6560-50-P

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 141

[EPA-HQ-OW-2023-0541; FRL-11620-01-OW]

Expedited Approval of Alternative Test Procedures for the Analysis of Contaminants under the Safe Drinking Water Act; Analysis and Sampling Procedures

AGENCY: Environmental Protection Agency (EPA).

ACTION: Final rule.

SUMMARY: This action announces the Environmental Protection Agency's (EPA's) approval of alternative testing methods for use in measuring the levels of contaminants in drinking water to determine compliance with national primary drinking water regulations. The Safe Drinking Water Act authorizes EPA to approve the use of alternative testing methods through publication in the *Federal Register*. EPA is using this streamlined authority to make 93 additional methods available for analyzing drinking water samples. This expedited approach provides public water systems, laboratories, and primacy agencies with more timely access to new measurement techniques and greater flexibility in the selection of analytical methods, thereby reducing monitoring costs while maintaining public health protection.

DATES: This action is effective **[INSERT DATE OF PUBLICATION IN THE FEDERAL REGISTER]**.

ADDRESSES: EPA has established a docket for this action under Docket ID No. EPA-HQ-OW-2023-0541. All documents in the docket are listed on the https://www.regulations.gov website. Although listed in the index, some information is not publicly available, e.g., confidential business information (CBI) or other information whose disclosure is restricted by statute. Certain other material, such as copyrighted

material, is not placed on the Internet and will be publicly available only in hard copy form. Publicly available docket materials are available electronically through https://www.regulations.gov.

FOR FURTHER INFORMATION CONTACT: Teresa Wells, Technical Support Branch, Standards and Risk Management Division, Office of Ground Water and Drinking Water (MS 140), Environmental Protection Agency, 26 West Martin Luther King Drive, Cincinnati, OH 45268; telephone number: (513) 569-7128; e-mail address: wells.teresa@epa.gov.

SUPPLEMENTARY INFORMATION:

I. General Information

A. *Does this Action Apply to Me?*

Public water systems are the regulated entities required to measure contaminants in drinking water samples. In addition, EPA Regions as well as States and Tribal governments with authority to administer the regulatory program for public water systems under the Safe Drinking Water Act (SDWA) may measure contaminants in water samples. When EPA sets a monitoring requirement in its national primary drinking water regulations for a given contaminant, the agency also establishes (in the regulations) standardized test procedures for analysis of the contaminant. This action makes alternative testing methods available for particular drinking water contaminants beyond the testing methods currently established in the regulations. EPA is providing public water systems, required to test water samples, with a choice of using either a test procedure already established in the existing regulations or an alternative testing method that has been approved in this action or in prior expedited approval actions. Categories and entities that may ultimately be affected by this action include:

Category	Examples of potentially regulated entities	NAICS[1]
State, local, & Tribal governments	State, local, and Tribal governments that analyze water samples on behalf of public water systems required to conduct such analysis; State, local, and Tribal	924110

	governments that directly operate community and non-transient non-community water systems required to monitor.	
Industry	Private operators of community and non-transient non-community water systems required to monitor.	221310
Municipalities	Municipal operators of community and non-transient non-community water systems required to monitor.	924110

[1]North American Industry Classification System.

This table is not intended to be exhaustive, but rather provides a guide for readers regarding entities likely to be interested in this action. Other types of entities not listed in the table could also have some interest. To determine whether your facility is affected by this action, you should carefully examine the applicability language in the *Code of Federal Regulations* (CFR) at 40 CFR 141.2 (definition of a public water system). If you have questions regarding the applicability of this action to a particular entity, consult the person listed in the preceding **FOR FURTHER INFORMATION CONTACT** section.

Abbreviations and Acronyms Used in this Action

CFR: *Code of Federal Regulations*

EPA: United States Environmental Protection Agency

NAICS: North American Industry Classification System

QC: Quality Control

SDWA: The Safe Drinking Water Act

VCSB: Voluntary Consensus Standard Bodies

II. Background

A. What is the Purpose of This Action?

In this action, EPA is approving 93 analytical methods for determining contaminant concentrations in drinking water samples collected under SDWA. Regulated entities required to sample and monitor may use either the testing methods already established in existing regulations or the alternative testing methods being approved in this action or in prior expedited approval actions. The new methods are listed along with

other methods similarly approved through previous expedited actions in 40 CFR part 141, appendix A to subpart C and on EPA's drinking water methods website at https://www.epa.gov/dwanalyticalmethods.

B. What is the Basis for This Action?

When EPA determines that an alternative analytical method is "equally effective" (i.e., as effective as a method that has already been promulgated in the regulations), SDWA allows EPA to approve the use of the alternative testing method through publication in the *Federal Register* (see section 1401(1) of SDWA). EPA is using this streamlined approval authority to make 93 additional methods available for determining contaminant concentrations in drinking water samples collected under SDWA. EPA has determined that, for each contaminant or group of contaminants listed in section III of this preamble, the additional testing methods being approved in this action are as effective as one or more of the testing methods already approved in the regulations for those contaminants. Section 1401(1) of SDWA states that the newly approved methods "shall be treated as an alternative for public water systems to the quality control and testing procedures listed in the regulation." Accordingly, this action makes these additional 93 analytical methods legally available as options for meeting EPA's monitoring requirements.

This action does not add regulatory language, but does, for informational purposes, update an appendix to the regulations at 40 CFR part 141 that lists all methods approved under section 1401(1) of SDWA. Accordingly, while this action is not a rule, it is updating CFR text and therefore is being published in the "Final Rules" section of the *Federal Register*.

III. Summary of Approvals

EPA is approving 93 methods that are equally effective relative to methods previously promulgated in the regulations. By means of this action, these 93 methods are

added to appendix A to subpart C of 40 CFR part 141.

A. Methods developed by Voluntary Consensus Standard Bodies (VCSB)

1. ASTM International. EPA compared the most recent version of one ASTM International method for determination of radium-226 by radon emanation to the earlier version of the method that is currently approved in 40 CFR 141.25(a). Changes between the earlier approved version and the most recent version of the method are described more fully in Smith 2023. The revisions involve primarily editorial changes (e.g., updated references, definitions, terminology, procedural clarifications, and reorganization of text). The revised method is the same as the approved version with respect to sample collection and handling protocols, sample preparation, analytical methodology, and method performance data; thus, EPA finds it is equally effective relative to the approved method.

EPA is thus approving the use of the following ASTM method for radium-226 as listed in the following table:

ASTM Revised Version	Approved Method	Contaminant	Regulation Citation
D 3454-21 (ASTM 2021)	D 3454-97 (ASTM 1997)	Radium-226	40 CFR 141.25(a)

The ASTM method is available from ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959 or https://www.astm.org.

