

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 establish a treatment technique that includes requirements for corrosion control treatment, source water treatment, lead service line replacement, and public education. These requirements are triggered, in some cases, by lead and copper action levels measured in samples collected at consumers' taps.

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:

1. 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.

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

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

4. 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.

5. For a public water system that has been allowed by the department to collect fewer than five samples in accordance with 41.4(1) "c"(3), the sample result with the highest concentration is considered the 90th percentile value.

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. A community water system with insufficient Tier 1, Tier 2, and Tier 3 sampling sites shall complete its sampling pool with representative sites throughout the distribution system. A representative site is defined as a site in which the plumbing materials used at that site would be commonly found at other sites served by the water system.

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. If additional sites are needed to complete the sampling pool, the NTNC system shall use representative sites throughout the distribution system. A representative site is defined as a site in which the plumbing materials used at that site would be commonly found at other sites served by the water system.

8. LSL 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 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) and 41.4(1)"c"(2)"5," 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. Non-first-draw samples collected in lieu of first-draw samples pursuant to 41.4(1)"c"(2)"5" shall be one liter in volume and 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. After acidification to resolubilize the metals, the sample must stand in the original container for the time specified in the approved EPA method before the sample can be analyzed. 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.

5. An NTNC system, or a CWS system that meets the criteria of 567—subparagraph 42.2(2)“b”(7) that does not have enough taps that can supply first-draw samples, as defined in 567—40.2(455B), may apply to the department in writing to substitute non-first-draw samples. Such systems must collect as many first-draw samples from appropriate taps as possible and identify sampling times and locations that would likely result in the longest standing time for the remaining sites. The department may waive the requirement for prior department approval of non-first-draw sample sites selected by the system, through written notification to the system.

(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) shall collect at least 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). Such reduced monitoring sites shall be representative of the sites required for standard monitoring. A public water system that has fewer than five drinking water taps that can be used for human consumption meeting the sample site criteria of 41.4(1)“c”(1) to reach the required number of sample sites listed in 41.4(1)“c”(3) must collect at least one sample from each tap and then must collect additional samples from those taps on different days during the monitoring period to meet the required number of sites. Alternatively, the department may allow these systems to collect a number of samples less than the number of sites specified in 41.4(1)“c”(1), provided that 100 percent of all taps that can be used for human consumption are sampled. The department must approve this reduction of the minimum number of samples in writing based upon a request from the system or on-site verification by the department. The department may specify sampling locations when a system is conducting reduced monitoring.

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 lead and copper samples according to 41.4(1)“c”(3) and reduce the frequency of sampling to once per year. A small or medium-size water system collecting fewer than five samples as specified in 41.4(1)“c”(3) that meets the lead and copper action levels during each of two consecutive six-month monitoring periods may reduce the frequency of sampling to once per year. The system may not ever reduce the number of samples required below the minimum of one sample per available tap. This sampling shall begin during the calendar year immediately following the end of the second consecutive six-month monitoring period.

- Any public water supply system that meets the lead action level and 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 reduce the monitoring frequency to once per year and reduce the number of lead and copper samples according to 41.4(1)“c”(3), upon written approval by the department. This sampling shall begin during the calendar year immediately following the end of the second consecutive six-month monitoring period. The department shall review monitoring, treatment, and other relevant information submitted by the water system in accordance with 567—subrule 42.4(2), and shall notify the system in writing when it determines that the system is eligible to commence reduced monitoring. The department will review and, where appropriate, 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 meets the lead action level and 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 reduce the frequency of monitoring from annually to once every three years if it receives written approval by the department. Samples collected once every three years shall be collected no later than every third calendar year. The department shall review monitoring, treatment, and other relevant information submitted by the water system in accordance with 567—subrule 42.4(2), and shall notify the system in writing when it determines that the system is eligible to reduce the monitoring frequency to once every three years. The department will review and, where appropriate, 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 through September, unless the department, at its discretion, has approved a different sampling period. If approved by the department, the period shall be no longer than four consecutive months and must represent a time of normal operation where the highest levels of lead are most likely to occur. The department shall designate a period that represents a time of normal operation for an NTNC system that does not operate during the months of June through September, and for which the period of normal operation where the highest levels of lead are most likely to occur is not known. This sampling shall begin during the period approved or designated by the department in the calendar year immediately following the end of the second consecutive six-month monitoring period for systems initiating annual monitoring and during the three-year period following the end of the third consecutive calendar year of annual monitoring for systems initiating triennial monitoring.

