period specified in 41.4(1)*"c"*(4) from the number of sites as listed in the column below titled "standard monitoring." A system conducting reduced monitoring under 41.4(1)*"c"*(4) may collect one sample from the number of sites specified in the column titled "reduced monitoring" during each monitoring period specified in 41.4(1)*"c"*(4).

REQUIRED NUMBER OF LEAD/COPPER SAMPLES

System Size (Number of People Served)	Standard Monitoring (Number of Sites)	Reduced Monitoring (Number of Sites)
greater than 100,000	100	50
10,001 to 100,000	60	30
3,301 to 10,000	40	20

501 to 3,300	20	10
101 to 500	10	5
less than or equal to 100	5	5

(4) Timing of monitoring.

1. Initial tap sampling. The first six-month monitoring period for small, medium-size and large systems shall begin on the following dates:

System Size (Number of People Served)	First Six-month Monitoring Period Begins on:
greater than 50,000 (large system)	January 1, 1992
3,301 to 50,000 (medium system)	July 1, 1992
less than or equal to 3,300 (small system)	July 1, 1993

All large systems shall monitor during two consecutive six-month periods. All small and medium-size systems shall monitor during each six-month monitoring period until the system exceeds the lead or copper action level and is, therefore, required to implement the corrosion control treatment requirements under 567—paragraph 43.7(1)*"a,"* in which case the system shall continue monitoring in accordance with 41.4(1)*"c"*(4), or the system meets the lead and copper action levels during two consecutive six-month monitoring periods, in which case the system may reduce monitoring in accordance with 41.4(1)*"c"*(4).

2. Monitoring after installation of corrosion control and source water treatment. Large systems which install optimal corrosion control treatment pursuant to 567—subparagraph 43.7(1)*"d"*(4) shall monitor during two consecutive six-month monitoring periods by the date specified in 567—subparagraph 43.7(1)*"d"*(5). Small or medium-size systems which install optimal corrosion control treatment pursuant to 567—subparagraph 43.7(1)*"e"*(5) shall monitor during two consecutive six-month monitoring periods as specified in 567—subparagraph 43.7(1)*"e"*(6). Systems which install source water treatment shall monitor during two consecutive six-month monitoring periods by the date specified in 567—subparagraph 43.7(3)*"a"*(4).

3. Monitoring after the department specifies water quality parameter values for optimal corrosion control. After the department specifies the values for water quality control parameters under 567—paragraph 43.7(2)*"f,"* the system shall monitor during each subsequent six-month monitoring period, with the first monitoring period to begin on the date the department specifies the optimal values under 567—paragraph 43.7(2)*"f."*

4. Reduced monitoring.

● A small or medium-size water system that meets the lead and copper action levels during each of two consecutive six-month monitoring periods may reduce the number of samples according to 41.4(1)*"c"*(3) and reduce the frequency of sampling to once per year.

● Any public water supply system that maintains the range of values for the water quality control parameters reflecting optimal corrosion control treatment specified by the department under 567—paragraph 43.7(2)*"f"* during each of two consecutive six-month monitoring periods may request that the system be allowed to reduce the monitoring frequency to once per year and to reduce the number of lead and copper samples according to 41.4(1)*"c"*(3). The department will review the information submitted by the water system and shall set forth the basis for its determination in writing. Where appropriate, the department will revise its determination when the system submits new monitoring or treatment data, or when other data relevant to the number and frequency of tap sampling becomes available.

● A small or medium-size water system that meets the lead and copper action levels during three consecutive years of monitoring may reduce the frequency of monitoring for lead and copper from annually to once every three years. Any water system that maintains the range of values for the water quality control parameters reflecting optimal corrosion control treatment specified by the department under 567—paragraph 43.7(2)*"f"* during three consecutive years of monitoring may request the department to allow the system to reduce the frequency of monitoring from annually to once every three years. The department shall review the information submitted by the system and shall set forth the basis for its determination in writing. Where appropriate, the department will revise its determination when the system submits new monitoring or treatment data, or when other data relevant to the number and frequency of tap sampling becomes available.

● A water system that reduces the number and frequency of sampling shall collect these samples from sites included in the pool of targeted sampling sites identified in 41.4(1)*"c"*(1). Systems sampling annually or less frequently shall conduct the lead and copper tap sampling during the months of June, July, August or September.

● A small or medium-size water system subject to reduced monitoring that exceeds the lead or copper action level shall resume sampling according to 41.4(1)*"c"*(4)"3" and collect the number of samples specified for standard monitoring in 41.4(1)*"c"*(3). Such systems shall also conduct water quality parameter monitoring in accordance with 41.4(1)*"d"*(2), (3), or (4), as appropriate, during the monitoring period in which it exceeded the action level. Any water system subject to reduced monitoring frequency that fails to operate within the range of values for the water quality control parameters specified by the department under 567—paragraph 43.7(2)*"f"* shall resume tap water sampling according to 41.4(1)*"c"*(4)"3" and collect the number of samples specified for standard monitoring in 41.4(1)*"c"*(3).

● Additional monitoring by systems. The results of any monitoring conducted in addition to the minimum requirements of 41.4(1)*"c"* shall be considered by the system and the department in making any determinations (i.e., calculating the 90th percentile lead or copper level) under this subrule.

d. Water quality parameter monitoring requirements. All large public water supply systems (and all small and medium-size public water supply systems that exceed the lead or copper action level) shall monitor water quality parameters in addition to lead and copper in accordance with this subrule. The requirements of this subrule are summarized in the table at the end of 41.4(1)*"d"*(6). The water quality parameters must be reported in accordance with the monthly operation report requirements listed in 567—subrule 42.4(3).

(1) General requirements.

1. Sample collection methods. Tap samples shall be representative of water quality throughout the distribution system taking into account the number of persons served, the different sources of water, the different treatment methods employed by the system, and seasonal variability. Tap sampling under this subrule is not required to be conducted at taps targeted for lead and copper sampling under 41.4(1)*"c"*(1)"1." Systems may conduct tap sampling for water quality parameters at sites used for coliform sampling. Samples collected at the entry point(s) to the distribution system shall be from locations representative of each source after treatment. If a system draws water from more than one source and the sources are combined before distribution, the system must sample at an entry point to the distribution system during periods of normal operating conditions (i.e., when water is representative of all sources being used).

2. Number of samples. Systems shall collect two samples for each applicable water quality parameter at each entry point to the distribution system during each six-month monitoring period specified in 41.4(1)*"d"*(2). During each monitoring period specified in 41.4(1)*"d"*(3) through (5), systems shall collect one sample for each applicable water quality parameter at each entry point to the distribution system. Systems shall collect two tap samples for applicable water quality parameters during each six-month monitoring period specified in 41.4(1)*"d"*(2) through (5) from the following number of sites.

REQUIRED NUMBER OF SAMPLES: WATER QUALITY PARAMETERS

System Size (Number of People Served)	Number of Sites for Water Quality Parameters
greater than 100,000	25
10,001 to 100,000	10
3,301 to 10,000	3
501 to 3,300	2
101 to 500	1
less than or equal to 100	1

(2) Initial sampling. Large water systems shall measure the applicable water quality parameters as specified below at taps and at each entry point to the distribution system during each six-month monitoring period specified in 41.4(1)*"c"*(4)"1." Small and medium-size systems shall measure the applicable water quality parameters at taps and at each entry point to the distribution system during each six-month monitoring period specified in 41.4(1)*"c"*(4)"1" during which the system exceeds the lead or copper action level. Tap water and entry point monitoring shall include: pH; alkalinity; orthophosphate, when an inhibitor containing a phosphate compound is used; silica, when an inhibitor containing a silicate compound is used; calcium; conductivity; and water temperature.

(3) Monitoring after installation of corrosion control. Large systems which install optimal corrosion control treatment pursuant to 567—subparagraph 43.7(1)*"d"*(4) shall measure the water quality parameters at the locations and frequencies specified below during each six-month monitoring period specified in 41.4(1)*"c"*(4)"2." Small or medium-size systems which install optimal corrosion control treatment shall conduct such monitoring during each six-month monitoring period specified in 41.4(1)*"c"*(4)"2" in which the system exceeds the lead or copper action level.

1. Tap water monitoring shall include two samples for: pH; alkalinity; orthophosphate, when an inhibitor containing a phosphate compound is used; silica, when an inhibitor containing a silicate compound is used; calcium, when calcium carbonate stabilization is used as part of corrosion control.

2. Monitoring at each entry point to the distribution system shall include one sample every two weeks (biweekly) for: pH; a reading of the dosage rate of the chemical used to adjust alkalinity, and the alkalinity concentration when alkalinity is adjusted as part of optimal corrosion control; and a reading of the dosage rate of the inhibitor used, and the concentration of orthophosphate or silica (whichever is applicable) when a corrosion inhibitor is used as part of optimal corrosion control.

(4) Monitoring after the department specifies water quality parameter values for optimal corrosion control. After the department specifies the values for applicable water quality control parameters reflecting optimal corrosion control treatment, large systems shall measure the applicable water quality parameters according to 41.4(1)*"d"*(3) during each monitoring period specified in 41.4(1)*"c"*(4)"3." Any small or medium-size system shall conduct such monitoring during each monitoring period specified in 41.4(1)*"c"*(4)"3" in which the system exceeds the lead or copper action level. The system may take a confirmation sample for any water quality parameter value no later than three days after the first sample. If a confirmation sample is taken, the result must be averaged with the first sampling result and the average must be used for any compliance determinations. The department may disregard results of obvious sampling errors from this calculation.

(5) Reduced monitoring.

1. Public water supply systems that maintain the range of values for the water quality parameters reflecting optimal corrosion control treatment during each of two consecutive six-month monitoring periods under 41.4(1)*"c"*(4) shall continue monitoring at the entry point(s) to the distribution system as specified in 567—paragraph 43.7(2)*"f."* Such system may collect two tap samples for applicable water quality parameters from the following reduced number of sites during each six-month monitoring period.

REDUCED WATER QUALITY PARAMETER MONITORING

System Size (Number of People Served)	Reduced Number of Sites for Water Quality Parameters
greater than 100,000	10
10,001 to 100,000	7
3,301 to 10,000	3
501 to 3,300	2
101 to 500	1
less than or equal to 100	1

2. Public water systems that maintain the range of values for the water quality parameters reflecting optimal corrosion control treatment specified by the department under 567—paragraph 43.7(2)*"f"* during three consecutive years of annual monitoring under this paragraph may reduce the frequency with which it collects the number of tap samples for applicable water quality parameters specified in 41.4(1)*"d"*(5) from annually to every three years.

3. A public water system that conducts sampling annually shall collect these samples evenly throughout the year so as to reflect seasonal variability.

4. Public water systems subject to reduced monitoring frequency that fail to operate within the range of values for the water quality parameters specified by the department under 567—paragraph 43.7(2)*"f"* shall resume tap water sampling in accordance with the number and frequency requirements in 41.4(1)*"d"*(3).

(6) Additional monitoring by systems. The results of any monitoring conducted in addition to the minimum requirements of this subrule shall be considered in making any determinations (i.e., determining concentrations of water quality parameters) under this subrule or 567—subrule 43.7(2).

SUMMARY OF MONITORING REQUIREMENTS FOR WATER QUALITY PARAMETERS[1]

Monitoring Period	Location	Parameters[2]	Frequency
Initial Monitoring	Taps and at entry point(s) to distribution systems	pH, alkalinity, orthophosphate or silica[3], calcium, conductivity, temperature	Every 6 months
After Installation of Corrosion Control	Taps	pH, alkalinity, orthophosphate, silica[3], calcium[4]	Every 6 months
	Entry point(s) to distribution system	pH, alkalinity dosage rate and concentration (if alkalinity adjusted as part of corrosion control), inhibitor dosage rate and inhibitor residual[5]	Biweekly
After State Specifies Parameter Values for Optimal Corrosion Control	Taps	pH, alkalinity, orthophosphate, silica[3], calcium[4]	Every 6 months
	Entry point(s) to distribution system	pH, alkalinity, dosage rate and concentration (if alkalinity adjusted as part of corrosion control), inhibitor dosage rate and inhibitor residual[5]	Biweekly
Reduced Monitoring	Taps	pH, alkalinity, orthophosphate or silica[3], calcium[4]	Every 6 months at a reduced number of sites
	Entry point(s) to distribution system	pH, alkalinity rate and concentration (if alkalinity adjusted as part of corrosion control), inhibitor dosage rate and inhibitor residual[5]	Biweekly

[1] Table is for illustrative purposes; consult the text of this subrule for precise regulatory requirements.

[2] Small and medium-size systems have to monitor for water quality parameters only during monitoring periods in which the system exceeds the lead or copper action level.

[3] Orthophosphate must be measured only when an inhibitor containing a phosphate compound is used. Silica must be measured only when an inhibitor containing silicate compound is used.

[4] Calcium must be measured only when calcium carbonate stabilization is used as part of corrosion control.

[5] Inhibitor dosage rates and inhibitor residual concentrations (orthophosphate or silica) must be measured only when an inhibitor is used.

e. Lead and copper source water monitoring requirements.

(1) Sample location, collection methods, and number of samples.

1. A water system that fails to meet the lead or copper action level on the basis of tap samples collected in accordance with 41.4(1)*"c"* shall collect lead and copper source water samples in accordance with the requirements regarding sample location, number of samples, and collection methods specified for inorganic chemical sampling. The timing of sampling for lead and copper shall be in accordance with 41.4(1)*"e"*(2) and (3).

2. Where the results of sampling indicate an exceedance of maximum permissible source water levels established under 567—subparagraph 43.7(3)*"b"*(4), the department may require that one additional sample be collected as soon as possible after the initial sample was taken (but not to exceed two weeks) at the same sampling point. If a confirmation sample is taken for lead or copper, then the results of the initial and confirmation samples shall be averaged in determining compliance with the maximum permissible levels. Lead and copper analytical results below the detection limit shall be considered to be zero. Analytical results above the detection limit but below the practical quantification level (PQL) shall either be considered as the measured value or be considered one-half the PQL.

(2) Monitoring after system exceeds tap water action level. Any system which exceeds the lead or copper action level at the tap shall collect one source water sample from each entry point to the distribution system within six months after the exceedance.

(3) Monitoring after installation of source water treatment. Any system which installs source water treatment pursuant to 567—subparagraph 43.7(3)*"a"*(3) shall collect an additional source water sample from each entry point to the distribution system during two consecutive six-month monitoring periods by the deadline specified.