2. Standard Methods for the Examination of Water and Wastewater (Standard Methods). The 24th edition of *Standard Methods for the Examination of Water and Wastewater* (APHA 2023) was published in 2023. EPA compared 90 methods in the 24th edition to earlier versions of those methods that are currently approved in 40 CFR parts 141 and 143. Changes between the approved version and the version of each method published in the 24th edition are summarized in Smith and Wendelken (2023) and Best (2023). The revisions primarily involve editorial changes (e.g., correction of errors, procedural clarifications and reorganization of text). The methods in the following table

are the same as the earlier approved versions with respect to the sample handling protocols, analytical procedures and method performance data. For these reasons, EPA has concluded that the versions in the 24th edition are equally effective relative to the currently approved versions in the regulations. Therefore, EPA is approving the use of 90 Standard Methods in the 24th edition for the contaminants and their respective regulations listed in the following table:

Standard Methods, 24th Edition (APHA 2023)	Approved Method	Contaminant	Regulation Citations
2120 B	2120 B-01, online version (APHA 2001a)	Color	40 CFR 143.4(b)
2130 B	2130 B-01, online version (APHA 2001b)	Turbidity	40 CFR 141.74(a)(1)
2150 B	2150 B-97, online version (APHA 1997a)	Odor	40 CFR 143.4(b)
2320 B	2320 B-97, online version (APHA 1997b)	Alkalinity	40 CFR 141.23(k)(1)
2510 B	2510 B-97, online version (APHA 1997c)	Conductivity	40 CFR 141.23(k)(1)
2540 C	2540 C-97, online version (APHA 1997d)	Total Dissolved Solids	40 CFR 143.4(b)
2550	2550-00, online version (APHA 2000a)	Temperature	40 CFR 141.23(k)(1)
3111 B	3111 B-99, online version (APHA 1999a)	Calcium, copper, magnesium, nickel, sodium, iron, manganese, silver, zinc	40 CFR 141.23(k)(1); 40 CFR 143.4(b)
3111 D	3111 D-99, online version (APHA 1999a)	Barium, aluminum	40 CFR 141.23(k)(1); 40 CFR 143.4(b)
3112 B	3112 B-99, online version (APHA 1999b)	Mercury	40 CFR 141.23(k)(1)
3113 B	3113 B, 19th Edition (APHA 1995)	Antimony, arsenic, barium, beryllium, cadmium, chromium, copper, lead, nickel, selenium, aluminum, iron, manganese, silver	40 CFR 141.23(k)(1); 40 CFR 143.4(b)
3114 B	3114 B-97, online version (APHA 1997e)	Arsenic, selenium	40 CFR 141.23(k)(1)
3120 B	3120 B-99, online	Barium, beryllium,	40 CFR

	version (APHA 1999c)	calcium, chromium, copper, magnesium, nickel, silica, aluminum, iron, manganese, silver, zinc	141.23(k)(1); 40 CFR 143.4(b)
3500-Ca B	3500-Ca B-97, online version (APHA 1997f)	Calcium	40 CFR 141.23(k)(1)
3500-Mg B	3500-Mg B-97, online version (APHA 1997g)	Magnesium	40 CFR 141.23(k)(1)
4110 B	4110 B-00, online version (APHA 2000b)	Fluoride, nitrate, nitrite, ortho-phosphate, chloride, sulfate	40 CFR 141.23(k)(1); 40 CFR 143.4(b)
4500-Cl D,F,G,H	4500-Cl D,F,G,H-00, online versions (APHA 2000c)	Free chlorine	40 CFR 141.74(a)(2); 40 CFR 141.131(c)(1)
4500-Cl D,E,F,G,I	4500-Cl D,E,F,G,I-00, online versions (APHA 2000c)	Total chlorine	40 CFR 141.74(a)(2); 40 CFR 141.131(c)(1)
4500-Cl D,F,G	4500-Cl D,F,G-00, online versions (APHA 2000c)	Combined chlorine	40 CFR 141.131(c)(1)
4500-Cl^- B,D	4500-Cl^- B,D-97, online versions (APHA 1997h)	Chloride	40 CFR 143.4(b)
4500-ClO_2 C	4500-ClO_2 C-00, online version (APHA 2000d)	Chlorine dioxide	40 CFR 141.74(a)(2)
4500-ClO_2 E	4500-ClO_2 E-00, online version (APHA 2000d)	Chlorine dioxide	40 CFR 141.74(a)(2); 40 CFR 141.131(c)(1)
4500-ClO_2 E	4500-ClO_2 E-00, online version (APHA 2000d)	Chlorite	40 CFR 141.131(b)(1)
4500-CN^- C,E,F,G	4500-CN^- C,E,F,G, 20th Edition (APHA 1998)	Cyanide	40 CFR 141.23(k)(1)
4500-F^- B,C,D,E	4500-F^- B,C,D,E-97, online versions (APHA 1997i)	Fluoride	40 CFR 141.23(k)(1)
4500-H^+ B	4500-H^+ B-00, online version (APHA 2000e)	pH	40 CFR 141.23(k)(1)
4500-NO_3^- D	4500-NO_3^- D-00, online version (APHA 2000f)	Nitrate	40 CFR 141.23(k)(1)
4500-NO_3^- E,F	4500-NO_3^- E,F-00, online versions (APHA 2000f)	Nitrate, nitrite	40 CFR 141.23(k)(1)
4500-NO_2^- B	4500-NO_2^- B-00, online version (APHA 2000g)	Nitrite	40 CFR 141.23(k)(1)
4500-O_3 B	4500-O_3 B-97, online version (APHA 1997j)	Ozone	40 CFR 141.74(a)(2)
4500-P E,F	4500-P E,F, 19th	Ortho-phosphate	40 CFR 141.23(k)(1)

	Edition, (APHA 1995)		
4500-SiO_2 C,D,E	4500-SiO_2 C,D,E-97, online versions (APHA 1997k)	Silica	40 CFR 141.23(k)(1)
4500-SO_4^{2-} C,D,E,F	4500-SO_4^{2-} C,D,E,F, 19th Edition (APHA 1995)	Sulfate	40 CFR 143.4(b)
5310 B,C	5310 B,C-00, online versions (APHA 2000h)	Dissolved and Total Organic Carbon	40 CFR 141.131(d)
5540 C	5540 C-00, online version (APHA 2000i)	Foaming agents	40 CFR 143.4(b)
5910 B	5910 B-00, online version (APHA 2000j)	UV Absorption at 254 nm	40 CFR 141.131(d)
6251 B	6251 B-94, online version (APHA 1994)	HAA5	40 CFR 141.131(b)(1)
6610 B	EPA Method 531.2, Rev. 1.0 (USEPA 2001)	Carbofuran, oxamyl	40 CFR 141.24(e)(1)
6640 B	EPA Method 515.4, Rev. 1.0 (USEPA 2000)	2,4-D; 2,4,5-TP; Dalapon; Dinoseb; Pentachlorophenol; Picloram	40 CFR 141.24(e)(1)
6651 B	6651 B, 20th Edition, (APHA 1998)	Glyphosate	40 CFR 141.24(e)(1)
7110 B	7110 B-00, online version (APHA 2000k)	Gross alpha and gross beta	40 CFR 141.25(a)
7110 C	7110 C-00, online version (APHA 2000k)	Gross alpha	40 CFR 141.25(a)
7110 D	EPA Method 900.0 (USEPA 1980)	Gross alpha and gross beta	40 CFR 141.25(a)
7120	7120-97, online version (APHA 1997l)	Gamma emitters (includes radioactive cesium and iodine)	40 CFR 141.25(a)
7500-Cs B	7500-Cs B-00, online version (APHA 2000l)	Radioactive Cesium and Gamma emitters	40 CFR 141.25(a)
7500-^{3}H B	7500-^{3}H B-00, online version (APHA 2000m)	Tritium	40 CFR 141.25(a)
7500-I B	7500-I B-00, online version (APHA 2000n)	Radioactive Iodine and Gamma emitters	40 CFR 141.25(a)
7500-I C,D	7500-I C,D-00, online versions (APHA 2000n)	Radioactive Iodine	40 CFR 141.25(a)
7500-Ra B,C	7500-Ra B,C-01, online versions (APHA 2001c)	Radium-226	40 CFR 141.25(a)
7500-Ra D	7500-Ra D-01, online version (APHA 2001c)	Radium-228	40 CFR 141.25(a)

