



**BILLING CODE 6560-50-P**

## **ENVIRONMENTAL PROTECTION AGENCY**

### **40 CFR Part 141**

**[EPA-HQ-OW-2014-0408; FRL-9912-52-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.

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**SUMMARY:** This action announces the U.S. Environmental Protection Agency's (EPA's) approval of alternative testing methods for use in measuring the levels of contaminants in drinking water and determining compliance with national primary drinking water regulations. The Safe Drinking Water Act (SDWA) authorizes EPA to approve the use of alternative testing methods through publication in the Federal Register. EPA is using this streamlined authority to make 21 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].

**FOR FURTHER INFORMATION CONTACT:** Safe Drinking Water Hotline (800) 426-4791 or Glynda Smith, Technical Support Center, 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) 569-7652; e-mail address: smith.glynda@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 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 test procedure 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 <sup>1</sup>
State, Local, & Tribal Governments	States, local and Tribal governments that analyze water samples on behalf of public water systems required to conduct such analysis; States, local and Tribal governments that themselves operate community and non-transient non-community water systems required to monitor.	924110
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

<sup>1</sup>North American Industry Classification System.

This table is not exhaustive, but rather provides a guide for readers regarding entities likely to be affected by this action. This table lists the types of entities that EPA is now aware could potentially be affected by this action. Other types of entities not listed in the table could also be impacted. 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 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.

#### *B. How Can I Get Copies of This Document and Other Related Information?*

Docket. EPA established a docket for this action under Docket ID No. EPA-HQ-OW-2014-0408. Publicly available docket materials are available either electronically through [www.regulations.gov](http://www.regulations.gov) or in hard copy at the Water Docket in the EPA Docket Center, (EPA/DC) William Jefferson Clinton West Building, Room 3334, 1301 Constitution Ave., NW, Washington, DC. Copyrighted materials are available only in hard copy. The EPA DC Public Reading Room is open from 8:30 a.m. to 4:30 p.m., Monday through Friday, excluding legal holidays. The telephone number for the Public Reading Room is (202) 566-1744, and the telephone number for the Water Docket is (202) 566-2426.

#### Abbreviations and Acronyms Used in this Action

APHA: American Public Health Association

ATP: Alternate Test Procedure

CFR: Code of Federal Regulations

DPD: N,N-diethyl-p-phenylenediamine

EPA: United States Environmental Protection Agency

GWR: Ground Water Rule

NAICS: North American Industry Classification System

NEMI: National Environmental Methods Index

PRFC: Planar Reagent-Filled Cuvette(s)

QC: Quality Control

RTCR: Revisions to the Total Coliform Rule

SDWA: The Safe Drinking Water Act

TCR: Total Coliform Rule

VCSB: Voluntary Consensus Standard Bodies

## **II. Background**

### *A. What is the Purpose of This Action?*

In this action, EPA is approving 21 analytical methods for determining contaminant concentrations in samples collected under SDWA. Regulated parties 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 Web site at

[http://water.epa.gov/scitech/drinkingwater/labcert/analyticalmethods\\_expedited.cfm](http://water.epa.gov/scitech/drinkingwater/labcert/analyticalmethods_expedited.cfm).

### *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 method through publication in the Federal Register. (See Section 1401(1) of SDWA.) EPA is using this streamlined approval authority to make 21 additional methods available for determining contaminant concentrations in samples collected

under SDWA. EPA has determined that, for each contaminant or group of contaminants listed in Section III, 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 21 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 21 methods that are equally effective relative to methods previously promulgated in the regulations. By means of this rule, these 21 methods are added to Appendix A to Subpart C of 40 CFR Part 141.

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

##### **1. Standard Methods for the Examination of Water and Wastewater (Standard Methods).**

EPA compared the most recent online versions of 14 Standard Methods to earlier versions of those methods that are currently approved in 40 CFR 141 and 143. Changes between the

approved version and the most recent version of each method are summarized in Smith and Wendelken (2013a). The revisions primarily involve editorial changes (e.g., corrections of errors, procedural clarifications, and reorganization of text). The updated online versions listed in the following table are the same as the earlier approved versions with respect to the chemistry and microbiology, sample handling protocols, and method performance data. For all of these reasons, EPA has concluded that the updated online versions are equally effective relative to those that are currently approved in the regulations. Therefore, EPA is approving the use of the 14 updated Standard Methods for the contaminants and their respective regulations listed in the following table:

Standard Method Revised Version	Approved Method	Contaminant	Regulation
2550-10, online version (APHA 2010a)	2550-00, online version (APHA 2000a)	Temperature	40 CFR 141.23(k)(1)
3113 B-10, online version (APHA 2010b)	3113 B-99, online version (APHA 1999)	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)
5910 B-11, online version (APHA 2011)	5910 B-00, online version (APHA 2000b)	UV Absorption at 254 nm	40 CFR 141.131(d)
6251 B-07, online version (APHA 2007)	6251 B-94, online version (APHA 1994)	HAA5	40 CFR 141.131(b)(1)
6640 B-06, online version (APHA 2006a)	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-05, online version (APHA 2005a)	6651 B, 20 <sup>th</sup> Edition (APHA 1998)	Glyphosate	40 CFR 141.24(e)(1)
9221 A-06, online version (APHA 2006b)	9221 A, 20 <sup>th</sup> Edition (APHA 1998)	Total Coliforms	40 CFR 141.21(f)(3); 40 CFR 141.74(a)(1)

9221 B-06, online version (APHA 2006c)	9221 B, 20 <sup>th</sup> Edition (APHA 1998)	Total Coliforms	40 CFR 141.21(f)(3); 40 CFR 141.74(a)(1)
9221 B.1, B.2-06, online version (APHA 2006c)	9221 B.1, B.2, 20 <sup>th</sup> Edition (APHA 1998)	Total Coliforms	40 CFR 141.852(a)(5)
9221 C-06, online version (APHA 2006d)	9221 C, 20 <sup>th</sup> Edition (APHA 1998)	Total Coliforms	40 CFR 141.74(a)(1)
9221 E-06, online version (APHA 2006e)	9221 E, 20 <sup>th</sup> Edition (APHA 1998)	Fecal Coliforms	40 CFR 141.21(f)(5); 40 CFR 141.74(a)(1)
9221 F-06, online version (APHA 2006f)	9221 F, 20 <sup>th</sup> Edition (APHA 1998)	<u>E. coli</u>	40 CFR 141.402(c)(2)
9221 F.1-06, online version (APHA 2006f)	9221 F.1, 20 <sup>th</sup> Edition (APHA 1998)	<u>E. coli</u>	40 CFR 141.852(a)(5)
9222 D-06, online version (APHA 2006g)	9222 D, 20 <sup>th</sup> Edition (APHA 1998)	Fecal Coliforms	40 CFR 141.74(a)(1)
9223 B-04, online version (APHA 2004a)	9223, 20 <sup>th</sup> Edition (APHA 1998)	Total Coliforms	40 CFR 141.21(f)(3); 40 CFR 141.74(a)(1); 40 CFR 141.852(a)(5)
9223 B-04, online version (APHA 2004a)	9223 B, 20 <sup>th</sup> Edition (APHA 1998)	<u>E. coli</u>	40 CFR 141.21(f)(6); 40 CFR 141.402(c)(2); 40 CFR 141.852(a)(5)
9215 B-04, online version (APHA 2004b)	9215 B, 20 <sup>th</sup> Edition (APHA 1998)	Heterotrophic Bacteria	40 CFR 141.74(a)(1)

The online versions of Standard Methods are available at <http://www.standardmethods.org>.