(4) Monitoring frequency after the department specifies maximum permissible source water levels or determines that source water treatment is not needed.

1. A system shall monitor at the frequency specified below in cases where the department specifies maximum permissible source water levels under 567—subparagraph 43.7(3)*"b"*(4) or determines that the system is not required to install source water treatment under 567—subparagraph 43.7(3)*"b"*(2). A water system using only groundwater shall collect samples once during the three-year compliance period in effect when the department makes this determination. Such systems shall collect samples once during each subsequent compliance period. A public water system using surface water (or a combination of surface and groundwater) shall collect samples once during each year, the first annual monitoring period to begin on the date on which the department makes this determination.

2. A system using only groundwater is not required to conduct source water sampling for lead or copper if the system meets the action level for the specific contaminant in tap water samples during the entire source water sampling.

(5) Reduced monitoring frequency.

1. A water system using only groundwater which demonstrates that finished drinking water entering the distribution system has been maintained below the maximum permissible lead or copper concentrations specified by the department in 567—subparagraph 43.7(3)*"b"*(4) during at least three consecutive compliance periods under 41.4(1)*"e"*(4)"1" may reduce the monitoring frequency for lead or copper to once during each nine-year compliance cycle as defined in 567—40.2(455B).

2. A water system using surface water (or a combination of surface and groundwaters) which demonstrates that finished drinking water entering the distribution system has been maintained below the maximum permissible lead and copper concentrations specified by the department in 567—subparagraph 43.7(3)*"b"*(4) for at least three consecutive years may reduce the monitoring frequency in 41.4(1)*"e"*(4)"1" to once during each nine-year compliance cycle.

3. A water system that uses a new source of water is not eligible for reduced monitoring for lead or copper until concentrations in samples collected from the new source during three consecutive monitoring periods are below the maximum permissible lead and copper concentrations specified.

f. Corrosivity monitoring protocol — special monitoring for corrosivity characteristics. Suppliers of water for community public water systems shall collect samples from a representative entry point to the water distribution system for the purpose of analysis to determine the corrosivity characteristics of the water. The determination of corrosivity characteristics of water shall only include one round of sampling, except in cases where the department concludes additional monitoring is necessary due to variability of the raw water sources. Sampling requirements and approved analytical methods are as follows:

(1) Surface water systems. Systems utilizing a surface water source either in whole or in part shall collect two samples per plant for the purpose of determining the corrosivity characteristics. One of these samples is to be collected during the midwinter months and the other during midsummer.

(2) Groundwater systems. Systems utilizing groundwater sources shall collect one sample per plant or source, except systems with multiple plants that do not alter the corrosivity characteristics identified in 41.4(1)*"f"*(3) or systems served by multiple wells drawing raw water from a single aquifer may, with departmental approval, be considered one treatment plant or source when determining the number of samples required.

(3) Corrosivity characteristics analytical parameters. Determination of corrosivity characteristics of water shall include measurements of pH, calcium hardness, alkalinity, temperature, total dissolved solids (total filterable residue), and calculation of the Langelier Index. In addition, sulfate and chloride monitoring may be required by the department. At the department's discretion, the Aggressiveness Index test may be substituted for the Langelier Index test.

(4) Corrosivity indices methodology. The following methods must be used to calculate the corrosivity indices:

1. Aggressiveness Index—"ANSI/AWWA C401-93: AWWA Standard for the Selection of Asbestos Cement Pressure Pipe, 4″”–16″” for Water Distribution Systems," American Water Works Association, Denver, CO.

2. Langelier Index—"Standard Methods for the Examination of Water and Wastewater," 14th edition, American Public Health Association, 1015 15th Street NW, Washington, DC 20005 (1975), Method 203, pp. 61-63.

(5) Distribution system construction materials. Community and nontransient noncommunity water supply systems shall identify whether the following construction materials are present in their distribution system and report to the department:

1. Lead from piping, solder, caulking, interior lining of distribution mains, alloys, and home plumbing.
2. Copper from piping and alloys, service lines, and home plumbing.
3. Galvanized piping, service lines, and home plumbing.
4. Ferrous piping materials such as cast iron and steel.
5. Asbestos cement pipe.
6. Vinyl lined asbestos cement pipe.
7. Coal tar lined pipes and tanks.
8. Pipe with asbestos cement lining.

g. Lead, copper, and water quality parameter analytical methods.

(1) Analytical methods. Analyses for alkalinity, calcium, conductivity, orthophosphate, pH, silica, and temperature may be performed by a Grade I, II, III, or IV certified operator meeting the requirements of 567—Chapter 81, any person under the supervision of a Grade I, II, III, or IV certified operator meeting the requirements of 567—Chapter 81, or a laboratory certified by the department to perform analysis under 567—Chapter 83. Analyses under this subrule for lead and copper shall only be conducted by laboratories that have been certified by the department, pursuant to 567—Chapter 83. The following methods must be used:

LEAD, COPPER AND WATER QUALITY PARAMETER ANALYTICAL METHODS

Contaminant	EPA Contaminant Code	Methodology[9]	Reference (Method Number)			
			EPA	ASTM[3]	SM[4]	USGS[5]
Alkalinity	1927	Titrimetric		D1067-92B	2320 B	
		Electrometric titration				I-1030-85
Calcium	1919	EDTA titrimetric		D511-93A	3500-Ca D	
		Atomic absorption; direct aspiration		D511-93B	3111 B	

Contaminant	EPA Contaminant Code	Methodology[9]	Reference (Method Number)			
			EPA	ASTM[3]	SM[4]	USGS[5]
		Inductively-coupled plasma	200.7[2]		3120 B	
Chloride	1017	Ion chromatography	300.0[8]	D4327-91	4110B	
		Potentiometric titration			4500-Cl-D	
Conductivity	1064	Conductance		D1125-95A	2510 B	
Copper[6]	1022	Atomic absorption; furnace technique		D1688-95C	3113 B	
		Atomic absorption; direct aspiration		D1688-95A	3111 B	
		Inductively-coupled plasma	200.7[2]		3120 B	
		Inductively-coupled plasma; mass spectrometry	200.8[2]			
		Atomic absorption; platform furnace	200.9[2]			
Lead[6]	1030	Atomic absorption; furnace technique		D3559-95D	3113 B	
		Inductively-coupled plasma; mass spectrometry	200.8[2]			
		Atomic absorption; platform furnace technique	200.9[2]			
		Differential pulse anodic stripping voltammatry				Method 1001[10]
pH	1925	Electrometric	150.1[1]	D1293-95	4500-H+ B	
			150.2[1]			
Orthophosphate (Unfiltered no digestion or hydrolysis)	1044	Colorimetric, automated, ascorbic acid	365.1[8]		4500-P F	
		Colorimetric, ascorbic acid, single reagent		D515-88A	4500-P E	
		Colorimetric, phosphomolybdate;				I-1602-85
		Automated-segmented flow				I-2601-90[8]
		Automated discrete				I-2598-85
		Ion chromatography	300.0[7]	D4327-91	4110 B	
Silica	1049	Colorimetric, molybdate blue				I-1700-85
		Automated-segmented flow				I-2700-85
		Colorimetric		D859-95		
		Molybdosilicate			4500-Si D	
		Heteropoly blue			4500-Si E	
		Automated method for molybdate-reactive silica			4500-Si F	
		Inductively-coupled plasma[6]	200.7[2]		3120 B	
Temperature	1996	Thermometric			2550 B	
Total Filterable Residue (TDS)	1930	Gravimetric			2540 C	

[1] "Methods for Chemical Analysis of Water and Wastes," EPA-600/4-79-020, March 1983. Available at NTIS as PB84-128677. Also available at US EPA, EMSL, Cincinnati, OH.

[2] "Methods for the Determination of Metals in Environmental Samples," EPA-600/4-91-010, June 1991. Available at NTIS as PB91-231498.

[3] Annual Book of ASTM Standards, 1994 and 1996, Vols. 11.01 and 11.02, American Society for Testing and Materials. The previous versions of D1688-95A and D1688-95C (copper), D3559-95 (lead), D1293-95 (pH), D1125-91A (conductivity), and D859-94(silica) are also approved. These previous versions, D1688-90A, C, D3559-90D, D1293-84, D1125-91A and D859-88, respectively, are located

in the Annual Book of ASTM Standards, 1994, Volume 11.01. Copies may be obtained from the American Society for Testing and Materials, 101 Barr Harbor Drive, West Conshohocken, PA 19428.

[4] 18th and 19th editions of Standard Methods for the Examination of Water and Wastewater, 1992 and 1995, respectively, American Public Health Association. Copies may be obtained from the American Public Health Association, 1015 Fifteenth Street NW, Washington, DC 20005.

[5] Techniques of Water Resources Investigation of the U.S. Geological Survey, Book 5, Chapter A-1, 3rd ed., 1989. Available from Information Services, U.S. Geological Survey, Federal Center, Box 25286, Denver, CO 80225-0425.

[6] Samples may not be filtered. Samples that contain less than 1 NTU (Nephelometric turbidity unit) and are properly preserved (concentrated nitric acid to pH < 2) may be analyzed directly (without digestion) for total metals; otherwise, digestion is required. When digestion is required, the total recoverable technique as defined in the method must be used.

[7] "Methods for the Determination of Inorganic Substances in Environmental Samples," EPA/600/R-93/100, August 1993. Available at NTIS as PB94-120821.

[8] "Methods of Analysis by the U.S. Geological Survey National Water Quality Laboratory—Determination of Inorganic and Organic Constituents in Water and Fluvial Sediments, Open File Report 93-125." Available at Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

9 Because MDLs reported in EPA Methods 200.7 and 200.9 were determined using a 2X preconcentration step during sample digestion, MDLs determined when samples are analyzed by direct analysis (i.e., no sample digestion) will be higher. Preconcentration may be required for direct analysis of lead by Methods 200.9, 3113B, and 3559-90D unless multiple in-furnace depositions are made.

10 The description for Method 1001 is available from Palintest, Ltd., 21 Kenton Lands Road, P.O. Box 18395, Erlanger, KY 41018; or from the Hach Company, P.O. Box 389, Loveland, CO.

(2) Certified laboratory requirements. Lead and copper analyses under this subrule shall only be conducted by laboratories that have been certified by the department and are in compliance with the requirements of 567—Chapter 83.

(3) All lead and copper levels measured between the practical quantitation limit (PQL) and method detection limit (MDL) must be either reported as measured or they can be reported as one-half the PQL specified for lead and copper in 41.4(1)*"g"*(2)"2." All levels below the lead and copper MDLs must be reported as zero.

41.4(2) *Lead, copper, and corrosivity regulation by the setting of an MCL.* Reserved.

The procedures shall be done in accordance with the documents listed below. The incorporation by reference of the following documents was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR Part 51, effective January 4, 1995. Copies of the documents may be obtained from the sources listed below. Contact the Safe Drinking Water Hotline at (800)426-4791 to obtain information about these documents. Documents may be inspected at EPA's Drinking Water Docket, 401 M Street, SW, Washington, DC 20460 (telephone: (202)260-3027); or at the Office of Federal Register, 800 North Capitol Street NW, Suite 700, Washington, DC.

567—41.5(455B) Organic chemicals.

41.5(1) *MCLs and other requirements for organic chemicals.* Maximum contaminant levels for three classes of organic chemical contaminants specified in 41.5(1)*"b"* apply to community water systems and nontransient noncommunity water systems as specified herein. The three referenced organic chemical classes are volatile organic chemicals (VOCs), synthetic organic chemicals (SOCs), and trihalomethanes. The requirements also contain monitoring requirements, best available technology (BAT) identification, and analytical method requirements referenced in 41.5(1)*"c," "d,"* and *"f,"* respectively.

a. *Applicability.* The maximum contaminant levels for volatile and synthetic organic contaminants apply to community and nontransient noncommunity water systems. Compliance with the volatile and synthetic organic contaminant maximum contaminant level is calculated pursuant to 41.5(1)*"b."* The maximum contaminant level of 0.10 mg/L for total trihalomethanes (the sum of the concentrations of bromodichloromethane, tribromomethane (bromoform), dibromochloromethane, and trichloromethane (chloroform)) applies to all surface water community public water systems (CWS) serving 10,000 or more persons and all IGW CWS serving 10,000 or more persons until December 31, 2001, after which time the systems must comply with 41.6(455B). This 0.10 mg/L MCL also applies to all groundwater CWS serving 10,000 or more persons until December 31, 2003, after which time the systems must comply with 41.6(455B). Compliance with the maximum contaminant level for total trihalomethanes is calculated pursuant to 41.5(1)*"e"*(4).

b. Maximum contaminant levels (MCLs) and analytical methodology for organic compounds. The maximum contaminant levels for organic chemicals are listed in the following table. Analyses for the contaminants in this subrule shall be conducted using the following methods, or their equivalent as approved by EPA.