7500-Ra E	GA Method (2004)	Radium-226 and Radium-228	40 CFR 141.25(a)
7500-Sr B	7500-Sr B-01, online version (APHA 2001d)	Strontium-89 and Strontium-90	40 CFR 141.25(a)
7500-U B,C	7500-U B,C-00, online versions (APHA 2000o)	Uranium	40 CFR 141.25(a)
9221 A,C	9221 A,C, 20th Edition, (APHA 1998)	Total coliforms	40 CFR 141.74(a)(1)
9221 B	9221 B, 20th Edition, (APHA 1998)	Total coliforms	40 CFR 141.74(a)(1) 40 CFR 141.852(a)(5) [B.1, B.2, B.3, B.4]
9221 D	9221 D, 20th Edition, (APHA 1998)	Total coliforms	40 CFR 141.852(a)(5) [D.1, D.2, D.3]
9221 E	9221 E, 20th Edition, (APHA 1998)	Fecal coliforms	40 CFR 141.74(a)(1)
9221 F	9221 F, 20th Edition, (APHA 1998)	*E. coli*	40 CFR 141.402(c)(2) 40 CFR 141.852(a)(5) [F.1]
9222 A	9222 A 20th Edition, (APHA 1998)	Total coliforms	40 CFR 141.74(a)(1)
9222 B,C	9222 B,C, 20th Edition, (APHA 1998)	Total coliforms	40 CFR 141.74(a)(1) 40 CFR 141.852(a)(5)
9222 D	9222 D, 20th Edition, (APHA 1998)	Fecal coliforms	40 CFR 141.74(a)(1)
9222 H	9222 G, 20th Edition, (APHA 1998)	*E. coli*	40 CFR 141.852(a)(5)
9222 I	9222 G, 20th Edition, (APHA 1998)	*E. coli*	40 CFR 141.402(c)(2) 40 CFR 141.852(a)(5)
9222 J	m-ColiBlue24 Test (Hach Company 1999)	Total coliforms	40 CFR 141.852(a)(5)
9222 J	m-ColiBlue24 Test (Hach Company 1999)	*E. coli*	40 CFR 141.402(c)(2) 40 CFR 141.852(a)(5)
9223 B	9223 B, 20th Edition (APHA 1998)	Total coliforms	40 CFR 141.74(a)(1); 40 CFR 141.852(a)(5)
9223 B	9223 B, 20th Edition (APHA 1998)	*E. coli*	40 CFR 141.402(c)(2); 40 CFR 141.852(a)(5)
9230 B	9230 C, 20th Edition (APHA 1998)	Enterococci	40 CFR 141.402(c)(2)
9230 C	9230 C, 20th Edition (APHA 1998)	Enterococci	40 CFR 141.402(c)(2)

9230 D	(Budnick 1996)	Enterococci	40 CFR 141.402(c)(2)

The 24th edition can be obtained from the American Public Health Association (APHA), 800 I Street, NW, Washington, DC 20001-3710. Approved online versions are available at *http://www.standardmethods.org*.

B. *Methods Developed by Vendors*

1. Hach Method 10312 – Spectrophotometric Measurement of Fluoride in Finished Drinking Water Aluminum-Chromeazurol S complex (AL-CAS) Using Planar Reagent-filled Cuvettes (Hach 2022a). Hach Method 10312 uses a reagent solution containing an intensely colored aluminum-chromeazurol S complex. The presence of fluoride in the sample removes aluminum from the complex, releasing the free chromeazurol S ion. The free chromeazurol S ion has peak absorbance in a different region of the visible spectrum. The quantifiable change in absorbance is directly proportional to the fluoride concentration. Test results are measured at 427 nm using a colorimeter.

Approved methods for fluoride are listed at 40 CFR 141.23(k)(1). The performance characteristics of Hach Method 10312 were compared to the performance characteristics of the approved Standard Methods 4500-F D (Standard Methods 1997i). The validation study report (Hach 2022b) summarizes the results obtained from three different facilities and laboratories. Method detection limits and method limits, precision and accuracy performance in high and low ionic strength water, and matrix spike studies were determined at all sites.

EPA has determined that Hach Method 13012 is equally effective relative to Standard Methods 4500-F D. The basis for this determination is discussed in Adams 2023a. Therefore, EPA is approving the Hach Method 10312 for determining fluoride in drinking water. A copy of the method is available from Hach Company, 5600 Lindbergh

Drive, Loveland, Colorado 80539.

2. Yokogawa Method 820 – Measurement of Turbidity in Drinking Water by Right Angle Scattered Light Turbidity Analyzer (Yokogawa 2022a). Yokogawa Method 820 uses a right-angle scattering turbidimeter with an LED light source with a peak emitting wavelength between 650 and 670 nm. The method is based upon a comparison of the intensity of light scattered by the sample under defined conditions with the intensity of light scattered by a standard reference suspension.

Approved methods for turbidity are listed at 40 CFR 141.74(a)(1). The performance characteristics of the Yokogawa Method 820 were compared to the performance characteristics of the approved EPA Method 180.1 (USEPA 1993). The validation study report (Yokogawa 2022b) summarizes the results obtained from the turbidimeters tested at three different utilities. Method resolution, linearity, limits of detection, and precision and accuracy were determined at the first site, with subsequent sites evaluating precision and accuracy performance.

EPA has determined that the Yokogawa Method 820 is equally effective relative to EPA Method 180.1. The basis for this determination is discussed in Adams 2023b. Therefore, EPA is approving the Yokogawa Method 820 for determining turbidity in drinking water. A copy of the method is available from Yokogawa Electric Corporation, 2-9-32 Nakamachi, Musashino-shi, Tokyo, Japan 180-8750.

IV. Statutory and Executive Order Reviews

As noted in section II of this preamble, under the terms of SDWA section 1401(1), this streamlined method approval action is not a rule. Accordingly, the Congressional Review Act, 5 U.S.C. 801 et seq., as added by the Small Business Regulatory Enforcement Fairness Act of 1996, does not apply because this action is not a rule for purposes of 5 U.S.C. 804(3). Similarly, this action is not subject to the Regulatory Flexibility Act because it is not subject to notice and comment requirements

under the Administrative Procedure Act or any other statute. In addition, because this approval action is not a rule, but simply makes alternative testing methods available as options for monitoring under SDWA, EPA has concluded that other statutes and executive orders generally applicable to rulemaking do not apply to this approval action.

V. References

Adams, W. 2023a. Memo to the record describing basis for expedited approval of Hach Method 10312. May 9, 2023. (Available at https://www.regulations.gov; docket ID No. EPA-HQ-OW-2023-0541.)

Adams, W. 2023b. Memo to the record describing basis for expedited approval of Yokogawa Method 820. May 9, 2023. (Available at *https://www.regulations.gov*; docket ID No. EPA-HQ-OW-2023-0541.)

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American Public Health Associate (APHA). 1995. *19th Edition of Standard Methods for the Examination of Water and Wastewater*. American Public Health Association, 800 I Street, NW, Washington, DC 20001-3710.

