

ANEXO I

METODOLOGIAS DE ANALISIS

PARTE A: AGUAS SUPERFICIALES CONTINENTALES

1. Metodologías descritas en : “Standard Methods” for Examination of Water and Wastewater. 20th edition 1998. Edited by Lenore S. Clesceri et al. APHA-AWWA-WPCF.

Compuesto o elemento	Metodología
Aceites y Grasas	5520 B Partition- Gravimetric Method 5520 C. Partición-infrared Method 5520 D. Soxhlet Extracción Method
Aldicarb	6610B High-performance liquid cromatographic methods
Aluminio	3500-Al B. Eriochrome Cyanine R Method 3111 D. Direct Nitrous Oxide-Acetylene Flame Method (AA) 3111 E Extraction/Nitrous Oxide-Acetylene Flame Method
Amonio	4500-NH ₃ F. Phenate Method
Arsénico	3500-As B. Silver Diethyldithiocarbamate Method 3114 B. Manual Hydride Generation/Atomic Absorption Spectrometric Method (AA) 3114 B - C Manual/Continuous Hydride Generation/Atomic Absorption Spectrometric Method
Bifenilos policlorados (PCBs)	6431 B. Liquid-líquid Extracción Gas Chromatographic Method. 6431C Liquid-líquid Extracción Gas Chromatographic/Mass Spectrometric Method.
Boro	4500-B B. Curcumin Method 4500-B C. Carmine Method
Cadmio	3500-Cd B. Atomic Absorption Spectrometric Method Voltimetría de redisolución anódica monitoreada por onda cuadrada 3500- Cd C. Inductively Couple Plasma and Inductively Couple Plasma/Mass Spectrometry ICP/MS. 3500-Cd D. Dithizone Method 3111 B. Direct Air-Acetylene Flame Method (AA)
Calcio	3111 B. Direct Air-Acetylene Flame Method
Carbofurano	6610B High-performance liquid cromatographic methods
Cianuro	4500 CN ⁻ E. Colorimetric Method
Clordano	6630B. Liquid-Liquid Extraction Gas Chromatographic Method I 6630 C. Liquid-Liquid Extraction Gas Chromatographic Method II
Clorofila a	10200 H Chrolophyll
Cloruro	4500-Cl B. Argentometric Method 4110 Determination of Anions by Ion Chromatography
Cobre	3500-Cu B. Neocuproine Method 3500-Cu C. Bathocuproine Method 3111 B. Direct Air-Acetylene Flame Method (AA)
Color aparente	2120 B. Visual Comparison Method
Coliformes fecales	9221 Membrane fliter Technique for Members of the Coliform Goup.
Coliformes totales	9221 Membrane fliter Technique for Members of the Coliform Goup.