Systems monitoring annually that have been collecting samples during the months of June through September and that receive department approval to alter their sample collection period must collect their next round of samples during a time period that ends no later than 21 months after the previous round of sampling.

Systems monitoring triennially that have been collecting samples during the months of June through September and that receive department approval to alter the sampling collection period must collect their next round of samples during a time period that ends no later than 45 months after the previous round of sampling.

Subsequent rounds of sampling must be collected annually or triennially, as required by 41.4(1) "c."

Small systems that have been granted waivers pursuant to 41.4(1) "c"(7), that have been collecting samples during the months of June through September and that receive department approval to alter their sample collection period as previously stated must collect their next round of samples before the end of the nine-year period.

- Any water system that demonstrates for two consecutive six-month monitoring periods that the 90th percentile tap water level computed under 41.4(1) "b"(3) is less than or equal to 0.005 mg/L for lead and is less than or equal to 0.65 mg/L for copper may reduce the number of samples in accordance with 41.4(1) "c"(3) and reduce the frequency of sampling to once every three calendar years, if approved by the department.

- 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). Any such system 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 such system may resume annual monitoring for lead and copper at the tap at the reduced number of sites specified in 41.4(1) "c"(3) after it has completed two subsequent consecutive six-month rounds of monitoring that meet the criteria of 41.4(1) "c"(4) "4," first bulleted paragraph, and may resume triennial monitoring for lead and copper at the reduced number of sites after it demonstrates through subsequent rounds of monitoring that it meets the criteria of either 41.4(1) "c"(4) "4," third bulleted paragraph or fifth bulleted paragraph, and has received department approval.

Any water system subject to reduced monitoring frequency that fails to meet the lead action level during any four-month monitoring period or that fails to operate at or above the minimum value or within the range of values for the water quality control parameters specified by the department under 567—paragraph 43.7(2) "f" for more than nine days in any six-month period specified in 41.4(1) "d"(4) shall resume tap water sampling according to 41.4(1) "c"(4) "3," collect the number of samples specified for standard monitoring in 41.4(1) "c"(3), and resume monitoring for water quality parameters within the distribution system in accordance with 41.4(1) "d"(4). This standard tap water sampling shall begin no later than the six-month period beginning January 1 of the calendar year following the lead action level exceedance or water quality parameter excursion. The system may resume reduced monitoring for lead and copper at the tap and for water quality parameters within the distribution system under the following conditions:

The system may resume annual monitoring for lead and copper at the tap at the reduced number of sites specified in 41.4(1) "c"(3) after it has completed two subsequent six-month rounds of monitoring that meet

the criteria of 41.4(1) “c”(4)“4,” second bulleted paragraph, and upon written approval from the department to resume reduced annual monitoring. This sampling shall begin during the calendar year immediately following the end of the second consecutive six-month monitoring period.

The system may resume triennial monitoring for lead and copper at the tap at the reduced number of sites after it demonstrates through subsequent rounds of monitoring that it meets the criteria of either 41.4(1) “c”(4)“4,” third bulleted paragraph or fifth bulleted paragraph, and upon written approval from the department to resume triennial monitoring.

The system may reduce the number of water quality parameter tap water samples required in 41.4(1) “d”(5)“1” and the sampling frequency required in 41.4(1) “d”(5)“2.” Such a system may not resume triennial monitoring for water quality parameters at the tap until it demonstrates that it has requalified for triennial monitoring, pursuant to 41.4(1) “d”(5)“2.”