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American Public Health Association (APHA). 1997d. Standard Method 2540 C-97. Solids. C. Total Dissolved Solids Dried at 180 ^{o}C. Approved by Standard Methods Committee 1997. Standard Methods Online (Available at *https//www.standardmethods.org*)

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American Public Health Association (APHA). 1997h. Standard Methods 4500-Cl^- B, D-97. Chloride. B. Argentometric Method. D. Potentiometric Method. Approved by Standard Methods Committee 1997. Standard Methods Online (Available at *https//www.standardmethods.org*)

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Method. D. SPADNS Method. E. Complexone Method. Approved by Standard Methods Committee

1997. Standard Methods Online (Available at *https//www.standardmethods.org*)

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American Public Health Association (APHA). 1997l. Standard Method 7120 B-97. Gamma-Emitting Radionuclides. B. Gamma Spectroscopic Method. Approved by Standard Methods Committee 1997. Standard Methods Online (Available at *https//www.standardmethods.org*)

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List of Subjects in 40 CFR Part 141

Environmental protection, Chemicals, Indians-lands, Intergovernmental relations, Reporting and recordkeeping requirements, Water supply.

Jennifer L. McLain, Director,
Office of Ground Water and Drinking Water.

For the reasons stated in the preamble, the Environmental Protection Agency amends 40 CFR part 141 as follows:

PART 141—NATIONAL PRIMARY DRINKING WATER REGULATIONS

1. The authority citation for part 141 continues to read as follows:

Authority: 42 U.S.C. 300f, 300g-1, 300g-2, 300g-3, 300g-4, 300g-5, 300g-6, 300j-4, 300j-9, and 300j-11**.**

2. Amend Appendix A to subpart C of part 141 by:

a. Revising the table entitled “Alternative Testing Methods for Contaminants Listed at 40 CFR 141.23(k)(1)”;

b. Revising the table entitled “Alternative Testing Methods for Contaminants Listed at 40 CFR 141.24(e)(1)”;

c. Revising the table entitled “Alternative Testing Methods for Contaminants Listed at 40 CFR 141.25(a)”;

d. Revising the table entitled “Alternative Testing Methods for Contaminants Listed at 40 CFR 141.74(a)(1)”;

e. Revising the table entitled “Alternative Testing Methods for Disinfectant Residuals Listed at 40 CFR 141.74(a)(2)”;

f. Revising the table entitled “Alternative Testing Methods for Contaminants Listed at 40 CFR 141.131(b)(1)”;

g. Revising the table entitled “Alternative Testing Methods for Disinfectant Residuals Listed at 40 CFR 141.131(c)(1)”;

h. Revisingthe table entitled “Alternative Testing Methods for Parameters Listed at 40 CFR 141.131(d)”;

i. Revising the table entitled “Alternative Testing Methods for Contaminants Listed at 40 CFR 141.402(c)(2)”;

j. Revising the table entitled “Alternative Testing Methods for Contaminants Listed at 40 CFR 141.852(a)(5)”;

k. Revising the table entitled “Alternative Testing Methods for Contaminants Listed at 40 CFR 143.4(b)”;

The revisions and additions read as follows:

APPENDIX A TO SUBPART C OF PART 141—ALTERNATIVE TESTING METHODS APPROVED FOR ANALYSES UNDER THE SAFE DRINKING WATER ACT

* * * * *

ALTERNATIVE TESTING METHODS FOR CONTAMINANTS LISTED AT 40 CFR 141.23 (k)(1)								
Contaminant	**Methodology**	**EPA Method**	**SM 21st Edition [1]**	**SM 22nd Edition [28]**	**SM 23rd Edition [49], SM 24th Edition [66]**	**SM Online [3]**	**ASTM [4]**	**Other**
Alkalinity	Titrimetric		2320 B	2320 B	2320 B		D1067-06 B, 11 B, 16 B	
Antimony	Hydride – Atomic Absorption						D 3697-07, -12, -17	
	Atomic Absorption; Furnace		3113 B	3113 B	3113 B	3113 B-04, B-10		
	Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP–AES)	200.5, Revision 4.2 [2]						
Arsenic	Atomic Absorption; Furnace		3113 B	3113 B	3113 B	3113 B-04, B-10	D 2972-08 C, -15 C	
	Hydride Atomic Absorption		3114 B	3114 B	3114 B	3114 B-09	D 2972-08 B, -15 B	
	Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP–AES)	200.5, Revision 4.2 [2]						
Barium	Inductively Coupled Plasma		3120 B	3120 B	3120 B			
	Atomic Absorption; Direct		3111 D	3111 D	3111 D			
	Atomic Absorption; Furnace		3113 B	3113 B	3113 B	3113 B-04, B-10		
	Axially viewed inductively coupled plasma-atomic emission	200.5, Revision 4.2 [2]						

	spectrometry (AVICP–AES)							
Beryllium	Inductively Coupled Plasma		3120 B	3120 B	3120 B			
	Atomic Absorption; Furnace		3113 B	3113 B	3113 B	3113 B-04, B-10	D 3645-08 B, -15 B	
	Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP–AES)	200.5, Revision 4.2 [2]						
Cadmium	Atomic Absorption; Furnace		3113 B	3113 B	3113 B	3113 B-04, B-10		
	Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP–AES)	200.5, Revision 4.2 [2]						
Calcium	EDTA titrimetric		3500-Ca B	3500-Ca B	3500-Ca B		D 511-09, -14 A	
	Atomic Absorption; Direct Aspiration		3111 B	3111 B	3111 B		D 511-09, -14 B	
	Inductively Coupled Plasma		3120 B	3120 B	3120 B			
	Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP–AES)	200.5, Revision 4.2 [2]						
	Ion Chromatography						D 6919-09, -17	
Chromium	Inductively Coupled Plasma		3120 B	3120 B	3120 B			
	Atomic Absorption; Furnace		3113 B	3113 B	3113 B	3113 B-04, B-10		
	Axially viewed	200.5,						

	inductively coupled plasma-atomic emission spectrometry (AVICP–AES)	Revision 4.2 [2]						
Copper	Atomic Absorption; Furnace		3113 B	3113 B	3113 B	3113 B-04, B-10	D 1688-07, -12 C, 17 C	
	Atomic Absorption; Direct Aspiration		3111 B	3111 B	3111 B		D 1688-07, -12 A, 17 A	
	Inductively Coupled Plasma		3120 B	3120 B	3120 B			
	Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP–AES)	200.5, Revision 4.2 [2]						
	Colorimetry							Hach Method 8026 [35] Hach Method 10272 [36]
Conductivity	Conductance		2510 B	2510 B	2510 B		D 1125-14 A	
Cyanide	Manual Distillation with $MgCl_2$ followed by:		4500-CN^- C	4500-CN^- C	4500-CN^- C	4500-CN^- C-99	D 2036-06 A	
	Spectrophotometric, Amenable		4500-CN^- G	4500-CN^- G	4500-CN^- G		D 2036-06 B	
	Spectrophotometric Manual		4500-CN^- E	4500-CN^- E	4500-CN^- E		D2036-06 A	
	Selective Electrode		4500-CN^- F	4500-CN^- F	4500-CN^- F			
	Gas Chromatography/ Mass Spectrometry Headspace							ME355.01 [7]
Fluoride	Ion Chromatography		4110 B	4110 B	4110 B		D 4327-11, -17	
	Manual Distillation;		4500-F^-	4500-F^-	4500-F^- B,			