2. ASTM International. EPA compared the most recent versions of three ASTM International methods (ASTM Methods D512-12 B, D3223-12, and D4327-11) to the earlier versions of those methods that are currently approved in 40 CFR 141 and 143. Changes between the earlier approved version and the most recent version of each method are summarized in Smith (2013).

The revisions primarily involve editorial changes (e.g., updated references, definitions,



terminology, procedural clarifications, and reorganization of text). The revised methods are the same as the approved versions with respect to sample collection and handling protocols, sample preparation, analytical methodology, and method performance data; thus, EPA finds they are equally effective relative to the approved methods.

EPA is thus approving the use of the following ASTM methods for the contaminants and their respective regulations listed in the following table:

ASTM Revised Version	Approved Method	Contaminant	Regulation
D512-12 B (ASTM 2012a)	D512-89 B (reapproved 1999) (ASTM 1989)	Chloride	40 CFR 143.4(b)
D3223-12 (ASTM 2012b)	D3223-02 (ASTM 2002)	Mercury	40 CFR 141.23(k)(1)
D4327-11 (ASTM 2011)	D4327-03 (ASTM 2003)	Fluoride, nitrate, nitrite, orthophosphate, chloride, sulfate	40 CFR 141.23(k)(1); 40 CFR 143.4(b)

The ASTM methods are available from ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959 or <http://www.astm.org>.

#### *B. Methods Developed by Vendors*

1. IDEXX Laboratories, Inc. Colilert-18®. Colilert-18® is an approved commercial medium capable of simultaneous detection of total coliform and Escherichia coli bacteria. The use of this medium is described in Standard Method 9223 B, 21<sup>st</sup> edition of Standard Methods for the Examination of Water and Wastewater (APHA 2005b). Standard Method 9223 B is approved for determination of total coliform bacteria and E. coli under the Revisions to the Total Coliform Rule (RTCR) (USEPA 2013) as cited at 40 CFR 141.852(a)(5). Colilert-18® is a minor variation

of an already approved medium, and was determined to be applicable to the Total Coliform Rule (TCR) (Dougherty 1996). EPA is using today's action to clarify that Colilert-18® is itself an approved medium when used as described in Standard Method 9223 B for determining total coliform bacteria and E. coli in drinking water under the RTCR. Accordingly, EPA is adding the Colilert-18® medium and methodology as described in Standard Method 9223 B to the list of alternative testing methods in Appendix A to Subpart C of Part 141. Colilert-18® is available from IDEXX Laboratories, Inc., One IDEXX Drive, Westbrook, ME 04092, and also at <http://www.idexx.com>.

2. Hach Company Method 10260 – Determination of Chlorinated Oxidants (Free and Total) in Water using Disposable Planar Reagent-Filled Cuvettes and Mesofluidic Channel Colorimetry (Hach Company 2013a). The Hach Company Method 10260 uses disposable planar reagent-filled cuvettes (PRFC) to measure free, total and combined chlorine as an optional alternate test procedure to Standard Method 4500-Cl G (APHA 1998) which is approved in the drinking water regulations at 40 CFR 141.74(a)(2) for determination of free and total chlorine, and at 40 CFR 141.131(c)(1) for determination of free, total and combined chlorine. In this method, a mesofluidic pump system draws a water sample through a cuvette that is prefilled with the reagents required to perform DPD (N,N-diethyl-p-phenylenediamine) colorimetric chlorine tests. The sample is then drawn to an optical channel where the chlorine level is measured at a wavelength between 490 and 530 nm. Automation of the DPD determination relative to the manual procedure described in the approved method reduces errors associated with reagent addition, mixing and color development. Three laboratories analyzed a variety of drinking water matrices (e.g., low ionic strength, high ionic strength, and tap water samples derived from both surface water and ground water sources). The performance characteristics of the Hach Method

10260 were compared to the performance characteristics of the approved method. The validation study report (Hach 2013b) summarizes the results obtained from the multi-laboratory study and indicates that Hach Method 10260 is equally as effective as Standard Method 4500-Cl G for the colorimetric determination of free and total chlorine in drinking water. The basis for this determination is discussed in Smith and Wendelken (2013b). EPA is thus approving Hach Method 10260 as an alternate method to Standard Method 4500-Cl G for the analysis of free and total chlorine in drinking water. Hach Method 10260 is available from Hach Company, 5600 Lindbergh Drive, P.O. Box 389, Loveland, CO 80539, and also at [www.hach.com](http://www.hach.com).

3. Palintest Ltd ChlordioX Plus Method – Chlorine Dioxide and Chlorite in Drinking Water by Amperometry using Disposable Sensors (Palintest Ltd 2013). The Palintest Ltd ChlordioX Plus uses recyclable disposable sensors for amperometric detection of chlorine dioxide and the disinfection byproduct, chlorite, in drinking water. Standard Method 4500-ClO<sub>2</sub> E (APHA 1998) is an amperometric titration method that is currently approved in the regulations at 40 CFR 141.74(a)(2) and 40 CFR 141.131(c)(1) for determination of chlorine dioxide in drinking water; it is also cited in the regulations at 40 CFR 141.131(b)(1) for routine daily monitoring of chlorite. The approved method requires experienced analysts and is not portable, which limits options for field and site testing. The ChlordioX Plus method is associated with a portable sensor driven instrument and chlorine dioxide standards are available, which can be used with the instrument. Chlorine dioxide is reduced at the surface of the sensor and the current produced is directly proportional to the chlorine dioxide level in the sample. The chlorite level can be determined from a sample duplicate by oxidation of iodide to iodine. The method performance of the ChlordioX Plus method was compared to the performance of Standard Method 4500-ClO<sub>2</sub> E at three public drinking water utilities that use chlorine dioxide for primary disinfection. A variety

of samples, including drinking water samples from both surface and ground water sources, were fortified with known chlorine dioxide and chlorite concentrations and then analyzed by each method. The results of the validation study are summarized in Smith and Wendelken (2013c). EPA has determined that the ChlordioX Plus method is equally as effective as the approved method, Standard Method 4500-ClO<sub>2</sub> E. The basis for this determination is discussed in Smith and Wendelken (2013c). Therefore, EPA is approving the ChlordioX Plus method for determining chlorine dioxide and chlorite in drinking water. A copy of the method can be obtained by contacting Palintest Ltd, 1455 Jamike Avenue (Suite 100), Erlanger, KY 41018.