- Any water system subject to a reduced monitoring frequency under 41.4(1) “c”(4)“4” must notify the department in writing in accordance with 567—subparagraph 42.4(2)“a”(3) of any upcoming long-term change in treatment or addition of a new source as described in that subparagraph. The department must review and approve the addition of a new source or long-term change in water treatment before it is implemented by the system. The department may require the system to resume sampling pursuant to 41.4(1) “c”(4)“3” and collect the number of samples specified for standard monitoring under 41.4(1) “c”(3), or take other appropriate steps such as increased water quality parameter monitoring or reevaluation of its corrosion control treatment given the potentially different water quality considerations.

(5) 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.

(6) Invalidation of lead or copper tap water samples. A sample invalidated under this paragraph does not count toward determining the lead or copper 90th percentile levels under 41.4(1) “b”(3) or toward meeting the minimum monitoring requirements of 41.4(1) “c”(3).

1. The department may invalidate a lead or copper tap water sample if at least one of the following conditions is met:

- The laboratory establishes that improper sample analysis caused erroneous results.
- The department determines that the sample was taken from a site that did not meet the site selection criteria of 567—41.4(455B).
- The sample container was damaged in transit to the laboratory.
- There is a substantial reason to believe that the sample was subject to tampering.
- The sample is not representative of water that would be consumed from the tap.
- The department determined that a major disruption of the water flow occurred in the system or building plumbing prior to sample collection, which resulted in lead or copper levels that were not representative of the system.

2. The system must report the results of all samples to the department and all supporting documentation for samples the system believes should be invalidated.

3. To invalidate a sample under 41.4(1) “c”(6)“1,” the decision and the rationale for the decision must be documented in writing. The department may not invalidate a sample solely on the grounds that a follow-up sample result is higher or lower than that of the original sample.

4. The system must collect replacement samples for any samples invalidated under subparagraph 41.4(1) “c”(6) if, after the invalidation of one or more samples, the system has too few samples to meet the minimum requirements of 41.4(1) “c”(3). Any such replacement samples must be taken as soon as possible, but no later than 20 days after the date the department invalidates the sample, or by the end of the applicable monitoring period, whichever occurs later. Replacement samples taken after the end of the applicable monitoring period shall not also be used to meet the monitoring requirements of a subsequent monitoring period. The replacement samples shall be taken at the same locations as the invalidated samples or, if that is not possible, at locations other than those already used for sampling during the monitoring period.

(7) Monitoring waivers for small systems. Any small system that meets the criteria of this subparagraph may apply to the department to reduce the frequency of monitoring for lead and copper under

subrule 41.4(1) to once every nine years if it meets all of the materials criteria specified in 41.4(1)“c”(7)“1” and the monitoring criteria specified in 41.4(1)“c”(7)“2.”

1. Materials criteria. The system must demonstrate that its distribution system and service lines and all drinking water supply plumbing, including plumbing conveying drinking water within all residences and buildings connected to the system, are free of lead-containing materials and copper-containing materials, as defined below:

- Lead. The water system must provide certification and supporting documentation to the department that the system is free of all lead-containing materials. The system does not contain any plastic pipes which contain lead plasticizers, or plastic service lines which contain lead plasticizers. The system must be free of lead service lines, lead pipes, lead soldered pipe joints, and leaded brass or bronze alloy fittings and fixtures, unless such fittings and fixtures meet the specifications of any standard established pursuant to 42 U.S.C. 300-g-6(e).

- Copper. The water system must provide certification and supporting documentation to the department that the system contains no copper pipes or copper service lines.

2. Monitoring criteria. The system must have completed at least one six-month round of standard tap water monitoring for lead and copper at sites approved by the department and from the number of sites required by 41.4(1)“c”(3), and demonstrate that the 90th percentile levels for any and all rounds of monitoring conducted since the system became free of all lead-containing and copper-containing materials meet the following criteria:

- Lead levels. The system must demonstrate that the 90th percentile lead level does not exceed 0.005 mg/L.