	Colorimetric SPADNS		B, D	B, D	D			
	Manual Electrode		4500-F^- C	4500-F^- C	4500-F^- C		D 1179-04, 10 B, 16 B	
	Automated Alizarin		4500-F^- E	4500-F^- E	4500-F^- E			
	Arsenite-Free Colorimetric SPADNS							Hach SPADNS 2 Method 10225 [22] Hach Method 10312 [67]
Lead	Atomic Absorption; Furnace		3113 B	3113 B	3113 B	3113 B-04, B-10	D 3559-08 D, 15 D	
	Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP–AES)	200.5, Revision 4.2 [2]						
	Differential Pulse Anodic Stripping Voltametry							Method 1001, Rev. 1.1 [57]
Magnesium	Atomic Absorption		3111 B	3111 B	3111 B		D 511-09, -14 B	
	Inductively Coupled Plasma		3120 B	3120 B	3120 B			
	Complexation Titrimetric Methods		3500-Mg B	3500-Mg B	3500-Mg B		D 511-09, -14 A	
	Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP–AES)	200.5, Revision 4.2 [2]						
	Ion Chromatography						D 6919-09, -17	
Mercury	Manual, Cold Vapor		3112 B	3112 B	3112 B	3112 B-09	D 3223-12, -17	
Nickel	Inductively Coupled Plasma		3120 B	3120 B	3120 B			

	Atomic Absorption; Direct		3111 B	3111 B	3111 B			
	Atomic Absorption; Furnace		3113 B	3113 B	3113 B	3113 B-04, B-10		
	Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP–AES)	200.5, Revision 4.2 [2]						
Nitrate	Ion Chromatography		4110 B	4110 B	4110 B		D 4327-11, -17	
	Automated Cadmium Reduction		4500-NO_3^- F	4500-NO_3^- F	4500-NO_3^- F			
	Manual Cadmium Reduction		4500-NO_3^- E	4500-NO_3^- E	4500-NO_3^- E			
	Ion Selective Electrode		4500-NO_3^- D	4500-NO_3^- D	4500-NO_3^- D			
	Reduction/Colorimetric							Systea Easy (1-Reagent) [8] NECi Nitrate-Reductase [40]
	Colorimetric; Direct							Hach TNTplus™ 835/836 Method 10206 [23]
	Capillary Ion Electrophoresis						D 6508-15	
Nitrite	Ion Chromatography		4110 B	4110 B	4110 B		D 4327-11, -17	
	Automated Cadmium Reduction		4500-NO_3^- F	4500-NO_3^- F	4500-NO_3^- F			
	Manual Cadmium Reduction		4500-NO_3^- E	4500-NO_3^- E	4500-NO_3^- E			
	Spectrophotometric		4500-	4500-	4500-NO_2^-			

			NO_2^- B	NO_2^- B	B			
	Reduction/Colorimetric							Systea Easy (1-Reagent) [8] NECi Nitrate-Reductase [40]
	Capillary Ion Electrophoresis						D 6508-15	
Ortho-phosphate	Ion Chromatography		4110 B	4110 B	4110 B		D 4327-11, -17	
	Colorimetric, ascorbic acid, single reagent		4500-P E	4500-P E	4500-P E	4500-P E-99		
	Colorimetric, Automated, Ascorbic Acid		4500-P F	4500-P F	4500-P F	4500-P F-99		Thermo Fisher Discrete Analyzer [41]
	Capillary Ion Electrophoresis						D 6508-15	
pH	Electrometric	150.3 [48]	4500-H^+ B	4500-H^+ B	4500-H^+ B		D 1293-12, -18	
Selenium	Hydride-Atomic Absorption		3114 B	3114 B	3114 B	3114 B-09	D 3859-08 A, -15 A	
	Atomic Absorption; Furnace		3113 B	3113 B	3113 B	3113 B-04, B-10	D 3859-08 B, -15 B	
	Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP–AES)	200.5, Revision 4.2 [2]						
Silica	Colorimetric						D859-05, 10, 16	
	Molybdosilicate		4500-SiO_2 C	4500-SiO_2 C	4500-SiO_2 C			
	Heteropoly blue		4500-SiO_2 D	4500-SiO_2 D	4500-SiO_2 D			
	Automated for Molybdate-reactive		4500-SiO_2 E	4500-SiO_2 E	4500-SiO_2 E			

	Silica							
	Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP–AES)	200.5, Revision 4.2 [2]						
	Inductively Coupled Plasma		3120 B	3120 B	3120 B			
Sodium	Atomic Absorption; Direct Aspiration		3111 B	3111 B	3111 B			
	Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP–AES)	200.5, Revision 4.2 [2]						
	Ion Chromatography						D 6919-09, -17	
Temperature	Thermometric		2550	2550	2550	2550-10		

ALTERNATIVE TESTING METHODS FOR CONTAMINANTS LISTED AT 40 CFR 141.24 (e)(1)							
Contaminant	**Methodology**	**EPA Method**	**SM 21st Edition[1]**	**SM 22nd Edition [28], SM 23rd Edition [49], SM 24th Edition [66]**	**SM Online [3]**	**ASTM [4]**	**Other**
Benzene	Purge &Trap/Gas Chromatography/Mass Spectrometry	524.3 [9], 524.4 [29]					
Carbon tetrachloride	Purge &Trap/Gas Chromatography/Mass Spectrometry	524.3 [9], 524.4 [29]					
Chlorobenzene	Purge &Trap/Gas Chromatography/Mass Spectrometry	524.3 [9], 524.4 [29]					

1,2-Dichlorobenzene	Purge &Trap/Gas Chromatography/Mass Spectrometry	524.3 [9], 524.4 [29]					
1,4-Dichlorobenzene	Purge &Trap/Gas Chromatography/Mass Spectrometry	524.3 [9], 524.4 [29]					
1,2-Dichloroethane	Purge &Trap/Gas Chromatography/Mass Spectrometry	524.3 [9], 524.4 [29]					
cis-Dichloroethylene	Purge &Trap/Gas Chromatography/Mass Spectrometry	524.3 [9], 524.4 [29]					
trans-Dichloroethylene	Purge &Trap/Gas Chromatography/Mass Spectrometry	524.3 [9], 524.4 [29]					
Dichloromethane	Purge &Trap/Gas Chromatography/Mass Spectrometry	524.3 [9], 524.4 [29]					
1,2-Dichloropropane	Purge &Trap/Gas Chromatography/Mass Spectrometry	524.3 [9], 524.4 [29]					
Ethylbenzene	Purge &Trap/Gas Chromatography/Mass Spectrometry	524.3 [9], 524.4 [29]					
Styrene	Purge &Trap/Gas Chromatography/Mass Spectrometry	524.3 [9], 524.4 [29]					
Tetrachloroethylene	Purge &Trap/Gas Chromatography/Mass Spectrometry	524.3 [9], 524.4 [29]					
1,1,1-Trichloroethane	Purge &Trap/Gas Chromatography/Mass Spectrometry	524.3 [9], 524.4 [29]					
Trichloroethylene	Purge &Trap/Gas Chromatography/Mass Spectrometry	524.3 [9], 524.4 [29]					

Toluene	Purge &Trap/Gas Chromatography/Mass Spectrometry	524.3 [9], 524.4 [29]					
1,2,4-Trichlorobenzene	Purge &Trap/Gas Chromatography/Mass Spectrometry	524.3 [9], 524.4 [29]					
1,1-Dichloroethylene	Purge &Trap/Gas Chromatography/Mass Spectrometry	524.3 [9], 524.4 [29]					
1,1,2-Trichlorethane	Purge &Trap/Gas Chromatography/Mass Spectrometry	524.3 [9], 524.4 [29]					
Vinyl chloride	Purge &Trap/Gas Chromatography/Mass Spectrometry	524.3 [9], 524.4 [29]					
Xylenes (total)	Purge &Trap/Gas Chromatography/Mass Spectrometry	524.3 [9], 524.4 [29]					
2,4-D	Gas Chromatography/Electron Capture Detection (GC/ECD)		6640 B	6640 B	6640 B-01, B-06	D 5317-20	
2,4,5-TP (Silvex)	Gas Chromatography/Electron Capture Detection (GC/ECD)		6640 B	6640 B	6640 B-01, B-06	D 5317-20	
Alachlor	Solid Phase Extraction/Gas Chromatography/Mass Spectrometry (GC/MS)	525.3 [24]					
Atrazine	Liquid Chromatography Electrospray Ionization Tandem Mass Spectrometry (LC/ESI-MS/MS)	536 [25]					

