

Number ²⁷	Parameter	Methodology ²⁶	Currently Approved at 40 CFR 136	Approved under MUR FR 3/12/07
2.	Alkalinity, as CaCO ₃ , mg/L	1. Electrometric or Colorimetric titration to pH 4.5, manual or 2. Automatic	EPA 310.1 ¹ SM 2320 B [18 th , 19 th , 20 th] ASTM D1067-92 USGS I-1030-85 ² AOAC 973.43 ³ EPA 310.2 ¹ USGS I-2030-85 ²	SM 2320 B [18 th , 19 th , 20 th] SM Online 2320 B-97 ASTM D1067-92, 02 USGS I-1030-85 ² AOAC 973.43 ⁴ EPA 310.2 (Rev. 1974) ¹ USGS I-2030-85 ²
4.	Ammonia (as N), mg/L	1. Manual distillation (at pH 9.5) ⁵ followed by: Nesslerization Titration Electrode Automated phenate, or Automated electrode 2. Ion Chromatography	EPA 350.2 ¹ SM 4500-NH ₃ B [18 th , 19 th , 20 th] AOAC 973.49 ³ EPA 350.2 ¹ SM 4500-NH ₃ C [18 th] ASTM D1426-98 (A) USGS I-3520-85 ² AOAC 973.49 ³ EPA 350.2 ¹ SM 4500 NH ₃ C [19 th , 20 th] SM 4500 NH ₃ E [18 th] EPA 350.3 ¹ SM 4500-NH ₃ F or G [18 th] SM 4500-NH ₃ D or E [19 th , 20 th] ASTM D1426-98 (B) EPA 350.1 ¹ SM 4500-NH ₃ G [19 th , 20 th] SM 4500-NH ₃ H [18 th] USGS I-4523-85 ² Footnote 6.	EPA 350.1, Rev 2.0 (1993) ⁷ SM 4500-NH ₃ B [18 th , 19 th , 20 th] SM Online 4500-NH ₃ B-97 AOAC 973.49 ⁴ SM 4500-NH ₃ C [18 th] ASTM D1426-98, 03 (A) USGS I-3520-85 ² AOAC 973.49 ⁴ SM 4500-NH ₃ E [18 th] SM 4500-NH ₃ C [19 th , 20 th] SM Online 4500-NH ₃ C-97 SM 4500-NH ₃ F or G [18 th] SM 4500-NH ₃ D or E [19 th , 20 th] SM Online 4500 NH ₃ D or E-97 ASTM D1426-98, 03 (B) EPA 350.1, Rev. 2.0 (1993) ^{7,8} SM 4500-NH ₃ H [18 th] SM 4500-NH ₃ G [19 th , 20 th] SM Online 4500-NH ₃ G-97 USGS I-4523-85 ² Footnote 6. ASTM D6919-03

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9.	Biochemical oxygen demand (BOD ₅), mg/L	Dissolved oxygen depletion	EPA 405.1 ¹ SM 5210 B [18 th , 19 th , 20 th] USGS I-1578-78 ⁹ AOAC 973.44 ³ p.17 ¹⁰	SM 5210 B [18 th , 19 th , 20 th] SM Online 5210 B-01 USGS I-1578-78 ⁹ AOAC 973.44 ⁴ p.17 ¹⁰
14.	Carbonaceous biochemical oxygen demand (CBOD ₅), mg/L ¹¹	Dissolved oxygen depletion with nitrification inhibitor	SM 5210 B [18 th , 19 th , 20 th]	SM 5210 B [18 th , 19 th , 20 th] SM Online 5210 B-01
17.	Chlorine – Total residual, mg/L Titrimetric:	1. Amperometric direct 2. Amperometric direct (low level) 3. Iodometric direct 4. Back titration ether endpoint ¹³ 5. DPD-FAS 6. Spectrophotometric, DPD 7. Electrode	EPA 330.1 ¹ SM 4500-CI D [18 th , 19 th , 20 th] ASTM D1253-86 (92) EPA 330.3 ¹ SM 4500-CI B [18 th , 19 th , 20 th] EPA 330.2 ¹ SM 4500-CI C [18 th , 19 th , 20 th] EPA 330.4 ¹ SM 4500-CI F [18 th , 19 th , 20 th] EPA 330.5 ¹ SM 4500-CI G [18 th , 19 th , 20 th] Footnote 14.	SM 4500-CI D [18 th , 19 th , 20 th] SM Online 4500-CI D-00 ASTM D1253-86 (96), 03 SM 4500-CI E [18 th , 19 th , 20 th] SM Online 4500-CI E-00 SM 4500-CI B [18 th , 19 th , 20 th] SM Online 4500-CI B-00 SM 4500-CI C [18 th , 19 th , 20 th] SM Online 4500-CI C-00 SM 4500-CI F [18 th , 19 th , 20 th] SM Online 4500-CI F-00 SM 4500-CI G [18 th , 19 th , 20 th] SM Online 4500-CI G-00 Footnote 14.