- Copper levels. The system must demonstrate that the 90th percentile copper level does not exceed 0.65 mg/L.

3. Department approval of waiver application. The department shall notify the system of its waiver determination in writing, including the basis of its decision and any condition of the waiver. The department may require as a waiver condition that the system conduct specific activities, such as limited monitoring and periodic outreach to customers to remind them to avoid installation of materials that would void the waiver. The system must continue monitoring for lead and copper at the tap as required by 41.4(1)“c”(4)“1” through “4,” as appropriate, until the system receives written approval for the waiver from the department.

4. Monitoring frequency of systems with waivers.

- A system must conduct tap water monitoring for lead and copper in accordance with 41.4(1)“c”(4)“4” at the reduced number of sampling sites identified in subparagraph 41.4(1)“c”(3) at least once every nine years and provide the materials certification specified in 41.4(1)“c”(7)“1” for both lead and copper to the department along with the monitoring results. Samples collected every nine years shall be collected no later than every ninth calendar year.

- A system with a waiver must notify the department in writing pursuant to 567—subparagraph 42.4(2)“a”(3) of any upcoming long-term change in treatment or addition of a new source, as described in that subparagraph. The department must review and approve the addition of a new source or long-term change in water treatment before it is implemented by the system. The department has the authority to require the system to add or modify waiver conditions, such as to require recertification that the system is free of lead-containing and copper-containing materials or to require additional monitoring, if the department deems such modifications are necessary to address treatment or source water changes at the system.

- If a system with a waiver becomes aware that it is no longer free of lead-containing or copper-containing materials, such as from new construction or repairs, the system shall notify the department in writing no later than 60 days after becoming aware of such a change.

5. Continued eligibility. If the system continues to satisfy the requirements of 41.4(1)“c”(7)“4,” the waiver will be renewed automatically, unless any of the conditions listed below occur. A system whose waiver has been revoked may reapply for a waiver at such time as it again meets the appropriate materials and monitoring criteria of 41.4(1)“c”(7)“1” and 41.4(1)“c”(7)“2.”

- A system no longer satisfies the materials criteria of 41.4(1) “c”(7)“1,” or has a 90th percentile lead level greater than 0.005 mg/L or a 90th percentile copper level greater than 0.65 mg/L.
- The department notifies the system in writing that the waiver has been revoked, including the basis of its decision.

6. Requirements following waiver revocation. A system whose waiver has been revoked by the department is subject to the corrosion control treatment and lead and copper tap water monitoring requirements as follows:

- If the system exceeds the lead or copper action level, the system must implement corrosion control treatment in accordance with the deadlines specified in 567—paragraph 43.7(1)“e,” and any other applicable parts of 567—41.4(455B).

- If the system meets both the lead and copper action levels, the system must monitor for lead and copper at the tap no less frequently than once every three years using the reduced number of sample sites specified in subparagraph 41.4(1) “c”(3).

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 tap samples for applicable water quality parameters during each 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

- Except as provided in 41.4(1) “d”(3)“3,” 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”(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.

(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. Except as provided for in 41.4(1)“d”(3)“3,” 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.

3. Any groundwater system can limit entry point sampling described in 41.4(1)“d”(3)“3” to those entry points that are representative of water quality and treatment conditions throughout the system. If water from untreated groundwater sources mixes with water from treated groundwater sources, the system must monitor for water quality parameters both at representative entry points receiving treatment and representative entry points receiving no treatment. Prior to the start of any monitoring under this paragraph, the system shall provide to the department written information identifying the selected entry points and documentation sufficient to demonstrate that the sites are representative of water quality and treatment conditions throughout the system, including information on seasonal variability.