	Solid Phase Extraction/Gas Chromatography/Mass Spectrometry (GC/MS)	525.3 [24], 523 [26]					
Benzo(a)pyrene	Solid Phase Extraction/Gas Chromatography/Mass Spectrometry (GC/MS)	525.3 [24]					
Carbofuran	High-performance liquid chromatography (HPLC) with post-column derivatization and fluorescence detection		6610 B	6610 B	6610 B-04		
	Liquid Chromatography/Mass Spectrometry						ME 531 [58]
Chlordane	Solid Phase Extraction/Gas Chromatography/Mass Spectrometry (GC/MS)	525.3 [24]					
Dalapon	Ion Chromatography Electrospray Ionization Tandem Mass Spectrometry (IC-ESI-MS/MS)	557 [14]					
	Gas Chromatography/Electron Capture Detection (GC/ECD)		6640 B	6640 B	6640 B-01, B-06		
Di(2-ethylhexyl)adipate	Solid Phase Extraction/Gas Chromatography/Mass Spectrometry (GC/MS)	525.3 [24]					
Di(2-ethylhexyl)phthalate	Solid Phase Extraction/Gas Chromatography/Mass Spectrometry (GC/MS)	525.3 [24]					

Dibromochloropropane (DBCP)	Purge &Trap/Gas Chromatography/Mass Spectrometry	524.3 [9]					
Dinoseb	Gas Chromatography/Electron Capture Detection (GC/ECD)		6640 B	6640 B	6640 B-01, B-06		
Endrin	Solid Phase Extraction/Gas Chromatography/Mass Spectrometry (GC/MS)	525.3 [24]					
Ethyl dibromide (EDB)	Purge &Trap/Gas Chromatography/Mass Spectrometry	524.3 [9]					
Glyphosate	High-Performance Liquid Chromatography (HPLC) with Post-Column Derivatization and Fluorescence Detection		6651 B	6651 B	6651 B-00, B-05		
Heptachlor	Solid Phase Extraction/Gas Chromatography/Mass Spectrometry (GC/MS)	525.3 [24]					
Heptachlor Epoxide	Solid Phase Extraction/Gas Chromatography/Mass Spectrometry (GC/MS)	525.3 [24]					
Hexachlorobenzene	Solid Phase Extraction/Gas Chromatography/Mass Spectrometry (GC/MS)	525.3 [24]					
Hexachlorocyclo-pentadiene	Solid Phase Extraction/Gas Chromatography/Mass Spectrometry (GC/MS)	525.3 [24]					

Lindane	Solid Phase Extraction/Gas Chromatography/Mass Spectrometry (GC/MS)	525.3 [24]					
Methoxychlor	Solid Phase Extraction/Gas Chromatography/Mass Spectrometry (GC/MS)	525.3 [24]					
Oxamyl	High-performance liquid chromatography (HPLC) with post-column derivatization and fluorescence detection		6610 B	6610 B	6610 B-04		
	Liquid Chromatography/Mass Spectrometry						ME 531 [58]
PCBs (as Aroclors)	Solid Phase Extraction/Gas Chromatography/Mass Spectrometry (GC/MS)	525.3 [24]					
Pentachlorophenol	Gas Chromatography/Electron Capture Detection (GC/ECD)		6640 B	6640 B	6640 B-01, B-06	D 5317-20	
	Solid Phase Extraction/Gas Chromatography/Mass Spectrometry (GC/MS)	525.3 [24]					
Picloram	Gas Chromatography/Electron Capture Detection (GC/ECD)		6640 B	6640 B	6640 B-01, B-06	D 5317-20	
Simazine	Liquid Chromatography Electrospray Ionization Tandem Mass Spectrometry (LC/ESI-MS/MS)	536 [25]					

	Solid Phase Extraction/Gas Chromatography/Mass Spectrometry (GC/MS)	525.3 [24], 523 [26]					
Toxaphene	Solid Phase Extraction/Gas Chromatography/Mass Spectrometry (GC/MS)	525.3 [24]					
Total Trihalomethanes	Purge &Trap/Gas Chromatography/Mass Spectrometry	524.3 [9], 524.4 [29]					

ALTERNATIVE TESTING METHODS FOR CONTAMINANTS LISTED AT 40 CFR 141.25(a)						
Contaminant	**Methodology**	**EPA Method**	**SM 21st Edition [1]**	**SM 22nd Edition [28], SM 23rd Edition [49], SM 24th Edition [66]**	**ASTM [4]**	**SM Online [3]**
Naturally Occurring:						
Gross alpha and beta	Evaporation	900.0, Rev. 1.0 [50]	7110 B	7110 B		
	Liquid Scintillation			7110 D	D 7283-17	7110 D-17
Gross alpha	Coprecipitation		7110 C	7110 C		
Radium 226	Radon emanation	903.1, Rev. 1.0 [53]	7500-Ra C	7500-Ra C	D 3454-05, -18, D 3454-21	
	Radiochemical	903.0, Rev. 1.0 [54]	7500-Ra B	7500-Ra B	D 2460-07	
	Gamma Spectrometry			7500-Ra E		7500-Ra E-07
Radium 228	Radiochemical	904.0, Rev. 1.0 [62]	7500-Ra D	7500-Ra D		
	Gamma Spectrometry			7500-Ra E		7500-Ra E-07

Uranium	Radiochemical		7500-U B	7500-U B		
	ICP-MS		3125		D 5673-05, 10, 16	
	Alpha spectrometry		7500-U C	7500-U C	D 3972-09	
	Laser Phosphorimetry				D 5174-07	
	Alpha Liquid Scintillation Spectrometry				D 6239-09	
Man-Made:						
Radioactive Cesium	Radiochemical		7500-Cs B	7500-Cs B		
	Gamma Ray Spectrometry		7120	7120	D 3649-06	
Radioactive Iodine	Radiochemical		7500-I B 7500-I C 7500-I D	7500-I B 7500-I C 7500-I D	D 3649-06	
	Gamma Ray Spectrometry		7120	7120	D 4785-08, -20	
Radioactive Strontium 89, 90	Radiochemical		7500-Sr B	7500-Sr B		
Tritium	Liquid Scintillation		7500-^{3}H B	7500-^{3}H B	D 4107-08, -20	
Gamma Emitters	Gamma Ray Spectrometry		7120 7500-Cs B 7500-I B	7120 7500-Cs B 7500-I B	D 3649-06 D 4785-08, -20	

ALTERNATIVE TESTING METHODS FOR CONTAMINANTS LISTED AT 40 CFR 141.74(a)(1)							
Organism	**Methodology**	**SM 21st Edition [1]**	**SM 22nd Edition [28]**	**SM 23rd Edition [49]**	**SM 24th Edition [66]**	**SM Online [3]**	**Other**
Total Coliform	Total Coliform Fermentation Technique	9221 A, B, C	9221 A, B, C	9221 A, B, C	9221 A, B, C	9221 A, B, C-06	
	Total Coliform Membrane Filter Technique	9222 A, B, C		9222 A, B, C	9222 A, B, C		
	ONPG-MUG Test	9223	9223 B	9223 B	9223 B	9223 B-04	