4. Veolia Water Solutions and Technologies Tecta EC/TC Method – Presence/Absence Method for the Simultaneous Detection of Total Coliforms and Escherichia coli (E. coli) in Drinking Water (Veolia 2014a). Tecta EC/TC is a microbiological method for the simultaneous detection of total coliforms and E. coli in drinking water by broth enrichment of samples. Total coliforms and E. coli are detected as being present or absent in 100 mL samples of drinking water by enzymatic cleavage of fluorogenic substances with the formation of fluorescent compounds after incubation. Approved drinking water methods for total coliforms are listed at 40 CFR 141.21(f)(3) under the Total Coliform Rule (TCR) and at 40 CFR 141.852(a)(5) under the Revisions to the Total Coliform Rule (RTCR). Methods approved for E. coli in drinking water are listed at 40 CFR 141.21(f)(6) under the TCR, at 40 CFR 141.402(c)(2) under the Ground Water Rule (GWR), and at 40 CFR 141.852(a)(5) under the RTCR. Tecta EC/TC is similar to other approved drinking water methods except that it uses hydrophobic fluorogens for total coliforms and E. coli which adhere to a hydrophobic plastic stub. These fluorogens emit fluorescent light into the interior of the stub when illuminated by ultraviolet light. The fluorescence from the fluorogens is detected by a photometer adjacent to the stub. The

incubation temperature maintenance, incubation timing, and fluorescence detection and results recording are all performed by an automated instrument. Tecta EC/TC is able to detect total coliforms and E. coli in 18 hours. Reagents and sample incubation containers are available, which can be used with the Tecta EC/TC incubator/detector. An Alternative Test Procedure (ATP) study was conducted to compare the method performance of Tecta EC/TC to the performance of the approved methods Standard Methods 9221 B (LTB/BGLB for total coliforms) and 9221 F (LTB/EC-MUG for E. coli) (APHA 1998). The comparison study involved analyses of 200 drinking water samples – 20 replicate samples that were inoculated with very low densities of chlorine-stressed total coliforms or E. coli obtained from 10 geographically dispersed waste waters. Method specificity was evaluated using approximately 100 positive and 100 negative cultures as determined from analyses by the reference methods. The ATP validation study report (Veolia 2014b) details the study design and method data evaluation. EPA has determined that Tecta EC/TC is equally effective relative to the approved Standard Method 9221 B for total coliforms under the TCR and RTCR, and Standard Method 9221 F for E. coli under the TCR, GWR, and RTCR. The basis for this determination is discussed in Sinclair (2014). Therefore, EPA is approving the Tecta EC/TC method for determining total coliforms and E. coli in drinking water. Tecta EC/TC is an automated and self-contained method, but is subject to the requirements for certified laboratories described in CFR 141.28.

A copy of the Tecta EC/TC method is available from Veolia Water Solutions and Technologies, Suite 4697, Biosciences Complex, 116 Barrie Street, Kingston, Ontario, Canada, K7L 3N6.

#### **IV. Statutory and Executive Order Reviews**

As noted in Section II, 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**

American Public Health Association (APHA). 1994. Standard Method 6251 B-94. Disinfection By-Products: Haloacetic Acids and Trichlorophenol. Micro Liquid-Liquid Extraction Gas Chromatographic Method. Approved by Standard Methods Committee 1994. Standard Methods Online. (Available at <http://www.standardmethods.org>.)

American Public Health Association (APHA). 1998. 20<sup>th</sup> Edition of Standard Methods for the Examination of Water and Wastewater, American Public Health Association, 800 I Street, NW, Washington, DC 20001-3710.

American Public Health Association (APHA). 1999. Standard Method 3113 B-99.

Electrothermal Atomic Absorption Spectrometric Method. Approved by Standard Methods Committee 1999. Standard Methods Online. (Available at <http://www.standardmethods.org>.)

American Public Health Association (APHA). 2000a. Standard Method 2550-00. Temperature. Approved by Standard Methods Committee 2000. Standard Methods Online. (Available at <http://www.standardmethods.org>.)

American Public Health Association (APHA). 2000b. Standard Method 5910 B-00. UV-Absorbing Organic Constituents. Ultraviolet Absorption Method. Approved by Standard Methods Committee 2000. Standard Methods Online. (Available at <http://www.standardmethods.org>.)

American Public Health Association (APHA). 2004a. Standard Method 9223 B-04. Enzyme Substrate Test. Approved by Standard Methods Committee 2004. Standard Methods Online. (Available at <http://www.standardmethods.org>.)

American Public Health Association (APHA). 2004b. Standard Method 9215 B-04. Heterotrophic Plate Count – Pour Plate Method. Approved by Standard Methods Committee 2004. Standard Methods Online. (Available at <http://www.standardmethods.org>.)

American Public Health Association (APHA). 2005a. Standard Method 6651 B-05. Glyphosate Herbicide – Liquid Chromatographic Post-Column Fluorescence Method. Approved by Standard Methods Committee 2005. Standard Methods Online. (Available at

<http://www.standardmethods.org>.)

American Public Health Association (APHA). 2005b. 21<sup>st</sup> Edition of Standard Methods for the Examination of Water and Wastewater, American Public Health Association, 800 I Street, NW, Washington, DC 20001-3710.

American Public Health Association (APHA). 2006a. Standard Method 6640 B-06. Acidic Herbicide Compounds – Micro Liquid-Liquid Extraction Gas Chromatographic Method. Approved by Standard Methods Committee 2006. Standard Methods Online. (Available at <http://www.standardmethods.org>.)

American Public Health Association (APHA). 2006b. Standard Method 9221 A-06. Multiple-Tube Fermentation Technique for Members of the Coliform Group – Introduction. Approved by Standard Methods Committee 2006. Standard Methods Online. (Available at <http://www.standardmethods.org>.)

American Public Health Association (APHA). 2006c. Standard Method 9221 B-06. Standard Total Coliform Fermentation Technique. Approved by Standard Methods Committee 2006. Standard Methods Online. (Available at <http://www.standardmethods.org>.)

American Public Health Association (APHA). 2006d. Standard Method 9221 C-06. Estimation of Bacterial Density. Approved by Standard Methods Committee 2006. Standard Methods Online. (Available at <http://www.standardmethods.org>.)



American Public Health Association (APHA). 2006e. Standard Method 9221 E-06. Fecal Coliform Procedure. Approved by Standard Methods Committee 2006. Standard Methods Online. (Available at <http://www.standardmethods.org>.)

American Public Health Association (APHA). 2006f. Standard Method 9221 F-06. Escherichia coli Procedure Using Fluorogenic Substrate. Approved by Standard Methods Committee 2006. Standard Methods Online. (Available at <http://www.standardmethods.org>.)

American Public Health Association (APHA). 2006g. Standard Method 9222 D-06. Thermotolerant (Fecal) Coliform Membrane Filter Procedure. Approved by Standard Methods Committee 2006. Standard Methods Online. (Available at <http://www.standardmethods.org>.)

American Public Health Association (APHA). 2007. Standard Method 6251 B-07. Disinfection By-Products: Haloacetic Acids and Trichlorophenol. Micro Liquid-Liquid Extraction Gas Chromatographic Method. Approved by Standard Methods Committee 2007. Standard Methods Online. (Available at <http://www.standardmethods.org>.)

American Public Health Association (APHA). 2010a. Standard Method 2550-10. Temperature. Approved by Standard Methods Committee 2010. Standard Methods Online. (Available at <http://www.standardmethods.org>.)

American Public Health Association (APHA). 2010b. Standard Method 3113 B-10.

Electrothermal Atomic Absorption Spectrometric Method. Approved by Standard Methods Committee 2010. Standard Methods Online. (Available at <http://www.standardmethods.org>.)