(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, all large systems shall measure the applicable water quality parameters according to 41.4(1)“d”(3) and determine compliance with the requirements of 567—paragraph 43.7(2)“g” every six months, with the first six-month period to begin on either January 1 or July 1, whichever comes first, after the department specifies the optimal values under 567—paragraph 43.7(2)“f.” 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. For any such small and medium-size system that is subject to a reduced monitoring frequency pursuant to 41.4(1)“c”(4)“4” at the time of the action level exceedance, the start of the applicable six-month monitoring period under this paragraph shall coincide with the end of the applicable monitoring period under 41.4(1)“c”(4)“4.” Compliance with department-designated optimal water quality parameter values shall be determined as specified in 567—paragraph 43.7(2)“g.”

(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. A public water system that maintains 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 monitoring may reduce the frequency with which the system collects the number of tap samples for applicable water quality parameters specified in 41.4(1)“d”(5) from every six months to annually. This sampling shall begin during the calendar year immediately following the end of the monitoring period in which the third consecutive year of six-month monitoring occurs. Any system that maintains 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 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. This sampling shall begin no later than the third calendar year following the end of the monitoring period in which the third consecutive year of monitoring occurs.

A water system may reduce the frequency with which it collects tap samples for applicable water quality parameters specified in 41.4(1)“d”(5)“1” to every three years if it demonstrates during two consecutive monitoring periods that its tap water lead level at the 90th percentile is less than or equal to 0.005 mg/L, that its tap water copper level at the 90th percentile is less than or equal to 0.65 mg/L, and that it also has maintained 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.” Monitoring conducted every three years shall be done no later than every third calendar year.

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

4. Any water system subject to the reduced monitoring frequency that fails to operate at or above the minimum value or within the range of values for the water quality parameters specified by the department under 567—paragraph 43.7(2)“f” for more than nine days in any six-month period specified in 567—paragraph 43.7(2)“g” shall resume distribution system tap water sampling in accordance with the number and frequency requirements in 41.4(1)“d”(3). Such a system may resume annual monitoring for water quality parameters at the tap at the reduced number of sites specified in 41.4(1)“d”(5)“1” after it has completed two subsequent consecutive six-month rounds of monitoring that meet the criteria of that paragraph or may resume triennial monitoring for water quality parameters at the tap at the reduced number of sites after it demonstrates through subsequent rounds of monitoring that it meets the criteria in 41.4(1)“d”(5)“2.”

(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 PARAMETERS¹

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 or silica ³ , calcium ⁴	Every 6 months
	Entry point(s) to distribution system ⁶	pH, alkalinity, if alkalinity is adjusted as part of corrosion control then include the chemical additive dosage rate and concentration, inhibitor dosage rate and inhibitor residual ⁵	At least every two weeks
After Department Specifies Parameter Values for Optimal Corrosion Control	Taps	pH, alkalinity, orthophosphate or silica ³ , calcium ⁴	Every 6 months
	Entry point(s) to distribution system ⁶	pH, alkalinity, if alkalinity is adjusted as part of corrosion control then include the chemical additive dosage rate and concentration, inhibitor dosage rate and inhibitor residual ⁵	At least every two weeks
Reduced Monitoring	Taps	pH, alkalinity, orthophosphate or silica ³ , calcium ⁴	Every 6 months, annually ⁷ , or every 3 years ⁸ , at a reduced number of sites

Monitoring Period	Location	Parameters ²	Frequency
	Entry point(s) to distribution system ⁶	pH, alkalinity, if alkalinity is adjusted as part of corrosion control then include the chemical additive dosage rate and concentration, inhibitor dosage rate and inhibitor residual ⁵	At least every two weeks

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

²Small 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.

³Orthophosphate 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.

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

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

⁶Groundwater systems may limit monitoring to representative locations throughout the systems.

⁷Water systems may reduce frequency of monitoring for water quality parameters at the tap from every six months to annually if they have maintained the range of values for water quality parameters reflecting optimal corrosion control during three consecutive years of monitoring.