Conductividad Eléctrica	2510 B Laboratory Method
Cromo Total	3500-Cr B. Colorimetric Method 3111 B. Direct Air-Acetylene Flame Method (AA) 3111 C Extraction/air –Acetylene Flame Method
Cromo VI	3500-Cr C. Ion Chromatographic Method 3111 C Extraction/air –Acetylene Flame Method
DBO5	5210 B. 5-Day Test
DDT	6630 B. Liquid-Liquid Extraction Gas Chromatographic Method I 6630 C. Liquid-Liquid Extraction Gas Chromatographic Method II
Detergentes (SAAM)	5540 B. Surfactant Separation by Sublation
Diclorometano (cloruro de metileno)	6200 B Purge and Trap Capillary-Column Gas Chromatographic/Mass Spectrometric Method. 6200 C Purge and Trap Capillary-Column Gas Chromatographic Method.
Dureza	2340 B. Hardness by calculation 2340 C. EDTA Titrimetric Method
Estaño	3111B. Direct Air-Acetylene Flame Method 3113B. Electrothermal Atomic Absorption Spectrometric Method
Fluoruro	4500-F C. Ion-Selective Electrode Method
Fósforo	4500-P E. Ascorbic Acid Method 4110 Determination of Anions by Ion Chromatography
Acido 2,4 diclorofenoxiacético (2,4-D)	6640 B Micro Liquid-liquid Extration Gas Chromatographic Method.
Hidrocarburos	5520 F. Hydrocarbons
Hidrocarburos Aromáticos Policíclicos	6440 B Liquid-Liquid Extraction Chromatographic Method 6440 C. Liquid-Liquid Extraction Gas Chromatographic/Mass Spectrometric Method
Hierro	3111 B. Direct Air-Acetylene Flame Method (AA) 3500 Fe-B Phenantholine Method 3120 B. Inductively Couple Plasma (ICP) Method
Indice de fenol (fenoles)	6420 B. Liquid-Liquid Extraction Gas Chromatographic Method 5530 C Chloroform Extraction Methods
Magnesio	3111 B. Direct Air-Acetylene Flame Method
Manganeso	3111 B. Direct Air-Acetylene Flame Method
Mercurio	3114 B. Manual Hydride Generation/Atomic Absorption Spectrometric Method 3112 B. Cold-Vapor Atomic Absorption Spectrometric Method. 3125 B. Inductively Coupled Plasma/Mass Spectrometry (ICP/MS) Method 3500 Hg B Cold-Vapor Atomic Absorption Spectrometric Method 3500 Hg C Dithizone Method
Molibdeno	3111 D. Direct Nitrous Oxide-Acetylene Flame Method (AA) 3120 B. Inductively Couple Plasma (ICP) Method 3125 B. Inductively Couple Plasma/Mass Spectrometry (ICP/MS) Method
Níquel	3111B. Direct Air-Acetylene Flame Method 3111C. Extraction/air-acetylene Flame Method 3113B. Electrothermal Atomic Absorption Spectrometric Method. 3120 B. Inductively Couple Plasma (ICP) Method 3125 B. Inductively Couple Plasma/Mass Spectrometry (ICP/MS) Method
Nitrógeno orgánico	4500-N C. Persulfate Method
Nitrógeno Kjeldahl	4500-NH ₃ F. Phenate Method
Nitrato	4110 B. Ion Chromatography with Chemical Suppresion of Eluent

	Conductivity. 4110 C. Single-Column Ion Chromatography with Electronic Suppression of Eluent Conductivity and Conductimetric Detection.
Nitrito	4110 B. Ion Chromatography with Chemical Suppression of Eluent Conductivity. 4110 C. Single-Column Ion Chromatography with Electronic Suppression of Eluent Conductivity and Conductimetric Detection.
Oxígeno disuelto	4500-O G. Membrane Electrode Method
Pentaclorofenol	6420 B. Liquid-Liquid Extraction Gas Chromatographic Method 6640 B. Micro Liquid-Liquid Extraction Gas Chromatographic Method
Pesticidas organoclorados (Aldrín, Lindano, Heptaclor, Dieldrín, Captán, DDT, Clordano, Paratión, Trifluralina)	6630 B. Liquid-liquid Extraction Gas Chromatographic Method I 6630 C. Liquid-liquid Extraction Gas Chromatographic Method II 6630 D. Liquid-liquid Extraction Gas Chromatographic/Mass Spectrometric Method
pH	4500-H ⁺ B. Electrometric Method
Plomo	3111 B. Direct Air-Acetylene Flame Method (AA) 3113 B Electrothermal Atomic Absorption Spectrometric Method 3125 B. Inductively Couple Plasma/Mass Spectrometry (ICP/MS) Method
Productividad primaria	10300 D. Primary Productivity
Selenio	3114 B. Manual Hydride Generation/Atomic Absorption Spectrometric Method 3114 C. Continuous Hydride generation/Atomic Absorption Spectrometric Method 3113 B. Electrothermal Atomic Absorption Spectrometric Method
Sodio	3111 B. Direct Air-Acetylene Flame Method (AA) 3500-Na B. Flame Emission Photometric Method 3120 B. Inductively Couple Plasma (ICP) Method 3125 B. Inductively couple Plasma/Mass spectrometry (ICP/MS) Method
Sólidos disueltos	2540 C Total dissolved Solids dried at 180°C.
Sólidos suspendidos	2540 D. Total Suspended Solids Dried at 103-105°C
Sulfato	4500-SO ₄ ²⁻ Turbidimetric Method 4110 Determination of Anions by Ion Chromatography
Sulfuro	4500-S ²⁻ D. Methylene Blue Method 4500-S ²⁻ F. Iodometric Method 4500-S ²⁻ G. Ion Selective Electrode Method
Temperatura	2250 B Laboratory and Field Method
Tetracloroetano	6200 B. Purge and Trap Capillary-Column Gas Chromatographic/Mass Spectrometric Method 6232 B. Liquid-Liquid Extraction Gas Chromatographic Method
Tetracloruro de carbono	6200 B Purge and Trap Capillary-Column Gas Chromatographic/Mass Spectrometric Method. 6200 C Purge and Trap Capillary-Column Gas Chromatographic Method.
Tolueno	6200 B Purge and Trap Capillary-Column Gas Chromatographic/Mass Spectrometric Method. 6200 C Purge and Trap Capillary-Column Gas Chromatographic Method with PID only.
Zinc	3111B. Direct Air-Acetylene Flame Method 3111C. Extraction/air-acetylene Flame Method 3120 B. Inductively Couple Plasma (ICP) Method 3125 B. Inductively Couple Plasma/Mass Spectrometry (ICP/MS) Method