American Public Health Association (APHA). 2011. Standard Method 5910 B-11. UV-Absorbing Organic Constituents. Ultraviolet Absorption Method. Approved by Standard Methods Committee 2011. Standard Methods Online. (Available at <http://www.standardmethods.org>.)

ASTM International. 1989. ASTM D512-89 B (reapproved 1999). Standard Test Methods for Chloride Ion in Water – Silver Nitrate Titration. ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428–2959. (Available at <http://www.astm.org>.)

ASTM International. 2002. ASTM D3223-02. Standard Test Method for Total Mercury in Water. ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428–2959. (Available at <http://www.astm.org>.)

ASTM International. 2003. ASTM D4327-03. Standard Test Method for Anions in Water by Chemically Suppressed Ion Chromatography. ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428–2959. (Available at <http://www.astm.org>.)

ASTM International. 2011. ASTM D4327-11. Standard Test Method for Anions in Water by Suppressed Ion Chromatography. ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428–2959. (Available at <http://www.astm.org>.)

ASTM International. 2012a. ASTM D512-12 B. Standard Test Methods for Chloride Ion in Water – Silver Nitrate Titration. ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428–2959. (Available at <http://www.astm.org>.)

ASTM International. 2012b. ASTM D3223-12. Standard Test Method for Total Mercury in Water. ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428–2959. (Available at <http://www.astm.org>.)

Dougherty, C. C. 1996. Letter to Joe O'Donnell, Senior Regulatory Affairs Specialist, IDEXX Laboratories, Inc., Sept. 10, 1996.

Hach Company. 2013a. Hach Company Method 10260 – Determination of Chlorinated Oxidants (Free and Total) in Water using Disposable Planar Reagent-Filled Cuvettes and Mesofluidic Channel Colorimetry. April 2013. 5600 Lindbergh Drive, P.O. Box 389, Loveland, CO 80539. (Available at <http://www.hach.com>.)

Hach Company. 2013b. Hach Company Method 10260 – Alternate Test Procedure (ATP) Validation Study Report for Free and Total Chlorine using Disposable “Planar” Reagent-Filled Cuvettes. August 2013. 5600 Lindbergh Drive, P.O. Box 389, Loveland, CO 80539. (Available at <http://www.hach.com>.)

Palintest Ltd. 2013. Palintest ChlordioX Plus Method – Chlorine Dioxide and Chlorite in

Drinking Water by Amperometry using Disposable Sensors. November 2013. 1455 Jamike Avenue (Suite 100), Erlanger, KY 41018.

Sinclair, J. 2014. Memo to the record describing basis for expedited approval of Tecta EC/TC. April 9, 2014.

Smith, G. 2013. Memo to the record describing basis for expedited approval of updated methods from ASTM International. December 1, 2013.

Smith, G. and Wendelken, S. 2013a. Memo to the record describing basis for expedited approval of online Standard Methods. December 3, 2013.

Smith, G. and Wendelken, S. 2013b. Memo to the record describing basis for expedited approval of Hach Company Method 10260 for determination of chlorinated oxidants (free and total) in water using disposable planar reagent-filled cuvettes and mesofluidic channel colorimetry. November 4, 2013.

Smith, G. and Wendelken, S. 2013c. Memo to the record describing basis for expedited approval of Palintest Ltd. ChlordioX Plus Method. November 20, 2013.

USEPA. 2000. EPA Method 515.4, Revision 1.0, "Determination of Chlorinated Acids in Drinking Water by Liquid-Liquid Microextraction, Derivatization and Fast Gas Chromatography with Electron Capture Detection," EPA/815/B-00/001, April 2000. (Available at

<https://www.nemi.gov>.)

USEPA. 2013. National Primary Drinking Water Regulations: Revisions to the Total Coliform Rule; Final Rule. 78 FR 10270. February 13, 2013.

Veolia. 2014a. Presence/Absence Method for Simultaneous Detection of Total Coliforms and Escherichia coli (E. coli) in Drinking Water. April 2014. Veolia Water Solutions and Technologies, Suite 4697, Biosciences Complex, 116 Barrie Street, Kingston, Ontario, Canada, K7L 3N6.

Veolia. 2014b. ATP Study Report for the Proposed US EPA Approval of ENDETEC (Tecta EC/TC), an Automated Method for Detecting Total Coliforms and E. coli in Drinking Water, under the USEPA Microbiological Alternate Test Procedure (ATP) Study Report ATP Case Number D11-0005. Originally submitted June 12, 2013, revised January 30, 2014. Veolia Water Solutions and Technologies, Suite 4697, Biosciences Complex, 116 Barrie Street, Kingston, Ontario, Canada K7L 3N6.

## **List of Subjects in 40 CFR Part 141**

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

Dated: June 3, 2014.

**Peter Grevatt,**

*Director, Office of Ground Water and Drinking Water.*

For the reasons stated in the preamble, 40 CFR Part 141 is amended 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. Appendix A to Subpart C of Part 141 is amended as follows:

- a. By revising the table entitled “ALTERNATIVE TESTING METHODS FOR CONTAMINANTS LISTED AT 40 CFR 141.21(f)(3).”
- b. By revising the table entitled “ALTERNATIVE TESTING METHODS FOR CONTAMINANTS LISTED AT 40 CFR 141.21(f)(5).”
- c. By revising the table entitled “ALTERNATIVE TESTING METHODS FOR CONTAMINANTS LISTED AT 40 CFR 141.21(f)(6).”
- d. By revising entries for “Antimony,” “Arsenic,” “Barium,” “Beryllium,” “Cadmium,” “Chromium,” “Copper,” “Fluoride,” “Lead,” “Mercury,” “Nickel,” “Nitrate,” “Nitrite,” “Orthophosphate,” “Selenium,” and “Temperature” in the table entitled “ALTERNATIVE TESTING METHODS FOR CONTAMINANTS LISTED AT 40 CFR 141.23(k)(1).”

- e. By revising entries for “2,4-D,” “2,4,5-TP (Silvex),” “Dalapon,” “Dinoseb,” “Glyphosate,” “Pentachlorophenol,” and “Picloram” in the table entitled “ALTERNATIVE TESTING METHODS FOR CONTAMINANTS LISTED AT 40 CFR 141.24(e)(1).”
- f. By revising the table entitled “ALTERNATIVE TESTING METHODS FOR CONTAMINANTS LISTED AT 40 CFR 141.74(a)(1).”
- g. By revising entries for “Free Chlorine,” “Total Chlorine,” and “Chlorine Dioxide” in the table entitled “ALTERNATIVE TESTING METHODS FOR DISINFECTANT RESIDUALS LISTED AT 40 CFR 141.74(a)(2).”
- h. By revising the table entitled “ALTERNATIVE TESTING METHODS FOR CONTAMINANTS LISTED AT 40 CFR 141.131(b)(1).”
- i. By revising the table entitled “ALTERNATIVE TESTING METHODS FOR DISINFECTANT RESIDUALS LISTED AT 40 CFR 141.131(c)(1).”
- j. By revising the table entitled “ALTERNATIVE TESTING METHODS FOR PARAMETERS LISTED AT 40 CFR 141.131(d).”
- k. By revising the entry for “E. coli” in the table entitled “ALTERNATIVE TESTING METHODS FOR CONTAMINANTS LISTED AT 40 CFR 141.402(c)(2).”
- l. By revising the table entitled “ALTERNATIVE TESTING METHODS FOR CONTAMINANTS LISTED AT 40 CFR 141.852(a)(5).”