⁸Water systems may further reduce the frequency of monitoring for water quality parameters at the tap from annually to once every three years if they have maintained the range of values for water quality parameters reflecting optimal corrosion control during three consecutive years of annual monitoring. Water systems may accelerate to triennial monitoring for water quality parameters at the tap if they have maintained 90th percentile lead levels less than or equal to 0.005 mg/L, 90th percentile copper levels less than or equal to 0.65mg/L, and the range of water quality parameters designated by the department under 567—paragraph 43.7(2)“f” as representing optimal corrosion control during two consecutive six-month monitoring periods.

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 following requirements regarding sample location, number of samples, and collection methods:

- Groundwater systems shall take a minimum of one sample at every entry point to the distribution system (source entry point) which is representative of each well after treatment. The system shall take one sample at the same source entry point unless conditions make another sampling location more representative of each source or treatment plant.

- Surface water systems and any system with a combination of surface water and groundwater 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. 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.

- 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, when water is representative of all sources being used.

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 no later than six months after the end of the monitoring period during which the lead or copper action level was exceeded. For monitoring periods that are annual or less frequent, the end of the monitoring period is September 30 of the calendar year in which the sampling occurs or, if the department has established an alternate monitoring period, the last day of that period.

(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. Triennial samples shall be collected every third calendar year. 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 during the year in which the department determination is made under this subparagraph.

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 may reduce the monitoring frequency for lead and copper in source water to once during each nine-year compliance cycle provided that the samples are collected no later than every ninth calendar year and if the system meets one of the following criteria:

- The system 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”; or

- The department has determined that source water treatment is not needed and the system demonstrates that, during at least three consecutive compliance periods in which sampling was conducted under 41.4(1)“e”(4)“1,” the concentration of lead in source water was less than or equal to 0.005 mg/L and the concentration of copper in source water was less than or equal to 0.65 mg/L.

2. A water system using surface water (or a combination of surface water and groundwater) may reduce the monitoring frequency in 41.4(1)“e”(4)“1” to once during each nine-year compliance cycle provided that the samples are collected no later than every ninth calendar year and if that system meets one of the following criteria:

- The system 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; or

- The department has determined that source water treatment is not needed and the system demonstrates that, during at least three consecutive years, the concentration of lead in source water was less than or equal to 0.005 mg/L and the concentration of copper in source water was less than or equal to 0.65 mg/L.

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, 800 I Street, NW, Washington, DC 20001-3710, (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	Methodology ⁹	Reference (Method Number)				
		EPA	ASTM ³	SM	SM Online ¹⁶	USGS ⁵ or Other
Alkalinity	Titrimetric		D1067-92B, 02B, 06B, 11B	2320 B ^{11, 15, 18}	2320 B-97	
	Electrometric titration					I-1030-85
Calcium	EDTA titrimetric		D511-93A, 03A, 09A, 14A	3500-Ca D ⁴	3500-Ca B-97	

