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Office of Water
Regulations and Standards
Washington, DC 20460

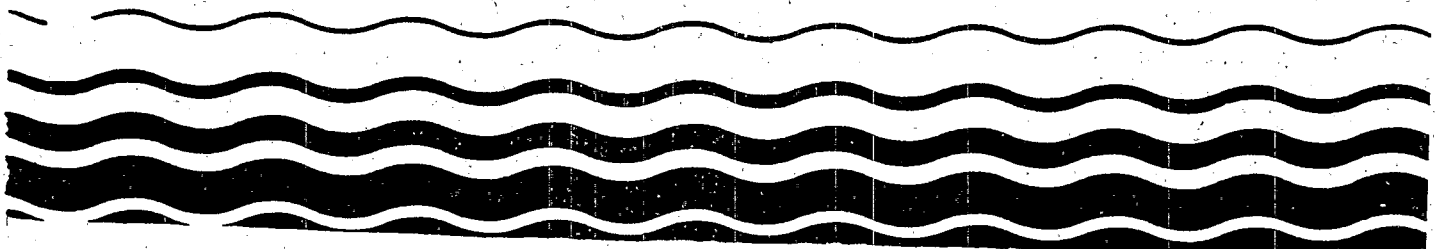
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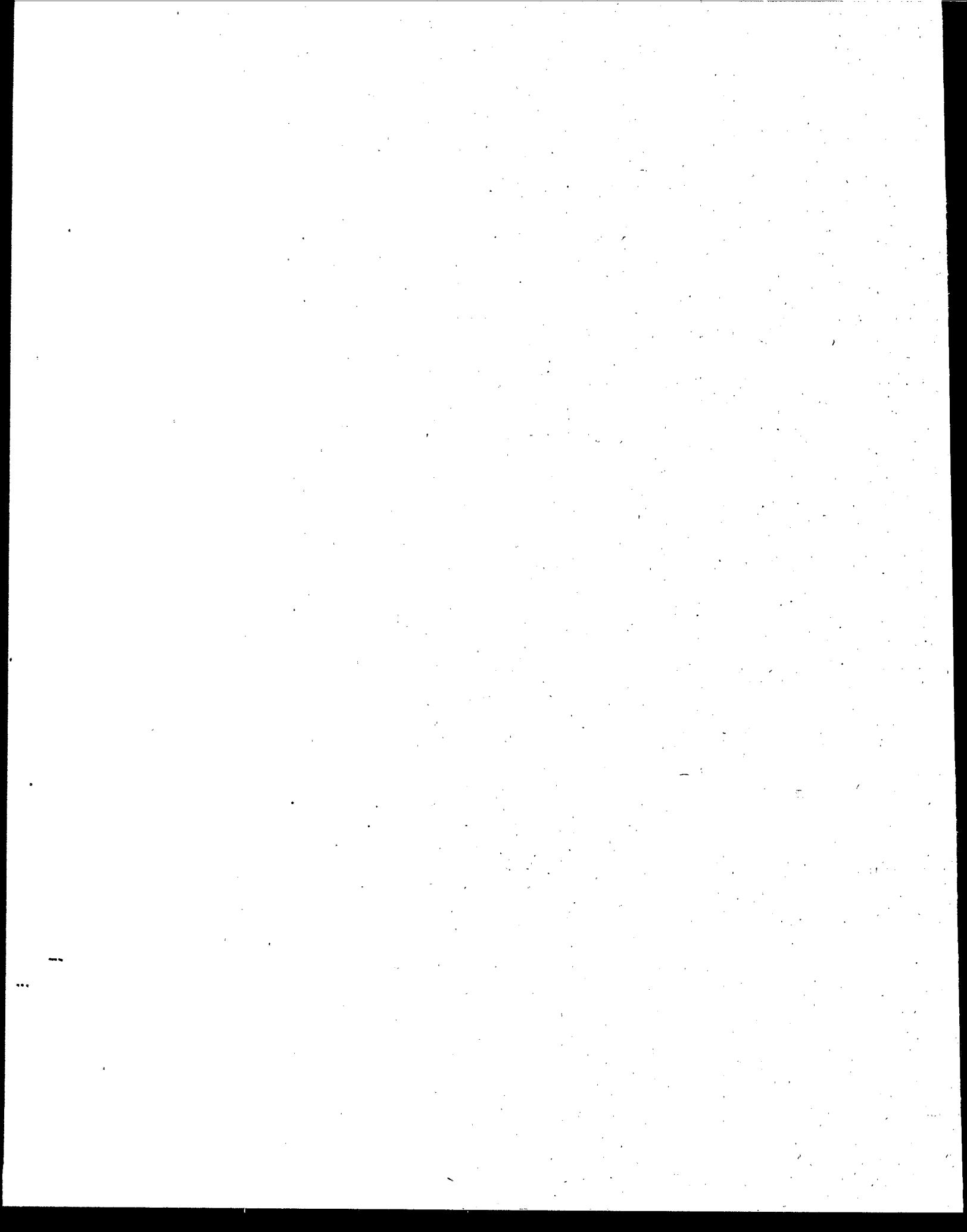