2. Metodologías descritas en: Methods for the Determination of Organics Compounds in Drinking Water. US Environmental Protection Agency EPA/600/4-88/039.

Compuesto o elemento	Metodología
Aldicarb [CAS 116-06-3]	Method 531.1 (3ª revisión, 1989) Measurement of N-methylcarbamoyloximes and N-methylcarbamates in water by direct aqueous injection HPLC with post column derivatization.
Atrazina [CAS 1912-24-9]	Method 507 (2ª revisión, 1989) Determination of nitrogen- and phosphorus-methylcarbamoyloximes and N-methylcarbamates in water by direct aqueous injection HPLC with post column derivatization.
Carbofurano [CAS 1563-66-2]	Method 531.1 (3ª revisión, 1989) Measurement of N-methylcarbamoyloximes and N-methylcarbamates in water by direct aqueous injection HPLC with post column derivatization.
Clorotalonil [CAS 2921-88-2]	Method 508 (3ª revisión, 1989) Determination of chlorinated pesticides in water by gas chromatography with an electron capture detector.
Cyanazina	[Method 507 (2ª revisión, 1989)] [Determination of nitrogen- and phosphorus-methylcarbamoyloximes and N-methylcarbamates in water by direct aqueous injection HPLC with post column derivatization]
Simazina [CAS 122-34-9]	Method 507 (2ª revisión, 1989) Determination of nitrogen- and phosphorus-methylcarbamoyloximes and N-methylcarbamates in water by direct aqueous injection HPLC with post column derivatization.

3. Metodologías descritas en: The Pesticide Manual. British Crop protection council. 11º Edition.

Compuesto o elemento	Metodología
Demeton	Hydrolysis alkaline determining the acid release. CIPAC Handbook 1970.1,312
Diclofop-metil	GLC analysis. CIPAC Handbook, 1985,1c, 2096
Dimetoato	GLC analysis CIPAC Handbook , 1992, e, 69-72
N-dealkil metabolitos de atrazina	ECD or FID analysis B.G.Tweedy R.A. Kahrs, 1978, 10, 493

4. Metodologías descritas en : "Limnological Analyses". Second Edition. Robert Wetzel. Ed. Springer-Verlag. New York, Berlin, Heidelberg, London, Paris, Tokyo, Hong Kong, Barcelona. 1991.

Compuesto o elemento	Metodología
Transparencia	Disco Secchi

5. Otras Metodologías descritas en US Environmental Protection Agency. USEPA

Compuesto o elemento	Metodología
Mercurio	Method 1631 Mercury in Water by, Oxidation, purge and Trap, and Cold Vapor Atomic Fluorescence Spectrometry (CVAFS)
Elementos traza	Method 1638. Trace Elements in Ambient Waters by Inductively Coupled Plasma-Mass Spectrometry. (ICPMS)

Metales traza	Method 1669. Sampling Ambient Water for Trace Metals.
Metales traza	Trace Metal Cleanroom. EPA 600/R/96/018
Amoniaco	Method 350.1. Determination of ammonia nitrogen by semiautomater colorimetry. Revisión 2.0 August 1993
Calcio	Method 200.7 Determination of metals and trace elements in water asn wastes by inductively couple plasma atomic emission spectrometry. Revision 4.4 1994

PARTE B. AGUAS MARINAS

1. Metodologías descritas en: "Standard Methods for Examination of Water and Wastewater". 20th Edition 1998. Edited by Lenore S. Clesceri et al. APHA-AWWA-WPCF.