(1) Table:

ORGANIC CHEMICAL CONTAMINANTS, CODES, MCLS, ANALYTICAL METHODS, AND DETECTION LIMITS

Contaminant	EPA Contaminant Code	MCL (mg/L)	Methodology[1]	Detection Limit (mg/L)
Volatile Organic Chemicals (VOCs):				
Benzene	2990	0.005	502.2, 524.2	0.0005
Carbon tetrachloride	2982	0.005	502.2, 524.2, 551.1	0.0005
Chlorobenzene (mono)	2989	0.1	502.2, 524.2	0.0005
1,2-Dichlorobenzene (ortho)	2968	0.6	502.2, 524.2	0.0005
1,4-Dichlorobenzene (para)	2969	0.075	502.2, 524.2	0.0005
1,2-Dichloroethane	2980	0.005	502.2, 524.2	0.0005
1,1-Dichloroethylene	2977	0.007	502.2, 524.2	0.0005
cis-1,2-Dichloroethylene	2380	0.07	502.2, 524.2	0.0005
trans-1,2-Dichloroethylene	2979	0.1	502.2, 524.2	0.0005
Dichloromethane	2964	0.005	502.2, 524.2	0.0005
1,2-Dichloropropane	2983*	0.005	502.2, 524.2	0.0005
Ethylbenzene	2992	0.7	502.2, 524.2	0.0005
Styrene	2996	0.1	502.2, 524.2	0.0005
Tetrachloroethylene	2987	0.005	502.2, 524.2, 551.1	0.0005
Toluene	2991	1	502.2, 524.2	0.0005
1,1,1-Trichloroethane	2981	0.2	502.2, 524.2, 551.1	0.0005
Trichloroethylene	2984	0.005	502.2, 524.2, 551.1	0.0005
1,2,4-Trichlorobenzene	2378	0.07	502.2, 524.2	0.0005
1,1,2-Trichloroethane	2985	0.005	502.2, 524.2, 551.1	0.0005
Vinyl chloride	2976	0.002	502.2, 524.2	0.0005
Xylenes (total)	2955*	10	502.2, 524.2	0.0005
Synthetic Organic Chemicals (SOCs):				
Alachlor[3]	2051	0.002	505, 507, 508.1, 525.2, 551.1	0.0002
Aldicarb	2047	0.003	531.1, 6610	0.0005
Aldicarb sulfone	2044	0.002	531.1, 6610	0.0008
Aldicarb sulfoxide	2043	0.004	531.1, 6610	0.0005
Atrazine[3]	2050	0.003	505, 507, 508.1, 525.2, 551.1	0.0001
Benzo(a)pyrene	2306	0.0002	525.2, 550, 550.1	0.00002
Carbofuran	2046	0.04	531.1, 6610	0.0009
Chlordane[3]	2959	0.002	505, 508, 508.1, 525.2	0.0002
2,4-D[6] (as acids, salts, or esters)	2105	0.07	515.1, 515.2, 515.3, 555, D5317-93	0.0001

Dalapon	2031	0.2	515.1, 515.3, 552.1, 552.2	0.001
Contaminant	EPA Contaminant Code	MCL (mg/L)	Methodology[1]	Detection Limit (mg/L)
1,2-Dibromo-3-chloropropane (DBCP)	2931	0.0002	504.1, 551.1	0.00002
Di(2-ethylhexyl)adipate	2035	0.4	506, 525.2	0.0006
Di(2-ethylhexyl)phthalate	2039	0.006	506, 525.2	0.0006
Dinoseb[6]	2041	0.007	515.1, 515.2, 515.3, 555	0.0002
Diquat	2032	0.02	549.2	0.0004
Endothall	2033	0.1	548.1	0.009
Endrin[3]	2005	0.002	505, 508, 508.1, 525.2, 551.1	0.00001
Ethylene dibromide (EDB)	2946	0.00005	504.1, 551.1	0.00001
Glyphosate	2034	0.7	547, 6651	0.006
Heptachlor[3]	2065	0.0004	505, 508, 508.1, 525.2, 551.1	0.00004
Heptachlor epoxide[3]	2067	0.0002	505, 508, 508.1, 525.2, 551.1	0.00002
Hexachlorobenzene[3]	2274	0.001	505, 508, 508.1, 525.2, 551.1	0.0001
Hexachlorocyclopentadiene[3]	2042	0.05	505, 508, 508.1, 525.2, 551.1	0.0001
Lindane (gamma BHC)[3]	2010	0.0002	505, 508, 508.1, 525.2, 551.1	0.00002
Methoxychlor[3]	2015	0.04	505, 508, 508.1, 525.2, 551.1	0.0001
Oxamyl	2036	0.2	531.1, 6610	0.002
Pentachlorophenol	2326	0.001	515.1, 515.2, 515.3, 525.2, 555, D5317-93	0.00004
Picloram[3,6]	2040	0.5	515.1, 515.2, 515.3, 555, D5317-93	0.0001
Polychlorinated biphenyls[4] (as decachlorobiphenyl) (as Arochlors)[3]	2383	0.0005	508A 505, 508, 508.1, 525.2	0.0001
Simazine[3]	2037	0.004	505, 507, 508.1, 525.2, 551.1	0.00007
2,3,7,8-TCDD (dioxin)	2063	$3x10^{-8}$	1613	$5x10^{-9}$
2,4,5-TP[6] (Silvex)	2110	0.05	515.1, 515.2, 515.3, 555, D5317-93	0.0002
Toxaphene[3]	2020	0.003	505, 508, 508.1, 525.2	0.001

Total Trihalomethanes (TTHMs)[5]:

Total Trihalomethanes (the sum of the concentrations of bromodichloromethane, dibromochloromethane, tribromomethane (bromoform), and trichloromethane (chloroform))	2950	0.10	502.2, 524.2, 551.1	

*As of January 1, 1999, the contaminant codes for the following compounds were changed from the Iowa Contaminant Code to the EPA Contaminant Code:

Contaminant	Iowa Contaminant Code (Old)	EPA Contaminant Code (New)
1,2 Dichloropropane	2325	2983
Xylenes (total)	2974	2955

[1] Analyses for the contaminants in this section shall be conducted using the following EPA methods or their equivalent as approved by EPA. This incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR Part 51, effective January 4, 1995. Copies may be inspected at EPA's Drinking Water Docket, 401 M Street SW, Washington, DC 20460; or at the Office of the Federal Register, 800 North Capitol Street NW, Suite 700, Washington, DC.

The following methods are available from the National Technical Information Service, U.S. Department of Commerce, 5285 Port Royal Road, Springfield, VA 22161 (telephone: (800)553-6847).

Methods for the Determination of Organic Compounds in Drinking Water, EPA-600/4-88-039, December 1988, Revised July 1991 (NTIS PB91-231480): Methods 508A and 515.1.

Methods for the Determination of Organic Compounds in Drinking Water—Supplement I, EPA-600/4-90-020, July 1990 (NTIS PB91-146027): Methods 547, 550, 550.1.

Methods for the Determination of Organic Compounds in Drinking Water—Supplement II, EPA-600/R-92-129, August 1992 (NTIS PB92-207703): Methods 548.1, 552.1, 555.

Methods for the Determination of Organic Compounds in Drinking Water—Supplement III, EPA-600/R-95-131, August 1995 (NTIS PB95-261616): Methods 502.2, 504.1, 505, 506, 507, 508, 508.1, 515.2, 524.2, 525.2, 531.1, 551.1, 552.2.

Method 1613 "Tetra-through Octa-Chlorinated Dioxins and Furans by Isotope-Dilution HRGC/HRMS," EPA-821-B-94-005, October 1994 (NTIS PB95-104774).

The following American Public Health Association (APHA) documents are available from APHA, 1015 Fifteenth Street NW, Washington, DC 20005.

Supplement to the 18th edition of Standard Methods for the Examination of Water and Wastewater, 1994, or Standard Methods for the Examination of Water and Wastewater, 19th edition, 1995 (either publication may be used), APHA: Method 6610.

Standard Methods for the Examination of Water and Wastewater, 18th edition, 1992, and 19th edition, 1995 (either edition may be used), APHA: Method 6651.

The following American Society for Testing and Materials (ASTM) method is available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428.

Annual book of ASTM Standards, 1996, Vol. 11.02 (or any edition published after 1993), ASTM: D5317-93.

Methods 515.3 and 549.2 are available from U.S. EPA NERL, 26 W. Martin Luther King Drive, Cincinnati, OH 45268.

Other required analytical test procedures germane to the conduct of these analyses are contained in Technical Notes on Drinking Water Methods, EPA-600/R-94-173, October 1994 (NTIS PB95-104766).

[2] Reserved.

[3] Substitution of the detector specified in Method 505, 507, 508, or 508.1 for the purpose of achieving lower detection limits is allowed as follows. Either an electron capture or nitrogen-phosphorus detector may be used provided all regulatory requirements and quality control criteria are met.

[4] PCBs are qualitatively identified as Aroclors and measured for compliance purposes as decachlorobiphenyl. Users of Method 505 may have more difficulty in achieving the required detection limits than users of Method 508. 508.1, or 525.2.

[5] The TTHM MCL for surface water or influenced groundwater CWS and NTNC systems serving over 10,000 persons will be changed to 0.080 mg/L on January 1, 2002. All remaining CWS and NTNC will be required to comply with the 0.080 mg/L MCL on January 1, 2004. See rule 41.6(455B) for additional requirements.

[6] Accurate determination of the chlorinated esters requires hydrolysis of the sample as described in EPA Methods 515.1, 515.2, 515.3, and 555, and ASTM Method D5317-93.

(2) Organic chemical compliance calculations (other than total trihalomethanes). Compliance with 41.5(1)*"b"*(1) shall be determined based on the analytical results obtained at each sampling point.

1. For systems which are conducting monitoring at a frequency greater than annual, compliance is determined by a running annual average of all samples taken at each sampling point. If the annual average of any sampling point is greater than the MCL, then the system is out of compliance. If the initial sample or a subsequent sample causes the annual average to be exceeded, then the system is out of compliance immediately. Any samples below the detection limit shall be calculated as zero for purposes of determining the annual average.

2. If monitoring is conducted annually, or less frequently, the system is out of compliance if the level of a contaminant at any sampling point is greater than the MCL. If a confirmation sample is required by the department, the determination of compliance will be based on the average of two samples.

3. If a public water system has a distribution system separable from other parts of the distribution system with no interconnections, the department may allow the system to give public notice to only that portion of the system which is out of compliance.

(3) Treatment techniques for acrylamide and epichlorohydrin. Each public water supply system must certify annually in writing to the department (using third-party or manufacturer's certification) that when acrylamide and epichlorohydrin are used in drinking water systems, the combination (or product) of dose and monomer level does not exceed the levels specified as follows:

Acrylamide = 0.05% dosed at 1 ppm (or equivalent)
Epichlorohydrin = 0.01% dosed at 20 ppm (or equivalent)

Certifications can rely on information provided by manufacturers or third parties, as approved by the department.

c. Organic chemical monitoring requirements. Each public water system shall monitor at the time designated within each compliance period.

(1) Routine volatile organic chemical (VOC) monitoring requirements. Beginning on January 1, 1993, community water supplies and NTNC water supplies shall conduct monitoring of the contaminants listed in 41.5(1)*"b"*(1) for the purpose of determining compliance with the maximum contaminant level.

(2) VOC monitoring protocol.

1. VOC groundwater monitoring protocol. Groundwater systems shall take a minimum of one sample at every entry point to the distribution system which is representative of each well after treatment (hereafter called a source/entry point). Each sample must be taken at the same sampling point unless conditions make another sampling point more representative of each source, treatment plant, or within the distribution system.

2. VOC surface water monitoring protocol. Surface water systems (and combined surface/groundwater systems) shall take a minimum of one sample at each entry point to the distribution system after treatment (hereafter called a source/entry point). Each sample must be taken at the same sampling point unless conditions make another sampling point more representative of each source, treatment plant, or within the distribution system.

3. Multiple sources. If the system draws water from more than one source and the sources are combined before distribution, the system must sample at an entry point to the distribution system during periods of normal operating conditions (i.e., when water representative of all sources is being used). If a representative sample of all water sources cannot be obtained, as determined by the department, separate source/entry points with the appropriate monitoring requirements will be assigned by the department.

4. Initial VOCs monitoring frequency. Each community and nontransient noncommunity water system shall take four consecutive quarterly samples for each contaminant listed in 41.5(1)*"b"*(1) during each compliance period, beginning in the initial compliance period. If the initial monitoring for contaminants listed in 41.5(1)*"b"*(1) has been completed by December 31, 1992, and the system did not detect any contaminant listed in 41.5(1)*"b"*(1), then each groundwater and surface water system shall take one sample annually beginning with the initial compliance period.

5. Reduced VOC monitoring for groundwater systems. After a minimum of three years of annual sampling, the department may allow groundwater systems with no previous detection of any contaminant listed in 41.5(1)*"b"*(1) to take one sample during each compliance period.

6. VOC monitoring waivers. Each community and nontransient noncommunity groundwater system which does not detect a contaminant listed in 41.5(1)*"b"*(1) may apply to the department for a waiver from the requirements of 41.5(1)*"c"*(2)"4" and "5" after completing the initial monitoring. A waiver shall be effective for no more than six years (two compliance periods). The department may also issue waivers to small systems for the initial round of monitoring for 1,2,4-trichlorobenzene. Detection is defined as greater than or equal to 0.0005 mg/L.

7. Bases of a VOC monitoring waiver. The department may grant a waiver if the department finds that there has not been any knowledge of previous use (including transport, storage, or disposal) of the contaminant within the watershed or zone of influence of the system. If previous use of the contaminant is unknown or it has been used previously, then the following factors shall be used to determine whether a waiver is granted.

- Previous analytical results.
- The proximity of the system to a potential point or nonpoint source of contamination. Point sources include spills and leaks of chemicals at or near a water treatment facility or at manufacturing, distribution, or storage facilities, or from hazardous and municipal waste landfills and other waste handling or treatment facilities.
- The environmental persistence and transport of the contaminants.
- The number of persons served by the public water system and the proximity of a smaller system to a larger system, and
- How well the water source is protected against contamination, such as whether it is a surface or groundwater system. Groundwater systems must consider factors such as depth of the well, the type of soil, and wellhead protection. Surface water systems must consider watershed protection.

8. VOC monitoring waiver requirements for groundwater systems. As a condition of the waiver, a groundwater system must take one sample at each sampling point during the time the waiver is effective (i.e., one sample during two compliance periods or six years) and update its vulnerability assessment considering the factors listed in 41.5(1)*"c"*(2)"7." Based on this vulnerability assessment the department must reconfirm that the system is nonvulnerable. If the department does not reconfirm within three years of the initial vulnerability determination, then the waiver is invalidated and the system is required to sample annually as specified in 41.5(1)*"c"*(2)"4."

9. VOC monitoring waiver requirements for surface water systems. Each community and nontransient noncommunity surface water system which does not detect a contaminant listed in 41.5(1)*"b"*(1) may apply to the department for a waiver from the requirements of 41.5(1)*"c"*(2)"4" after completing the initial monitoring. Composite samples from a maximum of five sampling points are allowed, provided that the detection limit of the method used for analysis is less than one-fifth of the MCL. Systems meeting this criterion must be determined by the department to be nonvulnerable based on a vulnerability assessment during each compliance period. Each system receiving a waiver shall sample at the frequency specified by the department (if any).

10. Increased VOC monitoring. If a contaminant listed in 41.5(1)*"b"*(1) is detected at a level exceeding 0.0005 mg/L in any sample, then:

The system must monitor quarterly at each sampling point which resulted in a detection.

The department may decrease the quarterly monitoring requirement specified in 41.5(1)*"c"*(2)"4" provided it has determined that the system is reliably and consistently below the maximum contaminant level. In no case shall the department make this determination unless a groundwater system takes a minimum of two quarterly samples and a surface water system takes a minimum of four quarterly samples.

If the department determines that the system is reliably and consistently below the MCL, the department may allow the system to monitor annually. Systems which monitor annually must monitor during the quarter(s) which previously yielded the highest analytical result.