28.	Hydrogen ion (pH), pH units	1. Electrometric measurement 2. Automated Electrode	EPA 150.1 ¹ SM 4500-H ⁺ B [18 th , 19 th , 20 th] ASTM D1293-84 (90)(A or B) USGS I-1586-85 ² AOAC 973.41 ³ USGS I-2587-85 ² Footnote 12.	SM 4500-H ⁺ B [18 th , 19 th , 20 th] SM Online 4500-H ⁺ B-00 ASTM D1293-84 (90), 99 (A or B) USGS I-1586-85 ² AOAC 973.41 ⁴ EPA 150.2 (Dec. 1982) ¹ USGS I-2587-85 ² Footnote 12.

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31.	Kjeldahl Nitrogen – Total, (as N), mg/L	1. Digestion & distillation followed by:	EPA 351.3 ¹ SM 4500-N _{org} B or C and SM 4500-NH ₃ B [18 th , 19 th , 20 th] ASTM D3590-89 (A)	SM 4500-N _{org} B or C and SM 4500-NH ₃ B [18 th , 19 th , 20 th] ^{19, 20} SM Online 4500-N _{org} B or C-97 and SM 4500-NH ₃ B-97 ^{19, 20} ASTM D3590-89, 02 (A) ^{19, 20}
		Titration or	EPA 351.3 ¹ ASTM D3590-89 (A) AOAC 973.48 ³	SM 4500-NH ₃ C [19 th , 20 th] SM 4500-NH ₃ E [18 th] SM Online 4500-NH ₃ C-97 ASTM D3590-89, 02 (A) AOAC 973.48 ⁴
		Nesslerization or	EPA 351.3 ¹ SM 4500-NH ₃ C [18 th] ASTM D3590-89 (A)	SM 4500-NH ₃ C [18 th] ASTM D3590-89, 02 (A)
		Electrode.	EPA 351.3 ¹ SM 4500-NH ₃ C [19 th , 20 th] SM 4500-NH ₃ E [18 th]	SM 4500-NH ₃ F or G [18 th] SM 4500-NH ₃ D or E [19 th , 20 th] SM Online 4500-NH ₃ D or E-97
		2. Automated phenate colorimetric	EPA 351.1 ¹ USGS I-4551-78 ⁹	EPA 351.1 (Rev. 1978) ¹ USGS I-4551-78 ⁹
		3. Semi-automated block digester colorimetric	EPA 351.2 ¹ ASTM D3590-89 (B) USGS I-4515-91 ¹⁵	EPA 351.2, Rev. 2.0 (1993) ⁷ ASTM D3590-89, 02 (B) USGS I-4515-91 ¹⁵
		4. Manual or block digester potentiometric	EPA 351.4 ¹ ASTM D3590-89 (A)	ASTM D3590-89, 02 (A)
		5. Block digester, followed by Auto distillation and Titration	Footnote 16.	Footnote 16.
		Nesslerization	Footnote 17.	Footnote 17.
		Flow injection gas diffusion	Footnote 18.	Footnote 18.