- m. By revising entries for “Aluminum,” “Chloride,” “Iron,” “Manganese,” “Silver,” and “Sulfate” in the table entitled  
“ALTERNATIVE TESTING METHODS FOR CONTAMINANTS LISTED AT 40 CFR 143.4(b).”
- n. By revising footnotes 17 and 23.
- o. By adding footnotes 31 through 33 to the table.

The additions and revisions read as follows:

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

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<b>ALTERNATIVE TESTING METHODS FOR CONTAMINANTS LISTED AT 40 CFR 141.21(f)(3)</b>					
Organism	Methodology	SM 21 <sup>st</sup> Edition <sup>1</sup>	SM 22 <sup>nd</sup> Edition <sup>28</sup>	SM Online <sup>3</sup>	Other
Total Coliforms	Total Coliform Fermentation Technique	9221 A, B	9221 A, B	9221 A,B-06	
	Total Coliform Membrane Filter Technique	9222 A, B, C			
	Presence-Absence (P-A) Coliform Test	9221 D			
	ONPG-MUG Test	9223	9223 B	9223 B-04	
	Colitag™				Modified Colitag™ <sup>13</sup>
	Tecta EC/TC <sup>33</sup>				

<b>ALTERNATIVE TESTING METHODS FOR CONTAMINANTS LISTED AT 40 CFR 141.21(f)(5)</b>
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Organism	Methodology	SM 22 <sup>nd</sup> Edition <sup>28</sup>	SM Online <sup>3</sup>
Fecal Coliforms	Fecal Coliform Procedure	9221 E	9221 E-06

**ALTERNATIVE TESTING METHODS FOR CONTAMINANTS LISTED AT 40 CFR 141.21(f)(6)**

Organism	Methodology	SM 20 <sup>th</sup> Edition <sup>6</sup>	SM 21 <sup>st</sup> Edition <sup>1</sup>	SM 22 <sup>nd</sup> Edition <sup>28</sup>	SM Online <sup>3</sup>	Other
<i>E.coli</i>	ONPG-MUG Test	9223 B	9223 B	9223 B	9223 B-97, B-04	
	Colitag™					Modified Colitag™ <sup>13</sup>
	Tecta EC/TC <sup>33</sup>					

**ALTERNATIVE TESTING METHODS FOR CONTAMINANTS LISTED AT 40 CFR 141.23 (k)(1)**

Contaminant	Methodology	EPA Method	SM 21 <sup>st</sup> Edition <sup>1</sup>	SM 22 <sup>nd</sup> Edition <sup>28</sup>	SM Online <sup>3</sup>	ASTM <sup>4</sup>	Other
* * * * *							
Antimony	Hydride – Atomic Absorption					D 3697-07	
	Atomic Absorption; Furnace		3113 B	3113 B	3113 B-04, B-10		
	Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP–AES)	200.5, Revision 4.2 <sup>2</sup>					
Arsenic	Atomic Absorption; Furnace		3113 B	3113 B	3113 B-04, B-10	D 2972-08 C	
	Hydride Atomic Absorption		3114 B	3114 B	3114 B-09	D 2972-08 B	

	Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP–AES)	200.5, Revision 4.2 <sup>2</sup>					
Barium	Inductively Coupled Plasma		3120 B	3120 B			
	Atomic Absorption; Direct		3111 D	3111 D			
	Atomic Absorption; Furnace		3113 B	3113 B	3113 B-04, B-10		
	Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP–AES)	200.5, Revision 4.2 <sup>2</sup>					
Beryllium	Inductively Coupled Plasma		3120 B	3120 B			
	Atomic Absorption; Furnace		3113 B	3113 B	3113 B-04, B-10	D 3645-08 B	
	Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP–AES)	200.5, Revision 4.2 <sup>2</sup>					
Cadmium	Atomic Absorption; Furnace		3113 B	3113 B	3113 B-04, B-10		
	Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP–AES)	200.5, Revision 4.2 <sup>2</sup>					

* * * * *							
Chromium	Inductively Coupled Plasma		3120 B	3120 B			
	Atomic Absorption; Furnace		3113 B	3113 B	3113 B-04, B-10		
	Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP–AES)	200.5, Revision 4.2 <sup>2</sup>					
Copper	Atomic Absorption; Furnace		3113 B	3113 B	3113 B-04, B-10	D 1688-07 C	
	Atomic Absorption; Direct Aspiration		3111 B	3111 B		D 1688-07 A	
	Inductively Coupled Plasma		3120 B	3120 B			
	Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP–AES)	200.5, Revision 4.2 <sup>2</sup>					
* * * * *							
Fluoride	Ion Chromatography		4110 B	4110 B		D 4327-11	
	Manual Distillation; Colorimetric SPADNS		4500-F <sup>-</sup> B, D	4500-F <sup>-</sup> B, D			
	Manual Electrode		4500-F <sup>-</sup> C	4500-F <sup>-</sup> C		D 1179-04, 10 B	
	Automated Alizarin		4500-F <sup>-</sup> E	4500-F <sup>-</sup> E			
	Arsenite-Free Colorimetric SPADNS						Hach SPADNS 2

							Method 10225 <sup>22</sup>
Lead	Atomic Absorption; Furnace		3113 B	3113 B	3113 B-04, B-10	D 3559-08 D	
	Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP–AES)	200.5, Revision 4.2 <sup>2</sup>					
* * * * *							
Mercury	Manual, Cold Vapor		3112 B	3112 B	3112 B-09	D 3223-12	
Nickel	Inductively Coupled Plasma		3120 B	3120 B			
	Atomic Absorption; Direct		3111 B	3111 B			
	Atomic Absorption; Furnace		3113 B	3113 B	3113 B-04, B-10		
	Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP–AES)	200.5, Revision 4.2 <sup>2</sup>					
Nitrate	Ion Chromatography		4110 B	4110 B		D 4327-11	
	Automated Cadmium Reduction		4500-NO <sub>3</sub> <sup>-</sup> F	4500-NO <sub>3</sub> <sup>-</sup> F			
	Manual Cadmium Reduction		4500-NO <sub>3</sub> <sup>-</sup> E	4500-NO <sub>3</sub> <sup>-</sup> E			
	Ion Selective Electrode		4500-NO <sub>3</sub> <sup>-</sup> D	4500-NO <sub>3</sub> <sup>-</sup> D			
	Reduction/Colorimetric						Systea Easy