Systems which have three consecutive annual samples with no detection of a contaminant may apply to the department for a waiver as specified in 41.5(1)*"c"*(2)"6."

Groundwater systems which have detected one or more of the following two-carbon organic compounds: trichloroethylene, tetrachloroethylene, 1,2-dichloroethane, 1,1,1-trichloroethane, cis-1,2-dichloroethylene, trans-1,2-dichloroethylene, or 1,1-dichloroethylene shall monitor quarterly for vinyl chloride. A vinyl chloride sample shall be taken at each sampling point at which one or more of the two-carbon organic compounds was detected. If the results of the first analysis do not detect vinyl chloride, the department may reduce the quarterly monitoring frequency of vinyl chloride monitoring to one sample during each compliance period. Surface water systems are required to monitor for vinyl chloride as specified by the department.

11. VOCs reliably and consistently below the MCL. Systems which violate the MCL requirements of 41.5(1)*"b"*(1) must monitor quarterly. After a minimum of four consecutive quarterly samples which show the system is in compliance and the department determines that the system is reliably and consistently below the maximum contaminant level, the system may monitor at the frequency and times specified in 41.5(1)*"c"*(2)"10," third unnumbered paragraph (following approval by the department).

(3) Routine and repeat synthetic organic chemical (SOC) monitoring requirements. Analysis of the synthetic organic contaminants listed in 41.5(1)*"b"*(1) for the purposes of determining compliance with the maximum contaminant level shall be conducted as follows:

1. SOC groundwater monitoring protocols. Groundwater systems shall take a minimum of one sample at every entry point to the distribution system which is representative of each well after treatment (hereafter called a source/entry point). Each sample must be taken at the same sampling point unless conditions make another sampling point more representative of each source or treatment plant.

2. SOC surface water monitoring protocols. Surface water systems shall take a minimum of one sample at each entry point to the distribution system after treatment (hereafter called a source/entry point). Each sample must be taken at the same sampling point unless conditions make another sampling

point more representative of each source or treatment plant. For purposes of this paragraph, surface water systems include systems with a combination of surface and ground sources.

3. Multiple sources. If the system draws water from more than one source and the sources are combined before distribution, the system must sample at an entry point to the distribution system during periods of normal operating conditions (i.e., when water representative of all sources is being used). If a representative sample of all water sources cannot be obtained, as determined by the department, separate source/entry points with the appropriate monitoring requirements will be assigned by the department.

4. SOC monitoring frequency. Community and nontransient noncommunity water systems shall take four consecutive quarterly samples for each contaminant listed in 41.5(1)*"b"*(1) during each compliance period beginning with the compliance period starting January 1, 1993. Systems serving more than 3,300 persons which do not detect a contaminant in the initial compliance period may reduce the sampling frequency to a minimum of two quarterly samples in one year during each repeat compliance period. Systems serving less than or equal to 3,300 persons which do not detect a contaminant in the initial compliance period may reduce the sampling frequency to a minimum of one sample during each repeat compliance period.

5. SOC monitoring waivers. Each community and nontransient water system may apply to the department for a waiver from the requirements of 41.5(1)*"c"*(3)"4." A system must reapply for a waiver for each compliance period.

6. Bases of an SOC monitoring waiver. The department may grant a waiver if the department finds that there has been no knowledge of previous use (including transport, storage, or disposal) of the contaminant within the watershed or zone of influence of the system. If previous use of the contaminant is unknown or it has been used previously, then the department shall determine whether a waiver may be granted by considering:

- Previous analytical results.
- The proximity of the system to a potential point or nonpoint source of contamination. Point sources include spills and leaks of chemicals at or near a water treatment facility or at manufacturing, distribution, or storage facilities, or from hazardous and municipal waste landfills and other waste handling or treatment facilities. Nonpoint sources include the use of pesticides to control insect and weed pests on agricultural areas, forest lands, home and gardens, and other land application uses.
- The environmental persistence and transport of the pesticide or PCBs.
- How well the water source is protected against contamination due to such factors as depth of the well and the type of soil and the integrity of the well casing.
- Elevated nitrate levels at the water supply source, and
- Use of PCBs in equipment used in the production, storage, or distribution of water (i.e., PCBs used in pumps and transformers).

7. Increased SOC monitoring. If a synthetic organic contaminant listed in 41.5(1)*"b"*(1) is detected in any sample, then:

- Each system must monitor quarterly at each sampling point which resulted in a detection.
- The department may decrease the quarterly SOC monitoring requirement if the system is reliably and consistently below the maximum contaminant level. In no case shall the department make this determination unless a groundwater system takes a minimum of two quarterly samples and a surface water system takes a minimum of four quarterly samples.
- After the department determines the system is reliably and consistently below the maximum contaminant level, the system may monitor annually. Systems which monitor annually must monitor during the quarter that previously yielded the highest analytical result.
- Systems which have three consecutive annual samples with no detection of a contaminant may apply to the department for a waiver as specified in 41.5(1)*"c"*(3)"6."
- If monitoring results in detection of one or more of certain related contaminants (aldicarb, aldicarb sulfone, aldicarb sulfoxide, heptachlor, and heptachlor epoxide), then subsequent monitoring shall analyze for all related contaminants.

8. MCL violation and reliably/consistently below the MCL. Systems which violate the requirements of 41.5(1)*"b"* must monitor quarterly. After a minimum of four quarterly samples show the system is in

compliance and the department determines the system is reliably and consistently below the MCL, the system shall monitor at the frequency specified in 41.5(1)*"c"*(3)"7."

(4) Organic chemical (SOC and VOC) confirmation samples. The department may require a confirmation sample for positive or negative results. If a confirmation sample is required by the department, the result must be averaged with the first sampling result and the average is used for the compliance determination as specified by 41.5(1)*"b"*(2). The department has discretion to disregard results of obvious sampling errors from this calculation.

(5) Organic chemical (SOC and VOC) composite samples. The department may reduce the total number of samples a system must analyze by allowing the use of compositing. Composite samples from a maximum of five sampling points are allowed, provided that the detection limit of the method used for analysis is less than one-fifth of the MCL. Compositing of samples must be done in the laboratory and analyzed within 14 days of sample collection.

1. If the concentration in the SOC or VOC composite sample is greater than or equal to 0.0005 mg/L for any contaminant listed in 41.5 (1)*"b"*(1), then a follow-up sample must be taken and analyzed within 14 days from each sampling point included in the composite.

2. If duplicates of the original sample taken from each sampling point used in the composite are available, the system may use these instead of resampling, provided the holding time of the samples is not exceeded. The duplicates must be analyzed and the results reported to the department within 14 days after completing analysis of the composite sample.

3. Compositing may only be permitted by the department at sampling points within a single system, unless the population served by the system is less than 3,300 persons. In systems serving less than or equal to 3,300 persons, the department may permit compositing among different systems provided the five-sample limit is maintained.

4. Compositing samples prior to gas chromatographic analysis.

- Add 5 mL or equal larger amounts of each sample (up to five samples are allowed) to a 25-mL glass syringe. Special precautions must be made to maintain zero headspace in the syringe.
- The samples must be cooled at 4 degrees Celsius during this step to minimize volatilization losses.
- Mix well and draw out a 5-mL aliquot for analysis.
- Follow sample introduction, purging, and desorption steps described in the method.
- If less than five samples are used for compositing, a proportionately small syringe may be used.

5. Compositing samples prior to gas chromotographic/mass spectrometric analysis.

- Inject 5 mL or equal larger amounts of each aqueous sample (up to five samples are allowed) into a 25-mL purging device using the sample introduction technique described in the method.
- The total volume of the sample in the purging device must be 25 mL.
- Purge and desorb as described in the method.

6. Grandfathered organic chemical (SOC and VOC) data. The department may allow the use of monitoring data collected after January 1, 1988, for VOCs and January 1, 1990, for SOCs required under Section 1445 of the Safe Drinking Water Act for purposes of initial monitoring compliance. If the data are generally consistent with the other requirements in this subparagraph, the department may use such data (i.e., a single sample rather than four quarterly samples) to satisfy the initial monitoring requirement for the initial compliance period beginning January 1, 1993. Systems which use grandfathered samples for VOCs and did not detect any contaminants listed in 41.5(1)*"b"*(1) shall begin monitoring annually in accordance with 41.5(1)*"c"*(2) beginning January 1, 1993.

7. Increased organic chemical (SOC and VOC) monitoring. The department may increase the required monitoring frequency, where necessary, to detect variations within the system (e.g., fluctuations in concentration due to seasonal use, changes in water source, changes to treatment facilities or normal operation thereof).

8. Organic chemical (SOC and VOC) vulnerability assessment criteria. Vulnerability of each public water system shall be determined by the department based upon an assessment of the following factors.

- VOC vulnerability assessment criteria—previous monitoring results. A system will be classified vulnerable if any sample was analyzed to contain one or more contaminants listed in 41.5(1)*"b"*(1)-(VOCs) or 41.5(1)*"b"*(3) except for trihalomethanes or other demonstrated disinfection by-products.
- SOC vulnerability assessment criteria—previous monitoring results. A system will be classified vulnerable if any sample was analyzed to contain one or more contaminants listed in 41.5(1)*"b"*(2)-(SOCs) or 41.5(1)*"b"*(3) except for trihalomethanes or other demonstrated disinfection by-products.
- Proximity of surface water supplies to commercial or industrial use, disposal or storage of volatile synthetic organic chemicals. Surface waters which withdraw water directly from reservoirs are considered vulnerable if the drainage basin upgradient and within two miles of the shoreline at the maximum water level contains major transportation facilities such as primary highways or railroads or any of the contaminant sources listed in this subparagraph. Surface water supplies which withdraw water directly from flowing water courses are considered vulnerable if the drainage basin upgradient and within two miles of the water intake structure contains major transportation facilities such as primary highways or railroads or any of the contaminant sources listed in this subparagraph.
- Proximity of supplies to commercial or industrial use, disposal or storage of volatile synthetic organic chemicals. Wells that are not separated from sources of contamination by at least the following distances will be considered vulnerable.

Sources of Contamination	Shallow Wells as defined in 567—40.2(455B)	Deep Wells as defined in 567—40.2(455B)
Sanitary and industrial point discharges	400 ft	400 ft
Mechanical waste treatment plants	400 ft	200 ft
Lagoons	1,000 ft	400 ft
Chemical and storage (aboveground)	200 ft	100 ft
Chemical and mineral storage including underground storage tanks on or below ground	400 ft	200 ft
Solid waste disposal site	1,000 ft	1,000 ft

- A system is deemed to be vulnerable for a period of three years after any positive measurement of one or more contaminants listed in 41.5(1)*"b"*(3) except for trihalomethanes or other demonstrated disinfection by-products.

d. Best available technology(ies) (BATs). Rescinded IAB 8/11/99, effective 9/15/99.

e. Total trihalomethanes sampling, analytical and other requirements. The maximum contaminant level for total trihalomethanes applies to community water systems which serve a population of 10,000 or more individuals and which add a disinfectant (oxidant) to the water in any part of the treatment process. Compliance with the maximum contaminant level is calculated pursuant to 41.5(1)*"b"*(1). Total trihalomethanes is the sum of the concentrations of bromodichloromethane, dibromochloromethane, tribromomethane (bromoform) and trichloromethane (chloroform).

(1) Applicability. Community water systems which use a groundwater source, serve a population of 10,000 or more individuals, and which add disinfectant (oxidant) to the water in any part of the drinking water treatment process shall analyze for total trihalomethanes in accordance with this subrule, until December 31, 2003, after which time the systems must comply with 41.6(455B). The requirements of this subrule also apply to community water systems which use surface water or IGW in whole or in part and serve 10,000 or more persons, until December 31, 2001, after which time the systems must comply with 41.6(455B). After December 31, 2003, paragraph 41.5(1)*"e"* is no longer applicable to any Iowa public water supply.

1. For the purpose of this subrule, samples to be taken by the system shall be based on the number of treatment plants used by the system, except that multiple wells drawing water from a single aquifer may, with approval of the department, be considered as one treatment plant for determining the minimum number of samples.

2. All samples required within a calendar quarter shall be collected within a 24-hour period.

(2) General sampling requirements.

1. For all community water systems utilizing surface water sources in whole or in part, and for all community water systems utilizing only groundwater sources that have not been determined by the department to qualify for the monitoring requirements of 41.5(1)*"e"*(3), analyses for total trihalomethanes shall be performed at quarterly intervals on at least four water samples for each treatment plant used by the system. At least 25 percent of the samples shall be taken at locations within the distribution system reflecting the maximum residence time of the water in the system. The remaining 75 percent shall be taken at representative locations in the distribution system, taking into account number of persons served, different sources of water and different treatment methods employed. The results of all analyses per quarter shall be arithmetically averaged. All samples collected shall be used in the computation of the average, unless the analytical results are invalidated for technical reasons. Sampling and analyses shall be conducted in accordance with the methods listed in 41.5(1)*"e"*(5).

2. The department may allow a community water system to reduce the monitoring frequency required by 41.5(1)*"e"*(2)"1" to a minimum of one sample analyzed for TTHMs per quarter taken at a point in the distribution system reflecting the maximum residence time of the water in the system, upon a determination by the department that the data from at least one year of monitoring in accordance with 41.5(1)*"e"*(2)"1" and local conditions demonstrate that total trihalomethane concentrations will be consistently below the maximum contaminant level.

3. If at any time during which the reduced monitoring frequency prescribed under 41.5(1)*"e"*(2)"2" applies, the results from any analysis exceed 0.10 mg/L of TTHMs and such results are confirmed by at least one check sample taken promptly after such results are received, or if the system makes any significant change to its source of water or treatment program, the system shall immediately begin monitoring in accordance with the requirements of 41.5(1)*"e"*(2)"1" which monitoring shall continue for at least one year before the frequency may be reduced again. The department may increase a system's monitoring frequency above the minimum in those cases where the department determines it is necessary to detect variations of TTHM levels within the distribution system.

(3) Groundwater sampling requirements.

1. The department may allow a community water system utilizing only groundwater sources to reduce the monitoring frequency required by 41.5(1)*"e"*(2)"1" to a minimum of one sample for maximum TTHM potential per year for each treatment plant used by the system taken at a point in the distribution system reflecting maximum residence time of the water in the system. The system's monitoring frequency may only be reduced upon a determination by the department that, based upon the data submitted by the system, the system has a maximum TTHM potential of less than 0.10 mg/L and that, based upon an assessment of the local conditions of the system, the system is not likely to approach or exceed the maximum contaminant level for TTHMs. All samples collected shall be used for determining whether the system must comply with the monitoring requirements of 41.5(1)*"e"*(2), unless the analytical results are invalidated for technical reasons. Sampling and analyses shall be conducted in accordance with the methods listed in 41.5(1)*"e"*(5).