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38.	Nitrate (as N), mg/L	1. Colorimetric (Brucine sulfate), or 2. CIE/UV 3. Ion Chromatography 4. Ion Selective Electrode 5. Nitrate-nitrite N minus Nitrite N (See parameters 39 and 40)	EPA 352.1 ¹ AOAC 973.50 ³ 419D ²¹ p. 28 ¹⁰	EPA 352.1 ¹ AOAC 973.50 ⁴ 419D ²¹ p. 28 ¹⁰ Footnote 22. EPA 300.0, Rev. 2.1 (1993) ⁷ EPA 300.1, Rev. 1.0 (1997) ⁷ SM 4110 B [18 th , 19 th , 20 th] SM Online 4110 B-00 ASTM D4327-97, 03 AOAC 993.30 ⁴ SM 4500-NO ₃ ⁻ D [18 th , 19 th , 20 th] SM Online 4500-NO ₃ ⁻ D-00
39.	Nitrate-nitrite (as N), mg/L	1. Cadmium reduction, Manual or Automated 2. Automated hydrazine 3. Ion Chromatography 4. CIE/UV	EPA 353.3 ¹ SM 4500-NO ₃ ⁻ E [18 th , 19 th , 20 th] ASTM D3867-99 (B) EPA 353.2 ¹ SM 4500-NO ₃ ⁻ F [18 th , 19 th , 20 th] ASTM D3867-99 (A) USGS I-4545-85 ² EPA 353.1 ¹ SM 4500-NO ₃ ⁻ H [18 th , 19 th , 20 th]	SM 4500-NO ₃ ⁻ E [18 th , 19 th , 20 th] SM Online 4500-NO ₃ ⁻ E-00 ASTM D3867-99 (B) EPA 353.2, Rev. 2.0 (1993) ⁷ SM 4500-NO ₃ ⁻ F [18 th , 19 th , 20 th] SM Online 4500-NO ₃ ⁻ F-00 ASTM D3867-99 (A) USGS I-4545-85 ² SM 4500-NO ₃ ⁻ H [18 th , 19 th , 20 th] SM Online 4500-NO ₃ ⁻ H-00 EPA 300.0, Rev. 2.1 (1993) ⁷ EPA 300.1, Rev. 1.0 (1997) ⁷ SM 4110 B [18 th , 19 th , 20 th] SM Online 4110 B-00 ASTM D4327-97 AOAC 993.30 ⁴ Footnote 22.

Number ²⁷	Parameter	Methodology ²⁶	Currently Approved at 40 CFR 136	Approved under MUR
40.	Nitrite (as N), mg/L	1. Spectrophotometric, Manual or Automated (Diazotization) 2. Automated (bypass cadmium reduction) 3. Manual (bypass cadmium reduction) 4. Ion Chromatography 5. CIE/UV	EPA 354.1 ¹ SM 4500-NO ₂ ⁻ B [18 th , 19 th , 20 th] Footnote 23. USGS I-4540-85 ²	SM 4500-NO ₂ ⁻ B [18 th , 19 th , 20 th] SM Online 4500-NO ₂ ⁻ B-00 Footnote 23. USGS I-4540-85 ² EPA 353.2, Rev. 2.0 (1993) ⁷ SM 4500-NO ₃ ⁻ F [18 th , 19 th , 20 th] SM Online 4500-NO ₃ ⁻ F-00 ASTM D3867-99 (A) USGS I-4545-85 ² SM 4500-NO ₃ ⁻ E [18 th , 19 th , 20 th] SM Online 4500-NO ₃ ⁻ E-00 ASTM D3867-99 (B) EPA 300.0, Rev. 2.1 (1993) ⁷ EPA 300.1, Rev. 1.0 (1997) ⁷ SM 4110 B [18 th , 19 th , 20 th] SM Online 4110 B-00 ASTM D4327-97, 03 AOAC 993.30 ⁴ Footnote 22.