Contaminant	Methodology ⁹	Reference (Method Number)				
		EPA	ASTM ³	SM	SM Online ¹⁶	USGS ⁵ or Other
	Atomic absorption; direct aspiration Inductively coupled plasma Ion chromatography Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP-AES)	200.7 ² 200.5, Rev. 4.2 ¹⁷	D511-93B, 03B, 09B, 14B D6919-03, 09	3500-Ca B ^{12, 15, 18} 3111 B ^{4, 15, 18} 3120 B ^{11, 15, 18}	3500-Ca B-97 3111 B-99 3120 B-99	
Chloride	Ion chromatography Potentiometric titration Argentometric titration Capillary ion electrophoresis	300.0 ⁸ , 300.1 ¹³	D4327-97, 03 D512-89B (reapproved 1999), D512-04B	4110 B ^{11, 15} 4500-Cl ⁻ D ^{11, 15} 4500-Cl ⁻ B ^{11, 15}	4550 B-00 4500-Cl ⁻ D-97 4500-Cl ⁻ B-97	 D6508, Rev. 2 ¹⁴
Conductivity	Conductance		D1125-95A (reapproved 1999), 14A	2510 B ^{11, 15, 18}	2510 B-97	
Copper ⁶	Atomic absorption; furnace technique Atomic absorption; direct aspiration Inductively coupled plasma Inductively coupled plasma; mass spectrometry Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP-AES) Atomic absorption; platform furnace Colorimetric	200.7 ² 200.8 ² 200.5, Rev. 4.2 ¹⁷ 200.9 ²	D1688-95C, 02C, 07C, 12C D1688-95A, 02A, 07A, 12A	3113 B ^{4, 15, 18} 3111 B ^{4, 15, 18} 3120 B ^{11, 15, 18}	3113 B-99, 04, 10 3111 B-99 3120 B-99	 Hach Method 8026 ¹⁹ ; Hach Method 10272 ²⁰
Lead ⁶	Atomic absorption; furnace technique Inductively coupled plasma; mass spectrometry Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP-AES) Atomic absorption; platform furnace technique Differential pulse anodic stripping voltammetry	200.8 ² 200.5, Rev. 4.2 ¹⁷ 200.9 ²	D3559-96D, 03D, 08D	3113 B ^{4, 15, 18}	3113 B-99, 04, 10	 Method 1001 ¹⁰

Contaminant	Methodology ⁹	Reference (Method Number)				
		EPA	ASTM ³	SM	SM Online ¹⁶	USGS ⁵ or Other
pH	Electrometric	150.1 ¹ 150.2 ¹	D1293-95, 99, 12	4500-H ⁺ B ^{11, 15, 18}	4500-H ⁺ B-00	
Orthophosphate (Unfiltered, no digestion or hydrolysis)	Colorimetric, automated, ascorbic acid	365.1 ⁸		4500-P F ^{11, 15, 18}	4500-P F-99	Thermo Fisher Discrete Analyzer ²¹
	Colorimetric, ascorbic acid, single reagent		D515-88A	4500-P E ^{11, 15, 18}	4500-P E-99	I-1602-85
	Colorimetric, phosphomolybdate; Automated-segmented flow					I-2601-90 ⁸
	Automated discrete					I-2598-85
	Ion chromatography	300.0 ⁷ , 300.1 ¹³	D4327-97, 03, 11	4110 B ^{11, 15, 18}	4110 B-00	D6508, Rev. 2 ¹⁴
Silica	Capillary ion electrophoresis					
	Colorimetric, molybdate blue					I-1700-85
	Automated-segmented flow					I-2700-85
	Colorimetric		D859-95, 00, 05, 10			
	Molybdosilicate			4500-Si D ⁴	4500-SiO ₂ C-97	
				4500-SiO ₂ C ^{12, 15, 18}	4500-SiO ₂ C-97	
	Heteropoly blue			4500-Si E ¹⁵	4500-SiO ₂ D-97	
Automated method for molybdate-reactive silica			4500-SiO ₂ D ^{12, 15, 18}	4500-SiO ₂ D-97		
Inductively coupled plasma ⁶	200.7 ²			4500-Si F	4500-SiO ₂ E-97	
Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP-AES)	200.5, Rev. 4.2 ¹⁷			4500-SiO ₂ E ^{12, 15, 18}	3120 B-99	
Sulfate	Ion chromatography	300.0 ⁷ , 300.1 ¹³	D4327-97, 03	4110 ^{11, 15, 18}	4110 B-00	
	Automated methylthymol blue	375.2 ⁷		4500-SO ₄ F ^{11, 15}	4500-SO ₄ ⁻² F-97	
	Gravimetric			4500-SO ₄ C ^{11, 15}	4500-SO ₄ ⁻² C-97	
				4500-SO ₄ D ^{11, 15}	4500-SO ₄ ⁻² D-97	
	Turbidimetric		D516-90, 02, 07	4500-SO ₄ E ^{11, 15}	4500-SO ₄ ⁻² E-97	
Capillary ion electrophoresis					D6508, Rev. 2 ¹⁴	
Temperature	Thermometric			2550 B ^{11, 15, 18}	2550-00, 10	

Contaminant	Methodology ⁹	Reference (Method Number)				
		EPA	ASTM ³	SM	SM Online ¹⁶	USGS ⁵ or Other
Total Filterable Residue (TDS)	Gravimetric			2540 C ^{11, 15}	2540 C-97	

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. 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.