2. If at any time during which the reduced monitoring frequency prescribed under 41.5(1)*"e"*(3)"1" applies, the results from any analysis taken by the system for the maximum TTHM potential are equal to or greater than 0.10 mg/L, and such results are confirmed by at least one check sample taken promptly after such results are received, the system shall immediately begin monitoring in accordance with the requirements of 41.5(1)*"e"*(2) and such monitoring shall continue for at least one year before the frequency may be reduced again. In the event of any significant change to the system's raw water or treatment program, the system shall immediately analyze an additional sample for maximum TTHM potential taken at a point in the distribution system reflecting maximum residence time of the water in the system for the purpose of determining whether the system must comply with

the monitoring requirements of 41.5(1)*"e"*(2). The department may increase monitoring frequencies above the minimum in those cases where the department determines it is necessary to detect variation of TTHM levels within the distribution system.

(4) Compliance calculation. Compliance with 41.5(1)*"b"*(3) shall be determined based on a running annual average of quarterly samples collected by the system as prescribed in 41.5(1)*"e"*(2)"1" or 41.5(1)*"e"*(2)"2." If the average of samples covering any 12-month period exceeds the maximum contaminant level, the supplier of water shall notify the public pursuant to 567—42.1(455B). Monitoring after public notification shall be at a frequency designated by the department and shall continue until a monitoring schedule as a condition to an operation permit or enforcement action shall become effective.

(5) Sampling and analytical methodology. Sampling and analyses made pursuant to this subrule shall be conducted by one of the approved total trihalomethane methods listed in 41.5(1)"*b*."

Samples for TTHM shall be dechlorinated upon collection to prevent further production of trihalomethanes, according to the procedures described in the above-referenced methods, except acidification is not required if only THMs or TTHMs are to be determined. Samples for maximum TTHM potential should not be dechlorinated or acidified, and should be held for seven days at 25 degrees Celsius (or above) prior to analysis.

(6) System modificiation. Before a community water system makes any modifications to its existing treatment process for the purposes of achieving compliance with the TTHM MCL, such system must submit and obtain department approval of a plan setting forth its proposed modification and any safeguards that it will implement to ensure that the bacteriological quality of the drinking water served by such system will not be adversely affected by such modification.

Each system shall comply with the provisions set forth in the department-approved plan. At a minimum, a department-approved plan shall require any system modifying its disinfection practice to:

1. Evaluate the water system for sanitary defects and evaluate the source for biological quality;

2. Evaluate its existing treatment practices and consider improvements that will minimize disinfectant demand and optimize finished water quality throughout the distribution system;

3. Provide baseline water quality survey data of the distribution system required by the department;

4. Conduct any additional monitoring determined by the department to be necessary to ensure continued maintenance of optimal biological quality in the finished water; and

5. Demonstrate an active disinfectant residual throughout the distribution system at all times during and after the modification.

Before a community water system makes any modifications to its existing physical treatment plant for the purpose of achieving compliance with 41.5(1)*"b"*(3), such system must obtain department approval in accordance with 567—43.3(455B).

(7) Maximum total trihalomethane potential methodology. The water sample for determination of maximum total trihalomethane potential is taken from a point in the distribution system that reflects maximum residence time. Procedures for sample collection and handling are given in the methods. No reducing agent is added to "quench" the chemical reaction producing THMs at the time of sample collection. The intent is to permit the level of THM precursors to be depleted and the concentration of THMs to be maximized for the supply being tested. Four experimental parameters affecting maximum THM production are pH, temperature, reaction time, and the presence of a disinfectant residual. These parameters are dealt with as follows:

1. Measure the disinfectant residual at the selected sampling point. Proceed only if a measurable residual is present.

2. Collect triplicate 40 mL water samples at the pH prevailing at the time of sampling and prepare a method blank according to the methods.

3. Seal and store these samples together for seven days at 25 degrees Celsius or above.

4. After this time period, open one of the sample containers and check for disinfectant residual. Absence of a disinfectant residual invalidates the sample for further analysis.

5. Once a disinfectant residual has been demonstrated, open another of the sealed samples and determine THM concentration using an approved analytical method.

f. *Analytical procedures—organics.*

(1) Volatile organic chemical (VOC) and synthetic organic chemical (SOC) analytical methods. Analysis for the VOC and SOC contaminants listed in 41.5(1)*"b"*(1) must be conducted using the specified EPA methods. Other analytical test procedures are contained in Technical Notes on Drinking Water Methods, EPA-600/R-94-173, October 1994, NTIS PB95-104766.

(2) PCB analytical methodology. Analysis for PCBs shall be conducted using the methods in 41.5(1)*"b"*(1) and as follows:

1. Each system which monitors for PCBs shall analyze each sample using Method 505, 508, 508.1, or 525.2. Users of Method 505 may have more difficulty in achieving the required Aroclor detection limits than users of Method 508, 508.1, or 525.2.

2. If PCBs (as one of seven Aroclors) are detected in any sample analyzed using Method 505 or 508, the system shall reanalyze the sample using Method 508A to quantitate PCBs as decachlorobiphenyl.

PCB AROCLOR DETECTION LIMITS

Aroclor	Detection Limit (mg/L)
1016	0.00008
1221	0.02
1232	0.0005
1242	0.0003
1248	0.0001
1254	0.0001
1260	0.0002

3. Compliance with the PCB MCL shall be determined based upon the quantitative results of analyses using Method 508A.

41.5(2) *Organic chemicals occurring as (nontrihalomethane) disinfection by-products.* Reserved.

567—41.6(455B) Disinfection byproducts maximum contaminant levels and monitoring requirements.

41.6(1) *Disinfection byproducts.*

a. *Applicability.*

(1) This rule establishes criteria under which CWS and NTNC public water supply systems that add a chemical disinfectant to the water in any part of the drinking water treatment process or which provide water that contains a chemical disinfectant must modify their practices to meet the MCLs listed in this rule and the maximum residual disinfectant levels (MRDL) and treatment technique requirements for disinfection byproduct precursors listed in 567—43.6(455B).

(2) This rule establishes criteria under which TNC public water supply systems that use chlorine dioxide as a disinfectant or oxidant must modify their practices to meet the chlorine dioxide MRDL listed in 567—paragraph 43.6(1)*"b."*

(3) Compliance dates for this rule are based upon the source water type and the population served. Systems are required to comply with this rule as follows, unless otherwise noted. The department may assign an earlier monitoring period as part of the operation permit, but compliance with the maximum contaminant level is not required until the dates stated below.

1. Surface water and IGW CWS and NTNC. CWS and NTNC systems using surface water or groundwater under the direct influence of surface water in whole or in part and which serve 10,000 or more persons must comply with this rule beginning January 1, 2002. CWS and NTNC systems serving fewer than 10,000 persons must comply with this rule beginning January 1, 2004.

2. Groundwater CWS and NTNC. CWS and NTNC systems using only groundwater not under the direct influence of surface water must comply with this rule beginning January 1, 2004.

3. TNC using chlorine dioxide. TNC systems are not required to comply with this rule.

(4) Consecutive systems. Consecutive systems that provide water containing a disinfectant or oxidant are required to comply with this rule. A consecutive system may be incorporated into the sampling plan of the supply that produces the water (the primary water supplier), provided:

1. There is a mutual signed agreement between the primary and consecutive system supplied by that primary system that states the primary system will be responsible for the compliance of its consecutive system with this rule, regardless of additional treatment by the consecutive system.

2. Beginning with the primary water supply, each successive consecutive system must also be included in the primary supply's sampling plan, so that there is no system with its own sampling plan between the primary supply and the consecutive supply covered by the primary supply's plan.

3. It is understood by the primary and all consecutive systems that, even if only one system in the sampling plan has a violation, all systems in the sampling plan will receive the violation and be required to conduct public notification.

4. The department receives a copy of the signed agreement and approves the sampling plan prior to the beginning of the compliance period.

If a mutual agreement is not possible, each system (the primary system and each consecutive system) is responsible for compliance with this rule for its specific system.

(5) Systems with multiple water sources. Systems with water sources that are used independently from each other, are not from the same source as determined by the department, or do not go through identical treatment processes are required to conduct the monitoring for the applicable disinfectants or oxidants and disinfection byproducts during operation of each source. The system must comply with this rule during the use of each water source.

b. Maximum contaminant levels for disinfection byproducts. The maximum contaminant levels (MCLs) for disinfection byproducts are as follows:

Disinfection byproduct	MCL (mg/L)
Bromate	0.010
Chlorite	1.0
Haloacetic acids (HAA5)	0.060
Total trihalomethanes (TTHM)	0.080

c. Monitoring requirements for disinfection byproducts.

(1) General requirements.

1. Systems must take all samples during normal operating conditions.

2. Systems may consider multiple wells drawing water from a single aquifer as one treatment plant for determining the minimum number of TTHM and HAA5 samples required, with department approval.

3. Failure to monitor in accordance with the monitoring plan required under 41.6(1)*"c"*(1)"6" is a monitoring violation.

4. Failure to monitor is a violation for the entire period covered by the annual average where compliance is based on a running annual average of monthly or quarterly samples or averages, and the system's failure to monitor makes it impossible to determine compliance with MCLs.

5. Systems may use only data collected under the provisions of this rule or 567—43.6(455B) to qualify for reduced monitoring.

6. Each system required to monitor under the provisions of this rule or 567—43.6(455B) must develop and implement a monitoring plan. The system must maintain the plan and make it available for inspection by the department and the general public no later than 30 days following the applicable compliance dates in 41.6(1)*"a"*(3). All systems using surface water or groundwater under the direct influence of surface water and serving more than 3,300 people must submit a copy of the monitoring plan to the department by the applicable date in 41.6(1)*"a"*(3)"1." The department may also require the

plan to be submitted by any other system. After review, the department may require changes in any plan elements. The plan must include at least the following elements:

- Specific locations and schedules for collecting samples for any parameters included in this rule.
- How the system will calculate compliance with MCLs, MRDLs, and treatment techniques.
- If providing water to one or more consecutive systems, and the consecutive systems have agreed to the sampling plan by the primary supplier of the water pursuant to 41.6(1)*"a"*(4), the sampling plan of the primary water supplier must reflect the entire distribution system.

7. The department may require a monthly monitoring frequency for disinfection byproducts, which would be specified in the operation permit.

(2) Bromate. Community and nontransient noncommunity systems using ozone for disinfection or oxidation must conduct monitoring for bromate.

1. Routine monitoring. Systems must take at least one sample per month for each treatment plant in the system using ozone, collected at each source/entry point to the distribution system while the ozonation system is operating under normal conditions.

2. Reduced monitoring. The department may allow systems required to analyze for bromate to reduce monitoring from monthly to once per quarter if the system demonstrates that the average source water bromide concentration is less than 0.05 mg/L based upon representative monthly bromide measurements for one year. The system may remain on reduced bromate monitoring until the running annual average source water bromide concentration, computed quarterly, is greater than or equal to 0.05 mg/L based upon representative monthly measurements. If the running annual average source water bromide concentration is greater than or equal to 0.05 mg/L, the system must resume routine monitoring required by 41.6(1)*"c"*(2)"1."

(3) Chlorite. Community and nontransient noncommunity water systems using chlorine dioxide, for disinfection or oxidation, must conduct monitoring for chlorite.

1. Routine daily monitoring. Systems must take daily samples at the entrance to the distribution system. For any daily sample that exceeds the chlorite MCL, the system must take additional samples in the distribution system the following day at the locations required by 41.6(1)*"c"*(3)"3," which are in addition to the sample required at the entrance to the distribution system.

2. Routine monthly monitoring. Systems must take a three-sample set each month in the distribution system. The system must take one sample at each of the following locations: near the first customer, at a location representative of average residence time, and at a location reflecting maximum residence time in the distribution system. Any additional routine sampling must be conducted in the same manner (as three-sample sets, at the specified locations). The system may use the results of additional monitoring conducted in accordance with 41.6(1)*"c"*(3)"3" to meet the requirement for monitoring in this subparagraph.

3. Additional monitoring. On each day following a routine sample monitoring result that exceeds the chlorite MCL at the entrance to the distribution system, the system is required to take three chlorite distribution system samples at the following locations: as close to the first customer as possible, in a location representative of average residence time, and as close to the end of the distribution system as possible (reflecting maximum residence time in the distribution system).

4. Reduced monitoring.

- Daily chlorite monitoring at the entrance to the distribution system required by 41.6(1)*"c"*(3)"1" may not be reduced.
- The department may allow systems with monthly chlorite monitoring in the distribution system required by 41.6(1)*"c"*(3)"2" to be reduced to a requirement of 1 three-sample set per quarter after one year of monitoring where no individual chlorite sample taken in the distribution system under 41.6(1)*"c"*(3)"2" has exceeded the chlorite MCL and the system has not been required to conduct additional monitoring under 41.6(1)*"c"*(3)"3." The system may remain on the reduced monitoring schedule until either any of the three individual chlorite samples taken quarterly in the distribution system under 41.6(1)*"c"*(3)"2" exceeds the chlorite MCL or the system is required to conduct monitoring under 41.6(1)*"c"*(3)"3" of this rule, at which time the system must revert to routine monitoring.

(4) Total trihalomethanes (TTHM) and haloacetic acids (HAA5).

1. Routine monitoring. Systems must monitor at the frequency indicated in the following table:

Routine Monitoring Frequency for TTHM and HAA5

Type of System (source water type and population served)	Minimum Monitoring Frequency	Sample Location in the Distribution System
SW/IGW[3] system serving ≥10,000 persons	Four water samples per quarter per treatment plant	At least 25 percent of all samples collected each quarter at locations representing maximum residence time. Remaining samples taken at locations representative of at least average residence time in the distribution system and representing the entire distribution system, taking into account number of persons served, different sources of water, and different treatment methods.[1]
SW/IGW[3] system serving 500 - 9,999 persons	One water sample per quarter per treatment plant	Locations representing maximum residence time.[1]
SW/IGW[3] system serving <500 persons	One sample per year per treatment plant during month of warmest water temperature	Locations representing maximum residence time.[1] If the sample (or average of annual samples, if more than one sample is taken) exceeds MCL, system must increase monitoring to one sample per treatment plant per quarter, taken at a point reflecting the maximum residence time in the distribution system, until system meets reduced monitoring criteria in 41.6(1)*"c"*(4)"2," fourth unnumbered paragraph.
System using only non-IGW groundwater using chemical disinfectant and serving ≥10,000 persons	One water sample per quarter per treatment plant[2]	Locations representing maximum residence time.[1]
System using only non-IGW groundwater using chemical disinfectant and serving <10,000 persons	One sample per year per treatment plant during month of warmest water temperature	Locations representing maximum residence time.[1] If the sample (or average of annual samples, if more than one sample is taken) exceeds MCL, system must increase monitoring to one sample per treatment plant per quarter, taken at a point reflecting the maximum residence time in the distribution system, until system meets reduced monitoring criteria in 41.6(1)*"c"*(4)"2," fourth unnumbered paragraph.