43.	Organic Nitrogen (as N), mg/L	Total Kjeldahl N (Parameter 31) minus Ammonia N (Parameter 4)		
44.	Orthophosphate (as P), mg/L (Continued next page)	1. Ascorbic Acid method: Automated Manual single reagent Manual two reagent	EPA 365.1 ¹ SM 4500-P F [18 th , 19 th , 20 th] USGS I-4601-85 ² AOAC 973.56 ³ EPA 365.2 ¹ SM 4500-P E [18 th , 19 th , 20 th] ASTM D515-88 (A) AOAC 973.55 ³ EPA 365.3 ¹	EPA 365.1, Rev. 2.0 (1993) ⁷ SM 4500-P F [18 th , 19 th , 20 th] USGS I-4601-85 ² AOAC 973.56 ⁴ SM 4500-P E [18 th , 19 th , 20 th] ASTM D515-88 (A) AOAC 973.55 ⁴ EPA 365.3 (Issued 1978) ¹

Number ²⁷	Parameter	Methodology ²⁶	Currently Approved at 40 CFR 136	Approved under MUR
44. (con't)	Orthophosphate (as P), mg/L (con't)	2. Ion Chromatography 3. CIE/UV		EPA 300.0, Rev. 2.1 (1993) ⁷ EPA 300.1, Rev. 1.0 (1997) ⁷ SM 4110 B [18 th , 19 th , 20 th] SM Online 4110 B-00 ASTM D4327-97, 03 AOAC 993.30 ⁴ Footnote 22.
46.	Oxygen, dissolved, mg/L	1. Winkler (Azide modification) 2. Electrode	EPA 360.2 ¹ SM 4500-O C [18 th , 19 th , 20 th] ASTM D888-92 (A) USGS I-1575-78 ⁹ AOAC 973.45B ³ EPA 360.1 ¹ SM 4500-O G [18 th , 19 th , 20 th] ASTM D888-92 (B) USGS I-1576-78 ⁹	SM 4500-O C [18 th , 19 th , 20 th] SM Online 4500-O C-01 ASTM D888-92, 03 (A) USGS I-1575-78 ⁹ AOAC 973.45B ⁴ SM 4500-O G [18 th , 19 th , 20 th] SM Online 4500-O G-01 ASTM D888-92, 03 (B) USGS I-1576-78 ⁹
50.	Phosphorus – Total, mg/L	1. Persulfate digestion followed by: Manual or Automated ascorbic acid reduction 2. Semi-automated block digester	EPA 365.2 ¹ SM 4500-P B.5 [18 th , 19 th , 20 th] AOAC 973.55 ³ EPA 365.2 ¹ EPA 365.3 ¹ SM 4500-P E [18 th , 19 th , 20 th] ASTM D515-88 (A) EPA 365.1 ¹ SM 4500-P F [18 th , 19 th , 20 th] USGS I-4600-85 ² AOAC 973.56 ³ EPA 365.4 ¹ ASTM D515-88 (B) USGS I-4610-91 ²⁴	SM 4500-P B.5 [18 th , 19 th , 20 th] ²⁰ AOAC 973.55 ^{4,20} EPA 365.3 (Issued 1978) ¹ SM 4500-P E [18 th , 19 th , 20 th] ASTM D515-88 (A) EPA 365.1, Rev. 2.0 (1993) ⁷ SM 4500-P F [18 th , 19 th , 20 th] USGS I-4600-85 ² AOAC 973.56 ⁴ EPA 365.4 (Issued 1974) ¹ ASTM D515-88 (B) USGS I-4610-91 ²⁴

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53.	Residue – Total, mg/L	Gravimetric, 103-105 ⁰	EPA 160.3 ¹ SM 2540 B [18 th , 19 th , 20 th] USGS I-3750-85 ²	SM 2540 B [18 th , 19 th , 20 th] SM Online 2540 B-97 USGS I-3750-85 ²
54.	Residue – filterable, mg/L	Gravimetric, 180 ⁰	EPA 160.1 ¹ SM 2540 C [18 th , 19 th , 20 th] USGS I-1750-85 ²	SM 2540 C [18 th , 19 th , 20 th] SM Online 2540 C-97 USGS I-1750-85 ²
55.	Residue – nonfilterable (TSS), mg/L	Gravimetric, 103-105 ⁰ post washing of residue	EPA 160.2 ¹ SM 2540 D [18 th , 19 th , 20 th] USGS I-3765-85 ²	SM 2540 D [18 th , 19 th , 20 th] SM Online 2540 D-97 USGS 3765-85 ²