Contaminante	Metodología
Aceites y grasas emulsificadas	5520 B Partition- Gravimetric Method 5520 C. Partition-infrared Method 5520 D. Soxhlet Extraction Method
Aluminio	3500-AI B. Eriochrome Cyanine R Method 3500 – AI C. Inductively Couple Plasma and Inductively Couple Plasma/Mass Spectrometry ICP/MS. 3111 D Direct Nitrous Oxide-Acetylene Flame Method 3111 E Extraction/Nitrous Oxide-Acetylene Flame Method
Amonio	4500-NH ₃ F. Phenate Method
Arsénico	3500-As B. Silver Diethyldithiocarbamate Method 3500- As E. Inductively Couple Plasma/Mass Spectrometry ICP/MS. 3114 B - C Manual/Continuous Hydride Generation/Atomic Absorption Spectrometric Method
Cadmio	3500-Cd B. Atomic Absorption Spectrometric Method Voltametría de redisolución anódica monitoreada por onda cuadrada 3500- Cd C. Inductively Couple Plasma and Inductively Couple Plasma/Mass Spectrometry ICP/MS. 3500-Cd D. Dithizone Method
Cianuro	4500 CN ⁻ E. Colorimetric Method
Cloro libre residual	4500-CI B. Iodometric Method I 4500 –CI- C Mercuric Nitrate Method 4500 –CI- D Potentiometric Method 4500 –CI- E Automated Ferricyanide Method
Clorofila a	10200 H Chlorophyll
Cobre	3500-Cu B. Neocuproine Method 3500-Cu C. Bathocuproine Method Voltametría de redisolución anódica monitoreada por onda cuadrada 3500- Cu C.. Inductively Couple Plasma/Mass Spectrometry ICP/MS.
Coliformes fecales	9221 Multiple-tube Fermentation Technique for Members of the Coliform Group 9222 Membrane Filter Technique for Members of the Coliform Group.
Coliformes totales	9221 Multiple-tube Fermentation Technique for Members of the Coliform Group 9222 Membrane Filter Technique for Members of the Coliform Group. 9223 Enzyme Substrate Coliform Test