[1] If a system chooses to sample more frequently than the minimum required, at least 25 percent of all samples collected each quarter (including those taken in excess of the required frequency) must be taken at locations that represent the maximum residence time of the water in the distribution system. The remaining samples must be taken at locations representative of at least average residence time in the distribution system.

[2] Multiple wells drawing water from a single aquifer may be considered one treatment plant for determining the minimum number of samples required, with department approval.

[3] SW/IGW indicates those systems that use either surface water (SW) or groundwater under the direct influence of surface water (IGW), in whole or in part.

2. Reduced monitoring. The department may allow systems a reduced monitoring frequency, except as otherwise provided, in accordance with the following table. Source water total organic carbon (TOC) levels must be determined in accordance with 567—subparagraph 43.6(2)*"c"*(1).

Reduced Monitoring Frequency for TTHM and HAA5

If you are a . . .	And you have monitored at least one year and your . . .	You may reduce monitoring to this level
SW/IGW[1] system serving ≥10,000 persons which has a source water annual average TOC level, before any treatment, of ≤4.0 mg/L.	TTHM annual average ≤0.040 mg/L and HAA5 annual average ≤0.030 mg/L	One sample per treatment plant per quarter at distribution system location reflecting maximum residence time.
SW/IGW[1] system serving 500 - 9,999 persons that has a source water annual average TOC level, before any treatment, of ≤4.0 mg/L.	TTHM annual average ≤0.040 mg/L and HAA5 annual average ≤0.030 mg/L	One sample per treatment plant per year at distribution system location reflecting maximum residence time during month of warmest water temperature.
SW/IGW[1] system serving <500 persons	Any SW/IGW[1] system serving <500 persons may not reduce its monitoring to less than one sample per treatment plant per year.	
System using only non-IGW groundwater using chemical disinfectant and serving ≥10,000 persons	TTHM annual average ≤0.040 mg/L and HAA5 annual average ≤0.030 mg/L	One sample per treatment plant per year at distribution system location reflecting maximum residence time during month of warmest water temperature.
System using only non-IGW groundwater using chemical disinfectant and serving <10,000 persons	TTHM annual average ≤0.040 mg/L and HAA5 annual average ≤0.030 mg/L for two consecutive years; or, TTHM annual average ≤0.020 mg/L and HAA5 annual average ≤0.015 mg/L for one year.	One sample per treatment plant per three-year monitoring cycle at distribution system location reflecting maximum residence time during month of warmest water temperature, with the three-year cycle beginning on January 1 following quarter in which system qualifies for reduced monitoring.

[1] SW/IGW indicates those systems that use either surface water (SW) or groundwater under the direct influence of surface water (IGW), in whole or in part.

- Systems on a reduced monitoring schedule may remain on that reduced schedule as long as the average of all samples taken in the year (for systems which must monitor quarterly) or the result of the sample (for systems which must monitor no more frequently than annually) is less than or equal to 0.060 mg/L for TTHMs and is less than or equal to 0.045 mg/L for HAA5. Systems that do not meet these levels must resume monitoring at the frequency identified in 41.6(1)*"c"*(4)"1" in the quarter immediately following the quarter in which the system exceeds 0.060 mg/L for TTHMs and 0.045 mg/L for HAA5. For systems using only groundwater not under the direct influence of surface water and serving fewer than 10,000 persons, if either the TTHM annual average is >0.080 mg/L or the HAA5 annual average is >0.060 mg/L, the system must go to increased monitoring identified in 41.6(1)*"c"*(4)"1."
- The department may allow systems on increased monitoring to return to routine monitoring if TTHM annual average is less than or equal to 0.040 mg/L and HAA5 annual average is less than or equal to 0.030 mg/L.
- The department may return a system to routine monitoring at the department's discretion.

d. Analytical requirements for disinfection byproducts.

(1) Systems must use only the analytical method(s) specified in this paragraph, or equivalent methods as determined by EPA, to demonstrate compliance with the requirements of this rule.

(2) Systems must measure disinfection byproducts by the methods (as modified by the footnotes) listed in the following table:

Approved Methods for Disinfection Byproduct Compliance Monitoring

Methodology[2]	EPA	Standard Methods	Byproduct measured[1]			
			TTHM	HAA5	Chlorite[4]	Bromate
P&T/GC/EICD & PID	502.2[3]		X			
P&T/GC/MS	524.2		X			
LLE/GC/ECD	551.1		X			
LLE/GC/ECD		6251 B		X		
SPE/GC/ECD	552.1			X		
LLE/GC/ECD	552.2			X		
Amperometric Titration		4500-ClO_2E			X	
IC	300.0				X	
IC	300.1				X	X

The procedures shall be done in accordance with the documents listed below. The incorporation by reference of the following documents was approved by the Director of the Federal Register on February 16, 1999, in accordance with 5 U.S.C. 552(a) and 1 CFR Part 51. Copies of the documents may be obtained from the sources listed below. Information regarding obtaining these documents can be obtained from the Safe Drinking Water Hotline at (800)426-4791. Documents may be inspected at EPA's Drinking Water Docket, 401 M Street SW, Washington, DC 20460 (telephone: (202)260-3027); or at the Office of Federal Register, 800 North Capitol Street NW, Suite 700, Washington, DC.

The following method is available from the American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohoken, PA 19428:

Annual Book of ASTM Standards, Volume 11.01, American Society for Testing and Materials, 1996: Method D 1253-86.

The following methods are available from the National Technical Information Service, U.S. Department of Commerce, 5285 Port Royal Road, Springfield, VA 22161 (telephone: (800)553-6847):

"Determination of Inorganic Anions in Drinking Water by Ion Chromatography, Revision 1.0," EPA-600/R-98/118, 1997 (available through NTIS, PB98-169196): Method 300.1.

Methods for the Determination of Inorganic Substances in Environmental Samples, EPA-600/R-93/100, August 1993, (NTIS PB94-121811): Method 300.0.

Methods for the Determination of Organic Compounds in Drinking Water—Supplement II, EPA-600/R-92-129, August 1992 (NTIS PB92-207703): Method 552.1.

Methods for the Determination of Organic Compounds in Drinking Water—Supplement III, EPA-600/R-95-131, August 1995 (NTIS PB95-261616): Methods 502.2, 524.2, 551.1, and 552.2.

The following methods are available from the American Public Health Association, 1015 Fifteenth Street NW, Washington, DC 20005:

Standard Methods for the Examination of Water and Wastewater, 19th edition, American Public Health Association, 1995: Methods: 4500-Cl D, 4500-Cl E, 4500-Cl F, 4500-Cl G, 4500-Cl H, 4500-Cl I, 4500-ClO_2 D, 4500-ClO_2 E, 6251 B, and 5910 B.

Standard Methods for the Examination of Water and Wastewater, Supplement to the 19th edition, American Public Health Association, 1996: Methods: 5310 B, 5310 C, and 5310 D.

[1] X indicates method is approved for measuring specified disinfection byproduct.

[2] ECD = electron capture detector IC = ion chromatography P&T = purge and trap

EICD = electrolytic conductivity detector LLE = liquid/liquid extraction PID = photoionization detector

GC = gas chromatography MS = mass spectrometer SPE = solid phase extractor

[3] If TTHMs are the only analytes being measured in the sample, then a PID is not required.

[4] Amperometric titration may be used for routine daily monitoring of chlorite at the entrance to the distribution system, as prescribed in 41.6(1)*"c"*(3)"1." Ion chromatography must be used for routine monthly monitoring of chlorite and additional monitoring of chlorite in the distribution system, as prescribed in 41.6(1)*"c"*(3)"2" and "3."

(3) Certified laboratory requirements. Analyses under this rule for disinfection byproducts shall only be conducted by laboratories that have been certified by the department and are in compliance with the requirements of 567—Chapter 83, except as specified under 41.6(1)*"d"*(4).

(4) Daily chlorite samples at the entrance to the distribution system must be measured by a Grade II, III or IV operator meeting the requirements of 567—Chapter 81, any person under the supervision of a Grade II, III or IV operator meeting the requirements of 567—Chapter 81, or a laboratory certified by the department to perform analysis under 567—Chapter 83.

e. Compliance requirements for disinfection byproducts.

(1) General requirements.

1. When compliance is based on a running annual average of monthly or quarterly samples or averages and the system fails to monitor for TTHM, HAA5, or bromate, this failure to monitor will be treated as a monitoring violation for the entire period covered by the annual average.

2. Unless invalidated by the department, all samples taken and analyzed under the provisions of this rule must be included in determining compliance, even if that number is greater than the minimum required.

3. If, during the first year of monitoring under paragraph 41.6(1)*"c,"* any individual quarter's average will cause the running annual average of that system to exceed the MCL, the system is out of compliance at the end of that quarter.

(2) Bromate. Compliance must be based on a running annual arithmetic average, computed quarterly, of monthly samples (or, for months in which the system takes more than one sample, the average of all samples taken during the month) collected by the system as prescribed by 41.6(1)*"c"*(2). If the average of samples covering any consecutive four-quarter period exceeds the MCL, the system is in violation of the MCL and must notify the public pursuant to 567—Chapter 42, in addition to reporting to the department pursuant to 567—paragraph 42.4(3)*"d."* If a PWS fails to complete 12 consecutive months' monitoring, compliance with the MCL for the last four-quarter compliance period must be based on an average of the available data.

(3) Chlorite. Compliance must be based on an arithmetic average of each three-sample set taken in the distribution system as prescribed by 41.6(1)*"c"*(3)"1" and 41.6(1)*"c"*(3)"2." If the arithmetic average of any three-sample set exceeds the MCL, the system is in violation of the MCL and must notify the public pursuant to 567—Chapter 42, in addition to reporting to the department pursuant to 567—paragraph 42.4(3)*"d."*

(4) TTHM and HAA5.

1. For systems monitoring quarterly, compliance with MCLs in 41.6(1)*"b"* must be based on a running annual arithmetic average, computed quarterly, of quarterly arithmetic averages of all samples collected by the system as prescribed by 41.6(1)*"c"*(4).

2. For systems monitoring less frequently than quarterly, systems demonstrate MCL compliance if the average of samples taken that year under the provisions of 41.6(1)*"c"*(4) does not exceed the MCLs in 41.6(1)*"b."* If the average of these samples exceeds the MCL, the system must increase monitoring to once per quarter per treatment plant and is not in violation of the MCL until it has completed one year of quarterly monitoring, unless the result of fewer than four quarters of monitoring will cause the running annual average to exceed the MCL, in which case the system is in violation at the end of that quarter. Systems required to increase to quarterly monitoring must calculate compliance by including the sample that triggered the increased monitoring plus the following three quarters of monitoring.

3. If the running annual arithmetic average of quarterly averages covering any consecutive four-quarter period exceeds the MCL, the system is in violation of the MCL and must notify the public pursuant to 567—Chapter 42 in addition to reporting to the department pursuant to 567—paragraph 42.4(3)*"d."*

4. If a PWS fails to complete four consecutive quarters of monitoring, compliance with the MCL for the last four-quarter compliance period must be based on an average of the available data.

f. Reporting requirements for disinfection byproduct precursors. Systems required to sample quarterly or more frequently must report to the department within ten days after the end of each quarter in which samples were collected, notwithstanding the public notification provisions of 567—42.1(455B). Systems required to sample less frequently than quarterly must report to the department within ten days after the end of each monitoring period in which samples were collected. The specific reporting requirements for disinfection byproducts are listed in 567—subparagraph 42.4(3)*"d"*(2).

41.6(2) Reserved.

567—41.7(455B) Physical properties maximum contaminant levels (MCL or treatment technique requirements) and monitoring requirements. Rescinded IAB 10/18/00, effective 11/22/00.

567—41.8(455B) Radionuclides.

41.8(1) *Radium-226, radium-228, and gross alpha particle radioactivity in community water systems.* The following are the maximum contaminant levels for radium-226, radium-228, and gross alpha particle radioactivity:

MCL

a. Combined radium-226 and radium-228 5 pCi/l

b. Gross alpha particle activity (including radium-226 but excluding radon and uranium) 15 pCi/l

41.8(2) Beta particle and photon radioactivity from man-made radionuclides in community water systems.

a. *Maximum contaminant level.* The average annual concentration of beta particle and photon radioactivity from man-made radionuclides in drinking water shall not produce an annual dose equivalent to the total body or any internal organ greater than 4 millirem/year.

b. *MCL calculation.* Except for the radionuclides listed in the table below, the concentration of man-made radionuclides causing 4 mrem total body or organ dose equivalents shall be calculated on the basis of a 2 liter per day drinking water intake using the 168-hour data listed in "Maximum Permissible Body Burdens and Maximum Permissible Concentration of Radionuclides in Air or Water for Occupational Exposure," NBS Handbook 69 as amended August 1963, U.S. Department of Commerce. If two or more radionuclides are present, the sum of their annual dose equivalent to the total body or to any organ shall not exceed 4 millirem/year.

AVERAGE ANNUAL CONCENTRATIONS ASSUMED TO PRODUCE
A TOTAL BODY OR ORGAN DOSE OF 4 MREM/YR

Radionuclide	Critical Organ	pCi per liter
Strontium-90	Bone marrow	8
Tritium	Total body	20,000

567—41.9(455B) Sampling and analytical requirements for radionuclides.

41.9(1) *Analytical methods for radioactivity.*

a. *Radionuclide analytical methodology.* Analysis for the following contaminants shall be conducted to determine compliance with 41.8(1) in accordance with the methods in the following table, or their equivalent as determined by EPA.