							(1-Reagent) <sup>8</sup>
	Colorimetric; Direct						Hach TNTplus™ 835/836 Method 10206 <sup>23</sup>
Nitrite	Ion Chromatography		4110 B	4110 B		D 4327-11	
	Automated Cadmium Reduction		4500-NO <sub>3</sub> <sup>-</sup> F	4500-NO <sub>3</sub> <sup>-</sup> F			
	Manual Cadmium Reduction		4500-NO <sub>3</sub> <sup>-</sup> E	4500-NO <sub>3</sub> <sup>-</sup> E			
	Spectrophotometric		4500-NO <sub>2</sub> <sup>-</sup> B	4500-NO <sub>2</sub> <sup>-</sup> B			
	Reduction/Colorimetric						Systea Easy (1-Reagent) <sup>8</sup>
Orthophosphate	Ion Chromatography		4110 B	4110 B		D 4327-11	
	Colorimetric, ascorbic acid, single reagent		4500-P E	4500-P E	4500-P E-99		
	Colorimetric, Automated, Ascorbic Acid		4500-P F	4500-P F	4500-P F-99		
* * * * *							
Selenium	Hydride-Atomic Absorption		3114 B	3114 B	3114 B-09	D 3859-08 A	
	Atomic Absorption; Furnace		3113 B	3113 B	3113 B-04, B-10	D 3859-08 B	
	Axially viewed inductively coupled plasma-atomic emission spectrometry	200.5, Revision 4.2 <sup>2</sup>					

	(AVICP–AES)						
* * * * *							
Temperature	Thermometric		2550	2550	2550-10		

ALTERNATIVE TESTING METHODS FOR CONTAMINANTS LISTED AT 40 CFR 141.24 (e)(1)					
Contaminant	Methodology	EPA Method	SM 21 <sup>st</sup> Edition <sup>1</sup>	SM 22 <sup>nd</sup> Edition <sup>28</sup>	SM Online <sup>3</sup>
* * * * *					
2,4-D	Gas Chromatography/Electron Capture Detection (GC/ECD)		6640 B	6640 B	6640 B-01, B-06
2,4,5-TP (Silvex)	Gas Chromatography/Electron Capture Detection (GC/ECD)		6640 B	6640 B	6640 B-01, B-06
* * * * *					
Dalapon	Ion Chromatography Electrospray Ionization Tandem Mass Spectrometry (IC-ESI-MS/MS)	557 <sup>14</sup>			
	Gas Chromatography/Electron Capture Detection (GC/ECD)		6640 B	6640 B	6640 B-01, B-06
* * * * *					
Dinoseb	Gas Chromatography/Electron Capture Detection (GC/ECD)		6640 B	6640 B	6640 B-01, B-06
* * * * *					
Glyphosate	High-Performance Liquid Chromatography (HPLC) with Post-Column Derivatization and Fluorescence Detection		6651 B	6651 B	6651 B-00, B-05
* * * * *					
Pentachlorophenol	Gas Chromatography/Electron Capture Detection (GC/ECD)		6640 B	6640 B	6640 B-01, B-06

	Solid Phase Extraction/Gas Chromatography/Mass Spectrometry (GC/MS)	525.3 <sup>24</sup>			
Picloram	Gas Chromatography/Electron Capture Detection (GC/ECD)		6640 B	6640 B	6640 B-01, B-06
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<b>ALTERNATIVE TESTING METHODS FOR CONTAMINANTS LISTED AT 40 CFR 141.74(a)(1)</b>					
Organism	Methodology	SM 21 <sup>st</sup> Edition <sup>1</sup>	SM 22 <sup>nd</sup> Edition <sup>28</sup>	SM Online <sup>3</sup>	Other
Total Coliform	Total Coliform Fermentation Technique	9221 A, B, C	9221 A, B, C	9221 A,B,C-06	
	Total Coliform Membrane Filter Technique	9222 A, B, C			
	ONPG-MUG Test	9223	9223 B	9223 B-04	
Fecal Coliforms	Fecal Coliform Procedure	9221 E	9221 E	9221 E-06	
	Fecal Coliform Filter Procedure	9222 D	9222 D	9222 D-06	
Heterotrophic bacteria	Pour Plate Method	9215 B	9215 B	9215 B-04	
Turbidity	Nephelometric Method	2130 B	2130 B		
	Laser Nephelometry (on-line)				Mitchell M5271 <sup>10</sup>
	LED Nephelometry (on-line)				Mitchell M5331 <sup>11</sup>
	LED Nephelometry (on-line)				AMI Turbiwell <sup>15</sup>
	LED Nephelometry (portable)				Orion AQ4500 <sup>12</sup>

<b>ALTERNATIVE TESTING METHODS FOR DISINFECTANT RESIDUALS LISTED AT 40 CFR 141.74(a)(2)</b>
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Residual	Methodology	SM 21 <sup>st</sup> Edition <sup>1</sup>	SM 22 <sup>nd</sup> Edition <sup>28</sup>	ASTM <sup>4</sup>	Other
Free Chlorine	Amperometric Titration	4500-Cl D	4500-Cl D	D 1253-08	
	DPD Ferrous Titrimetric	4500-Cl F	4500-Cl F		
	DPD Colorimetric	4500-Cl G	4500-Cl G		Hach Method 10260 <sup>31</sup>
	Syringaldazine (FACTS)	4500-Cl H	4500-Cl H		
	On-line Chlorine Analyzer				EPA 334.0 <sup>16</sup>
	Amperometric Sensor				ChloroSense <sup>17</sup>
Total Chlorine	Amperometric Titration	4500-Cl D	4500-Cl D	D 1253-08	
	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 <sup>31</sup>
	Iodometric Electrode	4500-Cl I	4500-Cl I		
	On-line Chlorine Analyzer				EPA 334.0 <sup>16</sup>
	Amperometric Sensor				ChloroSense <sup>17</sup>
Chlorine Dioxide	Amperometric Titration	4500-ClO <sub>2</sub> C	4500-ClO <sub>2</sub> C		
	Amperometric Titration	4500-ClO <sub>2</sub> E	4500-ClO <sub>2</sub> E		
	Amperometric Sensor				ChlordioX Plus <sup>32</sup>
* * * * *					

ALTERNATIVE TESTING METHODS FOR CONTAMINANTS LISTED AT 40 CFR 141.131(b)(1)							
Contaminant	Methodology	EPA Method	ASTM <sup>4</sup>	SM Online <sup>3</sup>	SM 21 <sup>st</sup> Edition <sup>1</sup>	SM 22 <sup>nd</sup> Edition <sup>28</sup>	Other
TTHM	P&T/GC/MS	524.3 <sup>9</sup> 524.4 <sup>29</sup>					

HAA5	LLE (diazomethane)/GC/ECD			6251 B-07	6251 B	6251 B	
	Ion Chromatography Electrospray Ionization Tandem Mass Spectrometry (IC-ESI- MS/MS)	557 <sup>14</sup>					
Bromate	Two-Dimensional Ion Chromatography (IC)	302.0 <sup>18</sup>					
	Ion Chromatography Electrospray Ionization Tandem Mass Spectrometry (IC-ESI- MS/MS)	557 <sup>14</sup>					
	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 – daily monitoring as prescribed in 40 CFR 141.132(b)(2) (i)(A)	Amperometric Titration				4500–ClO <sub>2</sub> E	4500–ClO <sub>2</sub> E	
	Amperometric Sensor						ChlordioX Plus <sup>32</sup>