Fecal Coliforms	Fecal Coliform Procedure	9221 E	9221 E	9221 E	9221 E	9221 E-06	
	Fecal Coliform Filter Procedure	9222 D	9222 D	9222 D	9222 D	9222 D-06	
Heterotrophic bacteria	Pour Plate Method	9215 B	9215 B	9215 B		9215 B-04	
Turbidity	Nephelometric Method	2130 B	2130 B	2130 B	2130 B		Hach Method 8195, Rev. 3.0 [52]
	Laser Nephelometry (on-line)						Mitchell M5271 [10] Mitchell M5331, Rev. 1.2 [42] Lovibond PTV 6000 [46]
	LED Nephelometry (on-line)						Mitchell M5331 [11] Mitchell M5331, Rev. 1.2 [42] Lovibond PTV 2000 [45] Yokogawa 820 [68]
	LED Nephelometry (on-line)						AMI Turbiwell [15] Lovibond PTV 1000 [44]
	LED Nephelometry (portable)						Orion AQ4500 [12], Lovibond TB 3500 [64], Lovibond TB 5000 [65]
	Laser Nephelometry (portable)						Lovibond TB 6000 [63]
	360° Nephelometry						Hach Method 10258, Rev. 1.0 [39], Hach Method 10258, Rev. 2.0 [51]

ALTERNATIVE TESTING METHODS FOR DISINFECTANT RESIDUALS LISTED AT 40 CFR 141.74(a)(2)

Residual	Methodology	EPA Methods	SM 21st Edition [1]	SM 22nd Edition [28], SM 23rd Edition [49], SM 24th Edition [66]	ASTM [4]	Other
Free Chlorine	Amperometric Titration		4500-Cl D	4500-Cl D	D 1253-08, -14	
	DPD Ferrous Titrimetric		4500-Cl F	4500-Cl F		
	DPD Colorimetric		4500-Cl G	4500-Cl G		Hach Method 10260 [31]
	Indophenol Colorimetric					Hach Method 10241 [34]
	Syringaldazine (FACTS)		4500-Cl H	4500-Cl H		
	On-line Chlorine Analyzer	EPA 334.0 [16]				
	Amperometric Sensor					ChloroSense [17], ChloroSense, Rev. 1.1 [59]
Total Chlorine	Amperometric Titration		4500-Cl D	4500-Cl D	D 1253-08, -14	
	Amperometric Titration (Low level measurement)		4500-Cl E	4500-Cl E		
	DPD Ferrous Titrimetric		4500-Cl F	4500-Cl F		
	DPD Colorimetric		4500-Cl G	4500-Cl G		Hach Method 10260 [31]
	Indophenol Colorimetric	127 [55]				
	Iodometric Electrode		4500-Cl I	4500-Cl I		
	On-line Chlorine Analyzer	EPA 334.0 [16]				
	Amperometric Sensor					ChloroSense [17], ChloroSense, Rev. 1.1 [59]
Chlorine Dioxide	Amperometric Titration		4500–ClO_2 C	4500–ClO_2 C		
	Amperometric Titration		4500–ClO_2 E	4500–ClO_2 E		
	Amperometric Sensor					ChlordioX Plus [32], ChlordioX Plus, Rev. 1.1 [60]

Ozone	Indigo Method		4500–O_3 B	4500–O_3 B		

ALTERNATIVE TESTING METHODS FOR CONTAMINANTS LISTED AT 40 CFR 141.131(b)(1)							
Contaminant	**Methodology**	**EPA Method**	**ASTM [4]**	**SM Online [3]**	**SM 21st Edition [1]**	**SM 22nd Edition [28], SM 23rd Edition [49], SM 24th Edition [66]**	**Other**
TTHM	P&T/GC/MS	524.3 [9], 524.4 [29]					
HAA5	LLE (diazomethane)/GC/ECD			6251 B-07	6251 B	6251 B	
	Ion Chromatography Electrospray Ionization Tandem Mass Spectrometry (IC-ESI-MS/MS)	557 [14]					
	Two-Dimensional Ion Chromatography (IC) with Suppressed Conductivity Detection						Thermo Fisher 557.1 [47]
Bromate	Two-Dimensional Ion Chromatography (IC)	302.0 [18]					
	Ion Chromatography Electrospray Ionization Tandem Mass Spectrometry (IC-ESI-MS/MS)	557 [14]					
	Chemically Suppressed Ion Chromatography		D 6581-08 A				
	Electrolytically Suppressed Ion Chromatography		D 6581-08 B				
Chlorite	Chemically Suppressed Ion Chromatography		D 6581-08 A				
	Electrolytically Suppressed Ion Chromatography		D 6581-08 B				
Chlorite –	Amperometric Titration				4500-ClO_2	4500-ClO_2	

daily monitoring as prescribed in 40 CFR 141.132(b)(2)(i)(A)					E	E	
	Amperometric Sensor						ChlordioX Plus [32], ChlordioX Plus, Rev. 1.1 [60]

ALTERNATIVE TESTING METHODS FOR DISINFECTANT RESIDUALS LISTED AT 40 CFR 141.131(c)(1)					
Residual	Methodology	SM 21st Edition [1]	SM 22nd Edition [28], SM 23rd Edition [49], SM 24th Edition [66]	ASTM [4]	Other
Free Chlorine	Amperometric Titration	4500-Cl D	4500-Cl D	D 1253-08, -14	
	DPD Ferrous Titrimetric	4500-Cl F	4500-Cl F		
	DPD Colorimetric	4500-Cl G	4500-Cl G		Hach Method 10260[31]
	Indophenol Colorimetric				Hach Method 10241[34]
	Syringaldazine (FACTS)	4500-Cl H	4500-Cl H		
	Amperometric Sensor				ChloroSense [17], ChloroSense, Rev. 1.1 [59]
	On-line Chlorine Analyzer				EPA 334.0 [16]
Combined Chlorine	Amperometric Titration	4500-Cl D	4500-Cl D	D 1253-08, -14	
	DPD Ferrous Titrimetric	4500-Cl F	4500-Cl F		
	DPD Colorimetric	4500-Cl G	4500-Cl G		Hach Method 10260[31]
Total Chlorine	Amperometric Titration	4500-Cl D	4500-Cl D	D 1253-08, -14	
	Low level Amperometric Titration	4500-Cl E	4500-Cl E		
	DPD Ferrous Titrimetric	4500-Cl F	4500-Cl F		

	DPD Colorimetric	4500-Cl G	4500-Cl G		Hach Method 10260[31]
	Iodometric Electrode	4500-Cl I	4500-Cl I		
	Amperometric Sensor				ChloroSense [17], ChloroSense, Rev. 1.1 [59]
	On-line Chlorine Analyzer				EPA 334.0 [16]
Chlorine Dioxide	Amperometric Method II	4500–ClO_2 E	4500–ClO_2 E		
	Amperometric Sensor				ChlordioX Plus[32], ChlordioX Plus, Rev. 1.1 [60]

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ALTERNATIVE TESTING METHODS FOR PARAMETERS LISTED AT 40 CFR 141.131(d)							
Parameter	**Methodology**	**SM 21st Edition [1]**	**SM 22nd Edition [28]**	**SM 23rd Edition [49], SM 24th Edition [66]**	**SM Online [3]**	**EPA**	**Other**
Total Organic Carbon (TOC)	High Temperature Combustion	5310 B	5310 B	5310 B		415.3, Rev 1.2 [19]	
	Persulfate-Ultraviolet or Heated Persulfate Oxidation	5310 C	5310 C	5310 C		415.3, Rev 1.2 [19]	Hach Method 10267 [38]
	Wet Oxidation	5310 D	5310 D			415.3, Rev 1.2 [19]	
	Ozone Oxidation						Hach Method 10261[37]