¹“Methods for Chemical Analysis of Water and Wastes,” EPA-600/4-79-020, March 1983. Available at NTIS as PB84-128677.

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

³Annual Book of ASTM Standards, 1994, 1996, 1999, or 2003, Vols. 11.01 and 11.02, American Society for Testing and Materials, International; the methods listed are the only versions that may be used. The previous versions of D1688-95A and D1688-95C (copper), D3559-95D (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 ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428 or www.astm.org.

⁴18th 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, 800 I Street, NW, Washington, DC 20001-3710.

⁵Techniques 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.

⁶Samples 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 from Information Services, U.S. Geological Survey, Federal Center, Box 25286, Denver, CO 80225-0425.

⁹Because 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.

¹⁰The 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 80538.

¹¹The 18th, 19th, and 20th editions of Standard Methods for the Examination of Water and Wastewater, 1992, 1995, and 1998, respectively, American Public Health Association. Any edition may be used, except that the versions of 3111B and 3113B in the 20th edition may not be used. Copies may be obtained from the American Public Health Association, 800 I Street, NW, Washington, DC 20001-3710.

¹²The 20th edition of Standard Methods for the Examination of Water and Wastewater, 1998, American Public Health Association. Copies may be obtained from the American Public Health Association, 800 I Street, NW, Washington, DC 20001-3710.

¹³“Methods for the Determination of Organic and Inorganic Compounds in Drinking Water,” Vol. 1, EPA 815-R-00-014, August 2000. Available at NTIS, PB2000-106981.

¹⁴Method D6508, Rev. 2, “Test Method for Determination of Dissolved Inorganic Anions in Aqueous Matrices Using Capillary Ion Electrophoresis and Chromate Electrolyte,” available from Waters Corp., 34 Maple Street, Milford, MA 01757; telephone: (508)482-2131.

¹⁵Standard Methods for the Examination of Water and Wastewater, 21st edition (2005), American Public Health Association. Available from the American Public Health Association, 800 I Street, NW, Washington, DC 20001-3710.

¹⁶Standard Methods Online is available at www.standardmethods.org. The year in which each method was approved by the Standard Methods Committee is designated by the last two digits in the method number. The methods listed are the only online versions that may be used.

¹⁷EPA Method 200.5, Revision 4.2: “Determination of Trace Elements in Drinking Water by Axially Viewed Inductively Coupled Plasma-Atomic Emission Spectrometry,” 2003. EPA/600/R-06/115. Available at www.nemi.gov.

¹⁸Standard Methods for the Examination of Water and Wastewater, 22nd edition (2012), American Public Health Association. Available from the American Public Health Association, 800 I Street, NW, Washington, DC 20001-3710.

¹⁹Hach Company. “Hach Method 8026 – Spectrophotometric Measurement of Copper in Finished Drinking Water,” December 2015, Revision 1.2. Available from www.hach.com.

²⁰Hach Company. “Hach Method 10272 – Spectrophotometric Measurement of Copper in Finished Drinking Water,” December 2015, Revision 1.2. Available from www.hach.com.

²¹Thermo Fisher. “Thermo Fisher Scientific Drinking Water Orthophosphate Method for Thermo Scientific Gallery Discrete Analyzer,” February 2016. Revision 5. Thermo Fisher Scientific, Ratastie 2 01620 Vantaa, Finland.

(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 567—paragraph 83.6(7)“a”(5)“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.*
[ARC 3735C, IAB 4/11/18, effective 5/16/18]