<b>ALTERNATIVE TESTING METHODS FOR DISINFECTANT RESIDUALS LISTED AT 40 CFR 141.131(c)(1)</b>					
Residual	Methodology	SM 21 <sup>st</sup> Edition <sup>1</sup>	SM 22 <sup>nd</sup> Edition <sup>28</sup>	ASTM <sup>4</sup>	Other
Free Chlorine	Amperometric Titration	4500-Cl D	4500-Cl D	D 1253-08	
	DPD Ferrous Titrimetric	4500-Cl F	4500-Cl F		
	DPD Colorimetric	4500-Cl G	4500-Cl G		Hach Method 10260 <sup>31</sup>
	Syringaldazine (FACTS)	4500-Cl H	4500-Cl H		
	Amperometric Sensor				ChloroSense <sup>17</sup>
	On-line Chlorine Analyzer				EPA 334.0 <sup>16</sup>
Combined Chlorine	Amperometric Titration	4500-Cl D	4500-Cl D	D 1253-08	
	DPD Ferrous Titrimetric	4500-Cl F	4500-Cl F		
	DPD Colorimetric	4500-Cl G	4500-Cl G		Hach Method 10260 <sup>31</sup>
Total Chlorine	Amperometric Titration	4500-Cl D	4500-Cl D	D 1253-08	
	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 <sup>31</sup>
	Iodometric Electrode	4500-Cl I	4500-Cl I		
	Amperometric Sensor				ChloroSense <sup>17</sup>
	On-line Chlorine Analyzer				EPA 334.0 <sup>16</sup>
Chlorine Dioxide	Amperometric Method II	4500-ClO <sub>2</sub> E	4500-ClO <sub>2</sub> E		
	Amperometric Sensor				ChlordioX Plus <sup>32</sup>

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<b>ALTERNATIVE TESTING METHODS FOR PARAMETERS LISTED AT 40 CFR 141.131(d)</b>					
Parameter	Methodology	SM 21 <sup>st</sup> Edition <sup>1</sup>	SM 22 <sup>nd</sup> Edition <sup>28</sup>	SM Online <sup>3</sup>	EPA
Total Organic Carbon (TOC)	High Temperature Combustion	5310 B	5310 B		415.3, Rev 1.2 <sup>19</sup>
	Persulfate-Ultraviolet or Heated Persulfate Oxidation	5310 C	5310 C		415.3, Rev 1.2 <sup>19</sup>
	Wet Oxidation	5310 D	5310 D		415.3, Rev 1.2 <sup>19</sup>
Specific Ultraviolet Absorbance (SUVA)	Calculation using DOC and UV <sub>254</sub> data				415.3, Rev 1.2 <sup>19</sup>
Dissolved Organic Carbon (DOC)	High Temperature Combustion	5310 B	5310 B		415.3, Rev 1.2 <sup>19</sup>
	Persulfate-Ultraviolet or Heated Persulfate Oxidation	5310 C	5310 C		415.3, Rev 1.2 <sup>19</sup>
	Wet Oxidation	5310 D	5310 D		415.3, Rev 1.2 <sup>19</sup>
Ultraviolet absorption at 254 nm (UV <sub>254</sub> )	Spectrophotometry	5910 B	5910 B	5910 B-11	415.3, Rev 1.2 <sup>19</sup>

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<b>ALTERNATIVE TESTING METHODS FOR CONTAMINANTS LISTED AT 40 CFR 141.402(c)(2)</b>						
Organism	Methodology	SM 20 <sup>th</sup> Edition <sup>6</sup>	SM 21 <sup>st</sup> Edition <sup>1</sup>	SM 22 <sup>nd</sup> Edition <sup>28</sup>	SM Online <sup>3</sup>	Other
<i>E. coli</i>	Colilert®		9223 B	9223 B	9223 B-97, B-04	
	Colisure®		9223 B	9223 B	9223 B-97, B-04	
	Colilert-18	9223 B	9223 B	9223 B	9223 B-97, B-04	
	Readycult®					Readycult® <sup>20</sup>
	Colitag					Modified Colitag™ <sup>13</sup>
	Chromocult®					Chromocult® <sup>21</sup>

	EC-MUG			9221 F	9221 F-06	
	Tecta EC/TC <sup>33</sup>					
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<b>ALTERNATIVE TESTING METHODS FOR CONTAMINANTS LISTED AT 40 CFR 141.852(a)(5)</b>					
Organism	Methodology Category	Method	SM 20 <sup>th</sup> , 21 <sup>st</sup> Editions <sup>1,6</sup>	SM 22 <sup>nd</sup> Edition <sup>28</sup>	SM Online <sup>3</sup>
Total Coliforms	Lactose Fermentation Methods	Standard Total Coliform Fermentation Technique		9221 B.1, B.2	9221 B.1, B.2-06
		Colilert®		9223 B	9223 B-04
	Enzyme Substrate Methods	Colisure®		9223 B	9223 B-04
		Colilert-18®	9223 B	9223 B	9223 B-04
		Tecta EC/TC <sup>33</sup>			
<i>Escherichia coli</i>	<i>Escherichia coli</i> Procedure (following Lactose Fermentation Methods)	EC-MUG medium		9221 F.1	9221 F.1-06
		Colilert®		9223 B	9223 B-04
	Enzyme Substrate Methods	Colisure®		9223 B	9223 B-04
		Colilert-18®	9223 B	9223 B	9223 B-04
		Tecta EC/TC <sup>33</sup>			

<b>ALTERNATIVE TESTING METHODS FOR CONTAMINANTS LISTED AT 40 CFR 143.4(b)</b>						
Contaminant	Methodology	EPA Method	ASTM <sup>4</sup>	SM 21 <sup>st</sup> Edition <sup>1</sup>	SM 22 <sup>nd</sup> Edition <sup>28</sup>	SM Online <sup>3</sup>

Aluminum	Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP–AES)	200.5, Revision 4.2 <sup>2</sup>				
	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 <sup>-</sup> B	4500-Cl <sup>-</sup> B	
	Ion Chromatography		D 4327-11	4110 B	4110 B	
	Potentiometric Titration			4500-Cl <sup>-</sup> D	4500-Cl <sup>-</sup> D	
* * * * *						
Iron	Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP–AES)	200.5, Revision 4.2 <sup>2</sup>				
	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 <sup>2</sup>				
	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	
* * * * *						

Silver	Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP–AES)	200.5, Revision 4.2 <sup>2</sup>				
	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	4110 B	4110 B	
	Gravimetric with ignition of residue			4500-SO <sub>4</sub> <sup>2-</sup> C	4500-SO <sub>4</sub> <sup>2-</sup> C	4500-SO <sub>4</sub> <sup>2-</sup> C-97
	Gravimetric with drying of residue			4500-SO <sub>4</sub> <sup>2-</sup> D	4500-SO <sub>4</sub> <sup>2-</sup> D	4500-SO <sub>4</sub> <sup>2-</sup> D-97
	Turbidimetric method		D 516-07, 11	4500-SO <sub>4</sub> <sup>2-</sup> E	4500-SO <sub>4</sub> <sup>2-</sup> E	4500-SO <sub>4</sub> <sup>2-</sup> E-97
	Automated methylthymol blue method			4500-SO <sub>4</sub> <sup>2-</sup> F	4500-SO <sub>4</sub> <sup>2-</sup> F	4500-SO <sub>4</sub> <sup>2-</sup> F-97
* * * * *						

<sup>1</sup> Standard Methods for the Examination of Water and Wastewater, 21<sup>st</sup> edition (2005). Available from American Public Health Association, 800 I Street, NW, Washington, DC 20001-3710.