RADIONUCLIDE ANALYTICAL METHODOLOGY

Contaminant	Methodology	Reference (method or page number)								
		EPA[1]	EPA[2]	EPA[3]	EPA[4]	SM[5]	ASTM[6]	USGS[7]	DOE[6]	
Naturally occurring:										
Gross alpha[11] & beta	Evaporation	900.0	p. 1	00-01	p. 1	302, 7110B		R-1120-76		
Gross alpha[11]	Co-precipitation			00-02		7110C				
Radium 226	Radon emanation	903.1	p. 16	Ra-04	p. 19	7500-Ra C	D 3454-91	R-1141-76	Ra-05	N
	Radiochemical	903.0	p. 13	Ra-03		304, 305, 7500-Ra B	D 2460-90	R-1140-76		
Radium 228	Radiochemical	904.0	p. 24	Ra-05	p. 19	304, 7500-Ra D		R-1142-76		N N
Uranium[12]	Radiochemical	908.0				7500-U B				
	Fluorometric	908.1				7500-U C[13]	D 2907-91	R-1180-76 R-1181-76	U-04	
	Alpha spectrometry			00-07	p. 33	7500-U C[14]	D 3972-90	R-1182-76	U-02	

	Laser phosphorimetry						D 5174-91			
Man-made:										
Radioactive Cesium	Radiochemical	901.0	p. 4			7500-Cs B	D 2459-72	R-1111-76		
	Gamma ray spectrometry	901.1			p. 92	7120[15]	D 3649-91	R-1110-76	4.5.2.3	
Radioactive Iodine	Radiochemical	902.0	p. 6 p. 9			7500-I B 7500-I C 7500-I D	D 3649-91			
	Gamma ray spectrometry	901.1			p. 92	7120[15]	D 4785-88		4.5.2.3	
Radioactive Strontium 89, 90	Radiochemical	905.0	p. 29	Sr-04	p. 65	303, 7500-Sr B		R-1160-76	Sr-01 Sr-02	
Tritium	Liquid scintillation	906.0	p. 34	H-02	p. 87	306, 7500-3H B	D 4107-91	R-1171-76		
Gamma emitters	Gamma ray spectrometry	901.1 902.0 901.0			p. 92	7120[15] 7500-Cs B 7500-I B	D 3649-91 D 4785-88	R-1110-76	4.5.2.3	

The procedures shall be done in accordance with the documents listed below. The incorporation by reference of documents 1 through 10 was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR Part 51, effective April 4, 1997. Copies of the documents may be obtained from the sources listed below. Contact the Safe Drinking Water Hotline at (800)426-4791 to obtain information about these documents. Documents may be inspected at EPA's Drinking Water Docket, 401 M Street SW, Washington, DC 20460 (telephone (202)260-3027); or at the Office of Federal Register, 800 North Capitol Street NW, Suite 700, Washington, DC.

[1] "Prescribed Procedures for Measurement of Radioactivity in Drinking Water," EPA 600/4-80-032, August 1980. Available at the US Department of Commerce, NTIS, 5285 Port Royal Road, Springfield, VA 22161 (telephone (800)553-6847) PB 80-224744.

[2] "Interim Radiochemical Methodology for Drinking Water," EPA 600/4-75-008(revised), March 1976. Available at NTIS, ibid. PB 253258.

[3] "Radiochemistry Procedures Manual," EPA 520/5-84-006, December 1987. Available at NTIS, ibid. PB 84-215581.

[4] "Radiochemical Analytical Procedures for Analysis of Environmental Samples." March 1979. Available at NTIS, ibid. EMSL LV 053917.

[5] Standard Methods for the Examination of Water and Wastewater, 13th, 17th, 18th, 19th editions, 1971, 1989, 1992, 1995. Available at American Public Health Association, 1015 Fifteenth Street NW, Washington, DC 20005. All methods are in the 17th, 18th, and 19th editions except 7500-U C Fluorimetric Uranium was discontinued after the 17th edition; 7120 Gamma Emitters is only in the 19th edition; and 302, 303, 304, 305, and 306 are only in the 13th edition.

[6] Annual Book of ASTM Standards, Vol. 11.02, 1994. Available at American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428.

[7] "Methods for Determination of Radioactive Substances in Water and Fluvial Sediments," Chapter A5 in Book 5 of Techniques of Water-Resources Investigations of the United States Geological Survey, 1977. Available at US Geological Survey (USGS) Information Services, Box 25286, Federal Center, Denver, CO 80225-0425.

[8] "EML Procedures Manual," 27th edition, Volume 1, 1990. Available at the Environmental Measurements Laboratory, US Department of Energy (DOE), 376 Hudson Street, New York, NY 10014-3621.

[9] "Determination of Ra-226 and Ra-228 (Ra-02)," January 1980, revised June 1982. Available at Radiological Sciences Institute Center for Laboratories and Research, New York State Department of Health, Empire State Plaza, Albany, NY 12201.

[10] "Determination of Ra-228 in Drinking Water," August 1980. Available at State of New Jersey, Department of Environmental Protection, Division of Environmental Quality, Bureau of Radiation and Inorganic Analytical Services, 9 Ewing Street, Trenton, NJ 08625.

[11] Natural uranium and thorium-230 are approved as gross alpha calibration standards for gross alpha with co-precipitation and evaporation methods; americium-241 is approved with co-precipitation methods.

[12] If uranium (U) is determined by mass, a 0.67 pCi/ug of uranium conversion factor must be used. This conversion factor is based on the 1:1 activity ratio of U-234 to U-238 that is characteristic of naturally occurring uranium.

[13] Standard Methods for the Examination of Water and Wastewater, 17th edition, APHA, 1989.

[14] Standard Methods for the Examination of Water and Wastewater, 18th or 19th edition, APHA, 1992, 1995.

[15] Standard Methods for the Examination of Water and Wastewater, 19th edition, APHA, 1995.

b. Method references for other radionuclides. When the identification and measurement of radionuclides other than those listed in 41.9(2) are required, the following references are to be used, except in cases where alternative methods have been approved in accordance with 41.12(455B).

(1) "Procedures for Radiochemical Analysis of Nuclear Reactor Aqueous Solutions," H. L. Krieger and S. Gold, EPA-R4-73-014, Environmental Protection Agency, Cincinnati, Ohio 45268 (May 1973).

(2) "HASL Procedure Manual," edited by John H. Harley. HASL 300, ERDA Health and Safety Laboratory, New York, NY (1973).

c. Radionuclide detection limits. For the purpose of monitoring radioactivity concentration in drinking water, the required sensitivity of the radioanalysis is defined in terms of a detection limit. The detection limit shall be that concentration which can be counted with a precision of plus or minus 100 percent at the confidence level (1.960 sigma where sigma is the standard deviation of the net counting rate of the sample).

(1) To determine compliance with 41.8(1)*"a,"* the detection limit shall not exceed 1 pCi/L. To determine compliance with 41.8(1)*"b,"* the detection limit shall not exceed 3 pCi/L.

(2) To determine compliance with 41.8(2), the detection limits shall not exceed the concentrations listed in the table below.

TABLE — Detection Limits for Man-Made Beta Particle and Photon Emitters

Radionuclide	Detection Limit
Tritium	1,000 pCi/L
Strontium-89	10 pCi/L
Strontium-90	2 pCi/L
Iodine-131	1 pCi/L
Cesium-134	10 pCi/L
Gross beta	4 pCi/L
Other radionuclides	1/10 of the applicable limit

d. Calculating compliance with radionuclide MCLs. To determine compliance with the maximum contaminant levels listed in 41.8(1) and 41.8(2), averages of data shall be used and shall be rounded to the same number of significant figures as the maximum contaminant level for the substance in question.

41.9(2) *Monitoring frequency for radioactivity in community water systems.*

a. Monitoring requirements for gross alpha particle activity, radium-226 and radium-228.

(1) Initial monitoring requirement and period. Initial sampling to determine compliance with 41.8(1) shall begin by June 24, 1979, and the analysis shall be completed by June 24, 1980. Compliance shall be based on the analysis of an annual composite of four consecutive quarterly samples or the average of the analyses of four samples obtained at quarterly intervals.

A gross alpha particle activity measurement may be substituted for the required radium-226 and radium-228 analysis, provided that the measured gross alpha particle activity does not exceed 5 pCi/L at a confidence level of 95 percent (1.65 sigma where sigma is the standard deviation of the net counting rate of the sample). In localities where radium-228 may be present in drinking water,radium-226 or radium-228 analyses are required when the gross alpha particle activity exceeds 2 pCi/L.

When the gross alpha particle activity exceeds 5 pCi/L, the same or an equivalent sample shall be analyzed for radium-226. If the concentration of radium-226 exceeds 3 pCi/L, the same or an equivalent sample shall be analyzed for radium-228.

(2) Data substitution for initial requirement. For the initial analysis required by 41.9(2)*"a"*(1), data acquired on or after June 24, 1976, may be substituted at the discretion of the department.

(3) Monitoring requirements. Suppliers of water shall monitor at least once every four years following the procedure required by 41.9(2)*"a"*(1). At the discretion of the department, when an annual record taken in conformance with 41.9(2)*"a"*(1) has established that the average annual concentration is less than half the maximum contaminant levels established by 41.8(1), analysis of a single sample may be substituted for the quarterly sampling procedure required by 41.9(2)*"a"*(1).

More frequent monitoring shall be conducted when requested by the department in the vicinity of mining or other operations which may contribute alpha particle radioactivity to either surface or groundwater sources of drinking water.

A supplier of water shall monitor in conformance with 41.9(2)*"a"*(1) within one year of the introduction of a new water source for a community water system. More frequent monitoring shall be conducted when requested by the department in the event of possible contamination or when changes in the distribution system or treatment processing occur which may increase the concentration of radioactivity in finished water.

A community water system using two or more sources having different concentrations of radioactivity shall monitor source water, in addition to water from a free-flowing tap, when requested by the department.

Monitoring for compliance with 41.8(1) after the initial period need not include radium-228 except when required by the department, provided that the average annual concentration of radium-228 has been assayed at least once using the quarterly sampling procedure required by 41.9(2)*"a"*(1).

Suppliers of water shall conduct annual monitoring of any community water system in which the radium-226 concentration exceeds 3 pCi/L, when requested by the department.

(4) Exceedance of the MCL. If the average annual maximum contaminant level for gross alpha particle activity or total radium as set forth in 41.8(1) is exceeded, the supplier of a community water system shall notify the public as required by 567—42.1(455B). Monitoring at quarterly intervals shall be continued until the annual average concentration no longer exceeds the maximum contaminant level or until a monitoring schedule as a condition of an operation permit or enforcement action shall become effective.

b. Monitoring requirements for man-made radioactivity in community water systems.

(1) Applicability and initial monitoring requirements. Systems using surface water sources and serving more than 100,000 persons and such other community water systems as are designated by the department shall be monitored for compliance with 41.8(2) by analysis of a composite of four consecutive quarterly samples. Compliance with 41.8(2) may be assumed without further analysis if the average annual concentration of gross beta particle activity is less than 50 pCi/L and if the average annual concentrations of tritium and strontium-90 are less than those listed in the detection limits table, provided, that if both radionuclides are present, the sum of their annual dose equivalents to bone marrow shall not exceed 4 millirem/year.

If the gross beta particle activity exceeds 50 pCi/L, an analysis of the sample must be performed to identify the major radioactive constituents present, and the appropriate organ and total body doses shall be calculated to determine compliance with 41.8(2).

Suppliers of water shall conduct additional monitoring, as requested by the department, to determine the concentration of man-made radioactivity in principal watersheds designated by the department.

At the discretion of the department, suppliers of water utilizing only groundwaters may be required to monitor for man-made radioactivity.

(2) Data substitution for initial requirement. For the initial analysis required by 41.9(2)*"b"*(1), data acquired on or after June 24, 1976, may be substituted at the discretion of the department.

(3) Monitoring requirement. After the initial analysis required by 41.9(2)*"b"*(1), suppliers of water shall monitor at least every four years following the procedure given in 41.9(2)*"b"*(2).

(4) Monitoring requirements for PWSs receiving effluent from nuclear facilities. The supplier of any community water system designated by the department as utilizing water contaminated by effluents from nuclear facilities shall initiate quarterly monitoring for gross beta particle and iodine-131 radioactivity and annual monitoring for strontium-90 and tritium.

Quarterly monitoring for gross beta particle activity shall be based on the analysis of monthly samples or the analysis of a composite of three monthly samples. The former is recommended. If the gross beta particle activity in a sample exceeds 15 pCi/L, the same or an equivalent sample shall be analyzed for strontium-89 and cesium-134. If the gross beta particle activity exceeds 50 pCi/L, an analysis of the sample must be performed to identify the major radioactive constituents present and the appropriate organ and total body doses shall be calculated to determine compliance with 41.8(2).

For iodine-131, a composite of five consecutive daily samples shall be analyzed once each quarter. As requested by the department, more frequent monitoring shall be conducted when iodine-131 is identified in the finished water.

Annual monitoring for strontium-90 and tritium shall be conducted by means of the analysis of a composite of four consecutive quarterly samples or analysis of four quarterly samples. The latter procedure is recommended.

The department may allow the substitution of environmental surveillance data taken in conjunction with a nuclear facility for direct monitoring of man-made radioactivity by the supplier of water where the department determines such data is applicable to a particular community water system.

(5) Exceedance of the MCL. If the average annual maximum contaminant level for man-made radioactivity set forth in 41.8(2) is exceeded, the operator of a community water system shall give notice to the public as required by 567—42.1(455B). Monitoring at monthly intervals shall be continued until the concentration no longer exceeds the maximum contaminant level or until a monitoring schedule as a condition of an operation permit or enforcement action becomes effective.

567—41.10(455B) Reporting, public notification and record keeping. Rescinded IAB 8/11/99, effective 9/15/99.

567—41.11(455B) Unregulated contaminant monitoring.

41.11(1) *Unregulated monitoring for organic chemicals (VOCs).*

a. Applicability. Community and nontransient noncommunity water systems shall monitor for the contaminants listed in 41.11(1)*"b."*

b. Volatile organic chemical contaminants (VOCs). Community water systems and nontransient, noncommunity water systems shall monitor for the following contaminants except as provided in 41.11(1)*"c"*(4) of this subrule:

(1) Chloroform
(2) Bromodichloromethane
(3) Chlorodibromomethane
(4) Bromoform
(5) Dibromomethane
(6) m-Dichlorobenzene
(7) 1,1-Dichloropropene
(8) 1,1-Dichloroethane
(9) 1,1,2,2-Tetrachloroethane
(10) 1,3-Dichloropropane
(11) Chloromethane
(12) Bromomethane
(13) 1,2,3-Trichloropropane
(14) 1,1,1,2-Tetrachloroethane
(15) Chloroethane
(16) 2,2-Dichloropropane
(17) o-Chlorotoluene
(18) p-Chlorotoluene
(19) Bromobenzene
(20) 1,3-Dichloropropene

c. Special organic chemical (VOC) monitoring protocol.