56.	Residue – settleable, mg/L	Volumetric (Imhoff cone), or Gravimetric	EPA 160.5 ¹ SM 2540 F [18 th , 19 th , 20 th]	SM 2540 F [18 th , 19 th , 20 th] SM Online 2540 F-97
57.	Residue – Volatile, mg/L	Gravimetric, 550 ⁰	EPA 160.4 ¹ USGS I-3753-85 ²	EPA 160.4 ¹ USGS I-3753-85 ²
64.	Specific Conductance, micromhos/cm at 25°C	Wheatstone bridge	EPA 120.1 ¹ SM 2510 B [18 th , 19 th , 20 th] ASTM D1125-95 (A) USGS I-2781-85 ² AOAC 973.40 ³	EPA 120.1 (Rev. 1982) ¹ SM 2510 B [18 th , 19 th , 20 th] SM Online 2510 B-97 ASTM D1125-95 (99) (A) USGS I-2781-85 ² AOAC 973.40 ⁴
69.	Temperature, °C	Thermometric	EPA 170.1 ¹ SM 2550 B [18 th , 19 th , 20 th] Footnote 25.	SM 2550 B [18 th , 19 th , 20 th] SM Online 2550 B-00 Footnote 25.
73.	Turbidity, NTU ²⁸	Nephelometric	EPA 180.1 ¹ SM 2130 B [18 th , 19 th , 20 th] ASTM D1889-94 (A) USGS I-3860-85 ²	EPA 180.1, Rev. 2.0 (1993) ⁷ SM 2130 B [18 th , 19 th , 20 th] SM Online 2130 B-01 ASTM D1889-94, 00 USGS I-3860-85 ²

1. “Methods for Chemical Analysis of Water and Wastes”, Environmental Protection Agency, Environmental Monitoring Systems Laboratory – Cincinnati (EMSL-CI), EPA-600/4-79-020, (NTIS PB 84-128677), Revised March 1983 and 1979, where applicable.
2. Fishman, M.J., *et al.* “Methods for Analysis of Inorganic Substances in Water and Fluvial Sediments”, U.S. Department of the Interior, Techniques of Water-Resource Investigations of the U.S. Geological Survey, Denver, CO, Revised 1989, unless otherwise stated.
3. “Official Methods of Analysis of the Association of Official Analytical Chemists”, methods manual, 15th ed. (1990).
4. “Official Methods of Analysis of the Association of Official Analytical Chemists”, methods manual, 16th ed., 4th Revision 1998.
5. Manual distillation is not required if comparability data on representative effluent samples are on file to show that this preliminary distillation is not necessary; however, manual distillation will be required to resolve any controversies.
6. Ammonia, Automated Electrode Method, Industrial Method Number 379-75 WE, dated February 19, 1976, Bran & Luebbe (Technicon) Auto Analyzer II, Bran & Luebbe Analyzing Technologies, Inc. Elmsford, NY 10523.
7. All EPA methods, excluding EPA Method 300.1, are published in “Methods for the Determination of Metals in Environmental Samples”, Supplement I, National Exposure Risk Laboratory-Cincinnati (NERL-CI), EPA/600/R-94/111, May 1994; and “Methods for the Determination of Inorganic

Substances in Environmental Samples”, NERL-CI, EPA/600/R-93/100, August 1993. EPA Method 300.1 is available from <http://www.epa.gov/safewater/methods/pdfs/met300.pdf>.

8. The use of EDTA may decrease method sensitivity in some samples. Analysts may omit EDTA provided that all method specified quality control acceptance criteria are met.