<sup>2</sup> EPA 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 <http://www.epa.gov/nerlcwww/ordmeth.htm>.)

<sup>3</sup> Standard Methods Online are available at <http://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.

<sup>4</sup> Available from ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959 or <http://astm.org>. The methods listed are the only alternative versions that may be used.

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<sup>6</sup> Standard Methods for the Examination of Water and Wastewater, 20<sup>th</sup> edition (1998). Available from American Public Health Association, 800 I Street, NW, Washington, DC 20001-3710.

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<sup>8</sup> Syssta Easy (1-Reagent). “Syssta Easy (1-Reagent) Nitrate Method,” February 4, 2009. Available at <https://www.nemi.gov> or from Syssta Scientific, LLC., 900 Jorie Blvd., Suite 35, Oak Brook, IL 60523.

<sup>9</sup> EPA Method 524.3, Version 1.0. “Measurement of Purgeable Organic Compounds in Water by Capillary Column Gas Chromatography/Mass Spectrometry,” June 2009. EPA 815-B-09-009. Available at <http://water.epa.gov/drink/>.

<sup>10</sup> Mitchell Method M5271, Revision 1.1. “Determination of Turbidity by Laser Nephelometry,” March 5, 2009. Available at <https://www.nemi.gov> or from Leck Mitchell, Ph.D., PE, 656 Independence Valley Dr., Grand Junction, CO 81507.

<sup>11</sup> Mitchell Method M5331, Revision 1.1. “Determination of Turbidity by LED Nephelometry,” March 5, 2009. Available at <https://www.nemi.gov> or from Leck Mitchell, Ph.D., PE, 656 Independence Valley Dr., Grand Junction, CO 81507.

<sup>12</sup> Orion Method AQ4500, Revision 1.0. “Determination of Turbidity by LED Nephelometry,” May 8, 2009. Available at <https://www.nemi.gov> or from Thermo Scientific, 166 Cummings Center, Beverly, MA 01915, <http://www.thermo.com>.

<sup>13</sup> Modified Colitag™ Method. “Modified Colitag™ Test Method for the Simultaneous Detection of *E. coli* and other Total Coliforms in Water (ATP D05-0035),” August 28, 2009. Available at <https://www.nemi.gov> or from CPI International, 5580 Skylane Boulevard, Santa Rosa, CA 95403.

<sup>14</sup> EPA Method 557. “Determination of Haloacetic Acids, Bromate, and Dalapon in Drinking Water by Ion Chromatography Electrospray Ionization Tandem Mass Spectrometry (IC-ESI-MS/MS),” September 2009. EPA 815-B-09-012. Available at <http://water.epa.gov/drink/>.

<sup>15</sup> AMI Turbiwell, “Continuous Measurement of Turbidity Using a SWAN AMI Turbiwell Turbidimeter,” August 2009. Available at <https://www.nemi.gov> or from Markus Bernasconi, SWAN Analytische Instrumente AG, Studbachstrasse 13, CH-8340 Hinwil, Switzerland.



<sup>16</sup> EPA Method 334.0. “Determination of Residual Chlorine in Drinking Water Using an On-line Chlorine Analyzer,” September 2009. EPA 815-B-09-013. Available at <http://water.epa.gov/drink/>.

<sup>17</sup> ChloroSense. “Measurement of Free and Total Chlorine in Drinking Water by Palintest ChloroSense,” August 2009. Available at <https://www.nemi.gov> or from Palintest Ltd, 1455 Jamike Avenue (Suite 100), Erlanger, KY 41018.

<sup>18</sup> EPA Method 302.0. “Determination of Bromate in Drinking Water using Two-Dimensional Ion Chromatography with Suppressed Conductivity Detection,” September 2009. EPA 815-B-09-014. Available at <http://water.epa.gov/drink/>.

<sup>19</sup> EPA 415.3, Revision 1.2. “Determination of Total Organic Carbon and Specific UV Absorbance at 254 nm in Source Water and Drinking Water,” September 2009. EPA/600/R-09/122. Available at <http://www.epa.gov/nerlcwww/ordmeth.htm>.

<sup>20</sup> Readycult® Method, “Readycult® Coliforms 100 Presence/Absence Test for Detection and Identification of Coliform Bacteria and *Escherichia coli* in Finished Waters,” January, 2007. Version 1.1. Available from EMD Millipore (division of Merck KGaA, Darmstadt, Germany), 290 Concord Road, Billerica, MA 01821.

<sup>21</sup> Chromocult® Method, “Chromocult® Coliform Agar Presence/Absence Membrane Filter Test Method for Detection and Identification of Coliform Bacteria and *Escherichia coli* in Finished Waters,” November, 2000. Version 1.0. EMD Millipore (division of Merck KGaA, Darmstadt, Germany), 290 Concord Road, Billerica, MA 01821.

<sup>22</sup> Hach Company. “Hach Company SPADNS 2 (Arsenite-Free) Fluoride Method 10225 – Spectrophotometric Measurement of Fluoride in Water and Wastewater,” January 2011. 5600 Lindbergh Drive, P.O. Box 389, Loveland, Colorado 80539. (Available at <http://www.hach.com>.)

<sup>23</sup> Hach Company. “Hach Company TNTplus™ 835/836 Nitrate Method 10206 – Spectrophotometric Measurement of Nitrate in Water and Wastewater,” January 2011. 5600 Lindbergh Drive, P.O. Box 389, Loveland, Colorado 80539. (Available at <http://www.hach.com>.)

<sup>24</sup> EPA Method 525.3. “Determination of Semivolatile Organic Chemicals in Drinking Water by Solid Phase Extraction and Capillary Column Gas Chromatography/Mass Spectrometry (GC/MS),” February 2012. EPA/600/R-12/010. Available at <http://www.epa.gov/nerlcwww/ordmeth.htm>.

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<sup>28</sup> Standard Methods for the Examination of Water and Wastewater, 22<sup>nd</sup> edition (2012). Available from American Public Health Association, 800 I Street, NW, Washington, DC 20001-3710.

<sup>29</sup> EPA Method 524.4, Version 1.0. “Measurement of Purgeable Organic Compounds in Water by Gas Chromatography/Mass Spectrometry using Nitrogen Purge Gas,” May 2013. EPA 815-R-13-002. Available at <http://water.epa.gov/drink>.

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<sup>31</sup> Hach Company. “Hach Method 10260 - Determination of Chlorinated Oxidants (Free and Total) in Water Using Disposable Planar Reagent-filled Cuvettes and Mesofluidic Channel Colorimetry,” April 2013. 5600 Lindbergh Drive, P.O. Box 389, Loveland, CO 80539. (Available at <http://www.hach.com>.)

<sup>32</sup> ChlordioX Plus. “Chlorine Dioxide and Chlorite in Drinking Water by Amperometry using Disposable Sensors,” November 2013. Available from Palintest Ltd, Jamike Avenue (Suite 100), Erlanger, KY 41018.

<sup>33</sup> Tecta EC/TC. “Presence/Absence Method for Simultaneous Detection of Total Coliforms and Escherichia coli (E. coli) in Drinking Water,” April 2014. Available from Veolia Water Solutions and Technologies, Suite 4697, Biosciences Complex, 116 Barrie Street, Kingston, Ontario, Canada, K7L 3N6.

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