Specific Ultraviolet Absorbance (SUVA)	Calculation using DOC and UV_{254} data					415.3, Rev 1.2 [19]	
Dissolved Organic Carbon (DOC)	High Temperature Combustion	5310 B	5310 B	5310 B		415.3, Rev 1.2 [19]	
	Persulfate-Ultraviolet or Heated Persulfate Oxidation	5310 C	5310 C	5310 C		415.3, Rev 1.2 [19]	
	Wet Oxidation	5310 D	5310 D			415.3, Rev 1.2 [19]	
Ultraviolet absorption at 254 nm (UV_{254})	Spectrophotometry	5910 B	5910 B	5910 B	5910 B-11	415.3, Rev 1.2 [19]	

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ALTERNATIVE TESTING METHODS FOR CONTAMINANTS LISTED AT 40 CFR 141.402(c)(2)							
Organism	**Methodology**	**SM 20th Edition [6]**	**SM 21st Edition [1]**	**SM 22nd Edition [28]**	**SM 23rd Edition [49], SM 24th Edition [66]**	**SM Online [3]**	**Other**
E. coli	Colilert		9223 B	9223 B	9223 B	9223 B-97, B-04	
	Colisure		9223 B	9223 B	9223 B	9223 B-97, B-04	
	Colilert-18	9223 B	9223 B	9223 B	9223 B	9223 B-97, B-04	
	Readycult®						Readycult® [20]
	Colitag						Modified Colitag™ [13], Modified Colitag™, Version 2.0 [61]
	Chromocult®						Chromocult® [21]
	EC-MUG			9221 F	9221 F	9221 F-06	
	NA-MUG				9222 I		
	mColiBlue24 Test				9222 J		
	Tecta EC/TC [33, 43]						
	RAPID'E.coli 2 [56]						
Enterococci	Multiple-Tube				9230 B	9230 B-04	

	Technique						
	Membrane Filter Techniques				9230 C		
	Fluorogenic Substrate Enterococcus Test (using Enterolert)				9230 D		
Coliphage	Two-Step Enrichment Presence-Absence Procedure						Fast Phage [30]

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ALTERNATIVE TESTING METHODS FOR CONTAMINANTS LISTED AT 40 CFR 141.852(a)(5)						
Organism	Methodology Category	Method	SM 20th, 21st Editions [1,6]	SM 22nd Edition [28]	SM 23rd Edition [49], SM 24th Edition [66]	SM Online [3]
Total Coliforms	Lactose Fermentation Methods	Standard Total Coliform Fermentation Technique		9221 B.1, B.2	9221 B.1, B.2, B.3, B.4	9221 B.1, B.2-06
		Presence-Absence (P-A) Coliform Test			9221 D.1, D.2, D.3	
	Membrane Filtration Methods	Standard Total Coliform Membrane Filter Procedure using Endo Media			9222 B, C	
		Simultaneous Detection of Total Coliforms and *E. coli* by Dual Chromogen Membrane Filter Procedure (using			9222 J	

		mColiBlue24 medium)				
		Simultaneous Detection of Total Coliform Bacteria and *Escherichia coli* Using RAPID'*E.coli* (REC2) in Drinking Water [56]				
	Enzyme Substrate Methods	Colilert®		9223 B	9223 B	9223 B-04
		Colisure®		9223 B	9223 B	9223 B-04
		Colilert-18	9223 B	9223 B	9223 B	9223 B-04
		Tecta EC/TC [33, 43]				
		Modified Colitag™, Version 2.0 [61]				
Escherichia coli	*Escherichia coli* Procedure (following Lactose Fermentation Methods)	EC-MUG medium		9221 F.1	9221 F.1	9221 F.1-06
	Escherichia coli Partitioning Methods (following Membrane Filtration Methods)	EC broth with MUG (EC-MUG)			9222 H	
		NA-MUG medium			9222 I	
	Simultaneous Detection of Total Coliforms and *E. coli* by Dual Chromogen Membrane Filter Procedure	mColiBlue24 medium			9222 J	
	Membrane Filtration Method	Simultaneous Detection of Total Coliform Bacteria and *Escherichia coli* Using RAPID'*E.coli* (REC2) in				

		Drinking Water [56]				
	Enzyme Substrate Methods	Colilert®		9223 B	9223 B	9223 B-04
		Colisure®		9223 B	9223 B	9223 B-04
		Colilert-18	9223 B	9223 B	9223 B	9223 B-04
		Tecta EC/TC [33, 43]				
		Modified Colitag™, Version 2.0 [61]				

ALTERNATIVE TESTING METHODS FOR CONTAMINANTS LISTED AT 40 CFR 143.4(b)						
Contaminant	Methodology	EPA Method	ASTM [4]	SM 21st Edition [1]	SM 22nd Edition [28], SM 23rd Edition [49], SM 24th Edition [66]	SM Online [3]
Aluminum	Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP–AES)	200.5, Revision 4.2 [2]				
	Atomic Absorption; Direct			3111 D	3111 D	
	Atomic Absorption; Furnace			3113 B	3113 B	3113 B-04, B-10
	Inductively Coupled Plasma			3120 B	3120 B	
Chloride	Silver Nitrate Titration		D 512-04 B, 12 B	4500-Cl^- B	4500-Cl^- B	
	Ion Chromatography		D 4327-11, -17	4110 B	4110 B	
	Potentiometric Titration			4500-Cl^- D	4500-Cl^- D	
Color	Visual Comparison			2120 B	2120 B	
Foaming Agents	Methylene Blue Active Substances (MBAS)			5540 C	5540 C	
Iron	Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP–AES)	200.5, Revision 4.2 [2]				
	Atomic Absorption; Direct			3111 B	3111 B	

	Atomic Absorption; Furnace			3113 B	3113 B	3113 B-04, B-10
	Inductively Coupled Plasma			3120 B	3120 B	
Manganese	Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP–AES)	200.5, Revision 4.2 [2]				
	Atomic Absorption; Direct			3111 B	3111 B	
	Atomic Absorption; Furnace			3113 B	3113 B	3113 B-04, B-10
	Inductively Coupled Plasma			3120 B	3120 B	
Odor	Threshold Odor Test			2150 B	2150 B	
Silver	Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP–AES)	200.5, Revision 4.2 [2]				
	Atomic Absorption; Direct			3111 B	3111 B	
	Atomic Absorption; Furnace			3113 B	3113 B	3113 B-04, B-10
	Inductively Coupled Plasma			3120 B	3120 B	
Sulfate	Ion Chromatography		D 4327-11, -17	4110 B	4110 B	
	Gravimetric with ignition of residue			4500-SO_4^{2-} C	4500-SO_4^{2-} C	4500-SO_4^{2-} C-97
	Gravimetric with drying of residue			4500-SO_4^{2-} D	4500-SO_4^{2-} D	4500-SO_4^{2-} D-97
	Turbidimetric method		D 516-07, 11, 16	4500-SO_4^{2-} E	4500-SO_4^{2-} E	4500-SO_4^{2-} E-97
	Automated methylthymol blue method			4500-SO_4^{2-} F	4500-SO_4^{2-} F	4500-SO_4^{2-} F-97
Total Dissolved Solids	Total Dissolved Solids Dried at 180 deg C			2540 C	2540 C	
Zinc	Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP–AES)	200.5, Revision 4.2 [2]				

	Atomic Absorption; Direct Aspiration			3111 B	3111 B	
	Inductively Coupled Plasma			3120 B	3120 B	

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