9. The approved method is that cited in “Methods for Determination of Inorganic Substances in Water and Fluvial Sediments”, USGS TWRI, Book 5, Chapter A1 (1979).
10. American National Standard on Photographic Processing Effluents, April 2, 1975. Available from ANSI, 25 West 43rd Street, New York, NY 10036.
11. Carbonaceous biochemical oxygen demand (CBOD₅) must not be confused with the traditional BOD₅ test method, which measures “total BOD”. The addition of the nitrification inhibitor is not a procedural option, but must be included to report the CBOD₅ parameter. A discharger whose permit requires reporting the traditional BOD₅ may not use a nitrification inhibitor in the procedure for reporting the results. Only when a discharger’s permit specifically states CBOD₅ is required can the permittee report data using a nitrification inhibitor.
12. Hydrogen ion (pH) Automated Electrode Method, Industrial Method Number 378-75WA, October 1976, Bran & Luebbe (Technicon) Autoanalyzer II, Bran & Luebbe Analyzing Technologies, Inc., Elmsford, NY 10523.
13. The back titration method will be used to resolve controversy.
14. Orion Research Instruction Manual, Residual Chlorine Electrode Model 97-70, 1977, Orion Research Incorporated, 840 Memorial Drive, Cambridge, MA 02138. The calibration graph for the Orion residual chlorine method must be derived using a reagent blank and three standard solutions containing 0.2, 1.0 and 5.0 mL 0.00281 N potassium iodate/100 mL solution, respectively.
15. “Methods of Analysis by the U.S. Geological Survey National Water Quality Laboratory – Determination of Ammonia Plus Organic Nitrogen by a Kjeldahl Digestion Method”, Open File Report (OFR) 00-170.
16. Nitrogen, Total Kjeldahl, Method PAI-DK01 (Block Digestion, Steam Distillation, Titrimetric Detection), revised 12/22/94, OI Analytical/ALPKEM, PO Box 9010, College Station, TX 77842.
17. Nitrogen, Total Kjeldahl, Method PAI-DK02 (Block Digestion, Steam Distillation, Colorimetric Detection), revised 12/22/94, OI Analytical/ALPKEM, PO Box 9010, College Station, TX 77842.
18. Nitrogen, Total Kjeldahl, Method PAI-DK03 (Block Digestion, Automated FIA Gas Diffusion), revised 12/22/94, OI Analytical/ALPKEM, PO Box 9010, College Station, TX 77842.
19. Copper sulfate may be used in place of mercuric sulfate.
20. When using a method with block digestion, this treatment is not required.
21. The approved method is that cited in *Standard Methods for the Examination of Water and Wastewater*, 14th edition, 1976.
22. Method D6508, Rev. 2, “Test Method for Determination of Dissolved Inorganic Anions in Aqueous Matrices Using Capillary Ion Electrophoresis and Chromate Electrolyte”, Available from Waters Corp., 34 Maple Street, Milford, MA 01757, Telephone: (508) 482-2131, Fax: (508) 482-3625.
23. Nitrogen, Nitrite, Method 8507, Hach Chemical Company, PO Box 389, Loveland, CO 80537.
24. “Methods of Analysis by the U.S. Geological Survey National Water Quality Laboratory – Determination of Total Phosphorus by Kjeldahl Digestion Method and an Automated Colorimetric Finish That Includes Dialysis”, Open File Report (OFR) 92-146.
25. Stevens, H.H., Ficke, J.F., and Smoot, G.F., “Water Temperature – Influential Factors, Field Measurement and Data Presentation”, Techniques of Water-Resources Investigations of the U.S. Geological Survey, Book 1, Chapter D1, 1975.
26. Unless otherwise stated, if the language of this table specifies a sample digestion and/or distillation “followed by” analysis with a method, approved digestion and/or distillation are required prior to analysis.
27. The numbers in this column coincide with the number designations given in 40 CFR 136, Table 1B.
28. Styrene divinyl benzene beads (e.g. AMCO-AEPA-1 or equivalent) and stabilized formazin (e.g. HACH StablCal™ or equivalent) are acceptable substitutes for formazin.