Cromo total	3500-Cr B. Colorimetric Method 3500-Cr C. Ion Chromatographic Method 3111 C Extraction/air –Acetylene Flame Method
Cromo VI	3113B. Electrothermal Atomic Absorption Spectrometric Method 3111 C Extraction/air –Acetylene Flame Method 3500 –Cr VI C. Inductively Couple Plasma and Inductively Couple Plasma/Mass Spectrometry ICP/MS.
Detergentes (SAAM)	5540 B. Surfactant Separation by Sublation
Estaño	3111B. Direct Air-Acetylene Flame Method 3113B. Electrothermal Atomic Absorption Spectrometric Method
Fenoles	6420 B. Liquid-Liquid Extraction Gas Chromatographic Method 5530 C Chloroform Extraction Methods
Fluoruro	4500-F ⁻ C. Ion-Selective Electrode Method
Fósforo - Ortofosfato disuelto	4500-P E. Ascorbic Acid Method 4500-P F. Automated Ascorbic Acid Reduction Method
Hidrocarburos aromáticos Policíclicos	6440 B. Liquid-Liquid Extraction Chromatographic Method
Hidrocarburos totales	5520 F. Hydrocarbons
Mercurio	3500-Hg B Cold-Vapor Atomic Absorption Spectrometric Method 3500 Hg C Dithizone Method 3112B. Cold-Vapor Atomic Absorption Spectrometric Method. 3125 B. Inductively Coupled Plasma/Mass Spectrometry (ICP/MS) Method
Níquel	3111B. Direct Air-Acetylene Flame Method 3111C. Extraction/air-acetylene Flame Method 3113B. Electrothermal Atomic Absorption Spectrometric Method 3120 B. Inductively Couple Plasma (ICP) Method 3125 B. Inductively Couple Plasma/Mass Spectrometry (ICP/MS) Method
Nitrógeno	4500 –N C. Persulfate Method 4500-NH ₃ F. Phenate Method 4110 B. Ion Chromatography with Chemical Suppression of Eluent Conductivity. 4110 C. Single-Column Ion Chromatography with Electronic Suppression of Eluent Conductivity and Conductimetric
Oxígeno disuelto	4500-O B Iodometric Methods Métodos de determinación en terreno
PCBs	6431 B. Liquid-Liquid Extraction Gas Chromatographic Method
Pentaclorofenol	6420 B. Liquid-Liquid Extraction Gas Chromatographic Method 6640 B. Micro Liquid-Liquid Extraction Gas Chromatographic Method
Pesticidas organoclorados: Aldrín, Lindano, Heptaclor, Dieldrín, DDT, Clordano, Paratión	6630B. Liquid-Liquid Extraction Gas Chromatographic Method I 6630 C. Liquid-Liquid Extraction Gas Chromatographic Method II 6630 D. Liquid-liquid Extraction Gas Chromatographic/Mass Spectrometric Method
pH	4500-H ⁺ B. Electrometric Methods
Plomo	3111 B. Direct Air-Acetylene Flame Method 3113 B Electrothermal Atomic Absorption Spectrometric Method 3120 C. Inductively Couple Plasma 3125 B. Inductively Couple Plasma/Mass Spectrometry (ICP/MS) Method Voltametría de redisolución anódica monitoreada por onda cuadrada
Selenio	3114 B. Manual Hydride Generation/Atomic Absorption Spectrometric Method 3114 C. Continuous Hydride generation/Atomic Absorption

	Spectrometric Method 3113 B. Electrothermal Atomic Absorption Spectrometric Method Voltametría de redisolución anódica monitoreada por onda cuadrada Inductively Couple Plasma and Inductively Couple Plasma/Mass Spectrometry (ICP/MS) Method
Sólidos Suspendidos	2540-D. Total Suspended Solids Dried at 103-105°C
Sulfuro	4500-S2- G. Ion Selective Electrode Method
Temperatura	2250 B Laboratory and Field Methods
Zinc	3111B. Direct Air-Acetylene Flame Method 3111C. Extraction/air-acetylene Flame Method 3120 B. Inductively Couple Plasma (ICP) Method 3125 B. Inductively Couple Plasma/Mass Spectrometry (ICP/MS) Method Voltametría de redisolución anódica monitoreada por onda cuadrada

2. Metodologías descritas en: The Pesticide Manual. British Crop Protection Council. 11th Edition:

Contaminante	Metodología
Demeton	Hydrolysis alkaline determining the acid release. CIPAC Handbook 1970.1,312

3. Metodologías descritas en Normas Chilenas Oficiales

4. Metodologías descritas en “Métodos Normalizados para el Análisis de Aguas Potables y Residuales”. APHA-AWWA-WPCF. Ediciones Díaz de Santos 1992, Madrid (España). Título Original “Standard Methods for the Examination of Water and Wastewater”. 17th Edition, 1989.

5. Otras Metodologías descritas en US Environmental Protection Agency

Contaminante	Metodología
Malation	Method 1657 The Determination of organo-phosphorus pesticides in Municipal and industrial wastewater. Method 614 The Determination of organophosphorus pesticides in Municipal and industrial wastewater

6. Metodología descritas en “Recommended Procedures for the Examination of Sea Water and Shellfish”. The American Public Health Association, Inc. 4th Edition, 1970. Págs. 28 – 40. Las señaladas para la determinación de grupo coliforme total y coliforme fecal.

7. Metodologías descritas en “Methods of Seawater Analysis”, K. Grasshof, M. Ehrhardt, K. Kremling, 1983.