(1) Surface water monitoring requirements. Surface water systems shall sample at entry points to the distribution system after any application of treatment. The minimum number of samples is one year of quarterly samples per water source.

(2) Groundwater monitoring requirements. Groundwater systems shall sample at points of entry to the distribution system representative of each well after any application of treatment. The minimum number of samples is one sample per entry point of the distribution system.

(3) Confirmation samples. The department may require confirmation samples for positive or negative results.

(4) Rescinded IAB 10/18/00, effective 11/22/00.

(5) VOC discretionary compounds. Monitoring for the following list of VOC compounds is required at the discretion of the department. The requirement for a PWS to monitor for the discretionary compounds will be listed in their operation permit, issued by the department.

Bromochloromethane
n-Butylbenzene
sec-Butylbenzene
tert-Butylbenzene
Dichlorodifluoromethane
Fluorotrichloromethane
Hexachlorobutadiene
Isopropylbenzene
p-Isopropyltoluene
Naphthalene
n-Propylbenzene
1,2,3-Trichlorobenzene
1,2,4-Trimethylbenzene
1,3,5-Trimethylbenzene

(6) Small system monitoring waivers. Instead of performing the monitoring required by this subrule, a community water system or nontransient noncommunity water system serving fewer than 150 service connections may send a letter to the department stating that its system is available for sampling. The letter must be sent to the state no later than January 1, 1991. The system is not required to submit samples to a certified laboratory for analysis, unless requested to do so by the department.

(7) Repeat monitoring. All community and nontransient, noncommunity water systems shall repeat the unregulated contaminant monitoring required in this subrule no less frequently than every five years from the dates specified in 41.11(1)*"a."*

(8) Composite samples. The department may reduce the total number of samples a system must analyze by allowing the use of compositing. Composite samples from a maximum of five sampling points are allowed (for the substances in 41.11(1)*"b"* or *"c"*). Compositing of samples must be done in the laboratory and the composite sample must be analyzed within 14 days of collection. If the population served by the system is greater than 3,300 persons, then compositing may only be permitted by the department at sampling points within a single system. In systems serving less than or equal to 3,300 persons, the department may permit compositing among different systems provided the five-sample limit is maintained.

d. Analytical methods.

(1) Methodology references. Analysis under this subrule shall be conducted using the recommended methods as follows, or their equivalent as determined by the department and EPA: 502.2, "Volatile Organic Compounds in Water by Purge and Trap Gas Chromatography with Photoionization and Electrolytic Conductivity Detectors in Series," or 524.2, "Volatile Organic Compounds in Water by Purge and Trap Capillary Column Gas Chromatography/Mass Spectrometry." These methods are contained in "Methods for the Determination of Organic Compounds in Finished Drinking Water and Raw Source Water," September 1986, available from the Drinking Water Public Docket or the National Technical Information Service (NTIS), NTIS PB91-231480 and PB91-146027, U.S. Department of Commerce, 5285 Port Royal Road, Springfield, VA 22161. The toll-free number is 800-336-4700. Analysis for bromodichloromethane, bromoform, chlorodibromomethane, and chloroform also may be conducted by EPA Method 551, and analysis for 1,2,3-trichloropropane also may be conducted by EPA Method 504.1.

(2) Certified laboratory requirements. Analysis under this subrule shall only be conducted by laboratories certified under 567—Chapter 83.

41.11(2) *Inorganic and organic unregulated contaminants monitoring.*

a. Applicability. Monitoring for unregulated contaminants. Monitoring of the contaminants listed in 41.11(2)*"b"* and 41.3(1)*"f"* shall be conducted as follows:

(1) Sampling for unregulated organic contaminants. Each community and nontransient noncommunity water system shall take four consecutive quarterly samples at each source/entry point for each contaminant listed in 41.11(2)*"b"* and report the results to the department. Monitoring must

be completed by December 31, 1995, and take place during the calendar quarter which is specified by the department.

(2) Sampling for unregulated inorganic contaminants. Each community and nontransient noncommunity water system shall take one sample at each source/entry point for each contaminant listed in 41.3(1)*"f"* and report the results to the department. Monitoring must be completed by December 31, 1995, using the methodology specified in 41.3(1)*"f."*

b. Unregulated organic chemical (SOC) contaminants. Systems shall monitor for the unregulated contaminants listed below, using the methods identified below and using the analytical test procedures contained within Technical Notes on Drinking Water Methods, EPA-600/R-94-173, October 1994, which is available at NTIS, PB95-104766. Method 6610 shall be followed in accordance with the Standard Methods for the Examination of Water and Wastewater, 18th edition Supplement, 1994, American Public Health Association. This incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR Part 51, effective January 4, 1995. Copies of methods listed in Standard Methods for the Examination of Water and Wastewater may be obtained from the American Public Health Association, 1015 Fifteenth Street NW, Washington, DC 20005. Copies may be inspected at EPA's Drinking Water Docket, 401 M Street SW, Washington, DC 20460; or at the Office of the Federal Register, 800 North Capitol Street NW, Suite 700, Washington, DC.

UNREGULATED ORGANIC CONTAMINANTS
AND METHODOLOGY

Organic Contaminants	EPA Analytical Method
Aldicarb	531.1, 6610
Aldicarb sulfone	531.1, 6610
Aldicarb sulfoxide	531.1, 6610
Aldrin	505, 508, 508.1, 525.2
Butachlor	507, 525.2
Carbaryl	531.1, 6610
Dicamba	515.1, 515.2, 555
Dieldrin	505, 508, 508.1, 525.2
3-Hydroxycarbofuran	531.1, 6610
Methomyl	531.1, 6610
Metolachlor	507, 508.1, 525.2
Metribuzin	507, 508.1, 525.2
Propachlor	507, 508.1, 525.2

c. Monitoring protocols.

(1) Groundwater sampling protocols. Groundwater systems shall take a minimum of one sample at every entry point to the distribution system which is representative of each well after treatment. Each sample must be taken at the same source/entry point unless conditions make another sampling point more representative of each source or treatment plant.

(2) Surface water sampling protocols. Surface water systems shall take a minimum of one sample at each entry point to the distribution system after treatment. Each sample must be taken at the same source/entry point unless conditions make another sampling point more representative of each source or treatment plant. For purposes of this subparagraph, surface water systems include systems with a combination of surface and ground sources.

(3) Multiple sources. If the system draws water from more than one source and the sources are combined before distribution, the system must sample at an entry point to the distribution system during periods of normal operating conditions (i.e., when water representative of all sources is being used). If a representative sample of all water sources cannot be obtained, as determined by the department, separate source/entry points with the appropriate monitoring requirements will be assigned by the department.

(4) Sampling waivers. Each community and nontransient noncommunity water system may apply to the department for a waiver from the requirements of 41.11(2)*"c"*(1) and (2).

(5) Bases of sampling waivers. The department may grant a waiver for the requirements of 41.11(2)*"a"*(1) based on the criteria specified in 41.3(455B) and 41.5(455B). The department may grant a waiver from the requirement of 41.11(2)*"a"*(2) if previous analytical results indicate contamination would not occur, provided this data was collected after January 1, 1990.

(6) Confirmation sampling. A confirmation sample for positive or negative results may be required by the department.

(7) Composite sampling. The department may reduce the total number of samples a system must analyze by allowing the use of compositing. Composite samples from a maximum of five sampling points are allowed. Compositing of samples must be done in the laboratory and the composite sample must be analyzed within 14 days of collection. If the population served by the system is greater than 3,300 persons, then compositing may only be permitted by the department at sampling points within a single system. In systems serving less than or equal to 3,300 persons, the department may permit compositing among different systems provided the five-sample limit is maintained.

(8) Small system exemptions. Instead of performing the monitoring required by this subrule, a community water system or nontransient noncommunity water system serving fewer than 150 service connections may send a letter stating that the system is available for sampling. This letter must be sent by January 1, 1994. The system shall not send such samples, unless requested to do so by the department.

41.11(3) *Special monitoring for sodium.* Suppliers of water for community public water systems shall collect and have analyzed one sample per source or plant, for the purpose of determining the sodium concentration in the distribution system. Systems utilizing multiple wells, drawing raw water from a single aquifer may, with departmental approval, be considered as one source for determining the minimum number of samples to be collected. Sampling frequency and approved analytical methods are as follows:

a. *Surface water systems.* Systems utilizing a surface water source, in whole or in part, shall monitor for sodium at least once annually at the entry point to the distribution system;

b. *Groundwater systems.* Systems utilizing groundwater sources shall monitor at least once every three years at the entry point to the distribution system;

c. *Increased monitoring.* Suppliers may be required to monitor more frequently where sodium levels are variable;

d. *Analytical methodology.* Analyses for sodium shall be performed in accordance with 41.3(1)*"e"*(1).

e. *Reporting.* The sodium level shall be reported to the public by at least one of the following methods:

(1) The community public water supply shall notify the appropriate local public health officials of the sodium levels by written notice by direct mail within three months. A copy of each notice required by this subrule shall be sent to the department within ten days of its issuance.

(2) In lieu of the reporting requirement of 41.11(3)*"e"*(1), the community public water supply shall include the sodium level in its annual consumer confidence report, per 567—subparagraph 42.3(3)*"c"*(1)"12."

567—41.12(455B) Alternative analytical techniques. With the written permission of this department, concurred in by the EPA, an alternative analytical technique may be employed. An alternative technique shall be acceptable only if it is substantially equivalent to the prescribed test in both precision and accuracy as it relates to the determination of compliance with any maximum contaminant level. The use of the alternative analytical technique shall not decrease the frequency of monitoring required by 41.2(455B) through 41.8(455B).

567—41.13(455B) Monitoring of interconnected public water supply systems. When a public water supply system supplies water to one or more other public water supply systems, the department may modify the monitoring requirements imposed by this part to the extent that the interconnection of the systems justifies treating them as a single system for monitoring purposes. Any modified monitoring shall be conducted pursuant to a schedule specified by the department and concurred in by the administrator of the U.S. Environmental Protection Agency.

567—41.14(455B) Department analytical results used to determine compliance. Analytical results or other information compiled by departmental staff may be used to determine compliance with the maximum contaminant levels, action levels, or treatment techniques listed in 567—Chapters 41 and 43 or for initiating remedial action with respect to these violations.

567—41.15(455B) Monitoring of other contaminants. If the department determines that other contaminants are present in a public water supply, and the contaminants are known to pose, or scientific evidence strongly suggests that they pose, a threat to human health, the supplier of water may be required to monitor for such contaminants. The supplier of water will monitor at a frequency and in a manner which will adequately identify the magnitude and extent of the contamination. The monitoring frequency and sampling location will be determined by the department. All analytical results will be obtained using approved EPA methods and all analytical results will be submitted to the department for review and evaluation. Any monitoring required under this paragraph will be incorporated into an operation permit or an order.

These rules are intended to implement Iowa Code sections 455B.171 through 455B.188 and 455B.190 through 455B.192.

[Filed prior to 7/1/52; amended 7/31/74]
[Filed 3/5/76, Notice 12/1/75—published 3/22/76, effective 4/26/76]
[Filed 2/25/77, Notice 11/17/76—published 3/23/77, effective 6/24/77]
[Filed without Notice 4/28/77—published 5/18/77, effective 6/24/77]
[Filed 7/1/77, Notice 3/23/77—published 7/27/77, effective 8/31/77]
[Filed after Notice 5/25/78, Notice 12/28/77, 5/3/78—published 6/14/78, effective 5/25/78]
[Filed 10/13/78, Notice 5/3/78—published 11/1/78, effective 12/6/78]
[Filed 2/2/79, Notice 7/26/78—published 2/21/79, effective 3/28/79]
[Filed 3/30/79, Notice 2/7/79—published 4/18/79, effective 5/23/79]
[Filed 5/11/79, Notice 2/7/79—published 5/30/79, effective 7/5/79]
[Filed 1/4/80, Notice 9/5/79—published 1/23/80, effective 2/27/80]
[Filed 6/6/80, Notice 3/19/80—published 6/25/80, effective 7/30/80]
[Filed 4/23/81, Notice 2/18/81—published 5/13/81, effective 6/17/81]
[Filed 6/18/82, Notice 4/14/82—published 7/7/82, effective 8/11/82]
[Filed emergency 6/3/83—published 6/22/83, effective 7/1/83]
[Filed 12/2/83, Notice 6/22/83—published 12/21/83, effective 1/25/84]
[Filed 3/22/85, Notice 9/12/84—published 4/10/85, effective 5/15/85]
[Filed emergency 11/14/86—published 12/3/86, effective 12/3/86]
[Filed 8/21/87, Notice 6/17/87—published 9/9/87, effective 10/14/87]
[Filed emergency 10/2/87—published 10/21/87, effective 10/14/87]
[Filed 7/22/88, Notice 5/18/88—published 8/10/88, effective 9/14/88]
[Filed 1/19/90, Notice 9/20/89—published 2/7/90, effective 3/14/90]
[Filed 11/26/90, Notice 6/13/90—published 12/12/90, effective 1/16/91]◊
[Filed 9/25/92, Notice 6/10/92—published 10/14/92, effective 11/18/92]
[Filed 7/30/93, Notice 5/12/93—published 8/18/93, effective 9/22/93]
[Filed 9/24/93, Notice 5/12/93—published 10/13/93, effective 11/17/93][1]
[Filed 3/22/96, Notice 11/8/95—published 4/10/96, effective 5/15/96]
[Filed 7/23/99, Notice 4/7/99—published 8/11/99, effective 9/15/99]
[Filed 9/29/00, Notice 6/14/00—published 10/18/00, effective 11/22/00]

◊ Two or more ARCs

[1] Effective date of [ARC4359A] 41.3(1)*"b"*(2)"3"; 41.3(1)*"c"*(2)"4," new sentence at end; 41.3(1)*"c"*(3)"6," "10"; 41.3(1)*"c"*(8), first sentence; 41.4(1)*"d"*(5)"4"; 41.5(1)*"a"*; 41.10(7)*"a"*(3); 41.11(2)*"a"*; 41.11(2)*"c"*(4); 41.11(2)*"c"*(5), first sentence, delayed 70 days by the Administrative Rules Review Committee at its meeting held November 9, 1993; delay lifted by the Committee December 14, 1993.