Water

Arsenic

Water Quality Standards Criteria Summaries: A Compilation of State/Federal Criteria





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The reader should consult the water quality standards of a particular State for exact regulatory language applicable to that State. Copies of State water quality standards may be obtained from the State's Water Pollution Control Agency or its equivalent.

Additional information may also be obtained from the:

Standards Branch
Criteria and Standards Division (WH-585)
Office of Water Regulations and Standards
U.S. Environmental Protection Agency
Washington, D.C. 20460
202-475-7315

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INTRODUCTION.

This digest is compiled to provide general information to the public as well as to Federal, State, and local officials. It contains excerpts from the individual Federal-State water quality standards establishing pollutant specific criteria for interstate surface waters. The water quality standards program is implemented by the U. S. Environmental Protection Agency where responsibility for providing water quality recommendations, approving State-adopted standards for interstate waters, evaluating adherence to the standards, and overseeing enforcement of standards compliance has been mandated by Congress.

Standards, a nationwide strategy for surface water quality management, contain three major elements: the use (recreation, drinking water, fish and wildlife propagation, industrial, or agricultural) to be made of the navigable water; criteria to protect these uses; and an antidegradation statement to protect existing high quality waters, from degradation by the addition of pollutants. Guidance for the development of standards by individual States is contained in two EPA documents entitled Water Quality Standards Handbook (1983) and Quality Criteria for Water (1986).

Arsenic is an element possessing both metallic and non-metallic properties. It exists in both trivalent and pentavalent states and compounds containing arsenic can be organic as well as inorganic. The trivalent inorganic species are the more toxic forms of arsenic, though most forms are toxic to some degree in mammals as well as aquatic life.

Arsenic has been found in unpolluted waters. However, it is present in most waters because of its use in a wide range of industries including herbicides, paint pigments, copper and lead alloys, glass and electrical semiconductors.

The 1986 Quality Criteria for Water recommends the following:

Freshwater Aquatic Organisms and Their Uses:

	Arsenic(III)
acute	360 ug/l
chronic	190 ug/l

Saltwater Aquatic Organisms and Their Uses:

acute	69 ug/l
chronic	36 ug/l

Human Health:

2.2 ng/l water and fish ingestion
17.5 ng/l fish consumption only
(calculated according to certain risk level)

Since water quality standards are revised from time to time, following procedures set forth in the Clean Water Act, individual entries in this digest may be superseded. This digest will be updated periodically. Because this

publication is intended for use only as a general information reference, the reader needs to refer to the current approved water quality standards to obtain the latest information for special purposes and applications. These can be obtained from the State water pollution control agencies or the EPA Regional Offices.

REFERENCES

- 5 California Water Quality Standards by River Basins, ca. 1975
For more detailed information on selected basins, sub-basins and stretches of streams and coastal areas refer to California State Water Quality Standards.
- 12 Idaho Department of Health and Welfare Rules and Regulations, Title 1, Chapter 2, "Water Quality Standards and Wastewater Treatment Requirements", 1980.
- 25 Missouri Water Quality Standards, 10 CSR 20-7.031, Rule of Department of Natural Resources: Division 20 - Clean Water Commission.
- 31 Water Quality Standards for Interstate and Intrastate Streams in New Mexico, State of New Mexico Water Quality Control Commission, 1988.
- 35 Ohio Water Quality Standards, Chapter 3745-1 of the Administrative Code, Ohio Environmental Protection Agency, 1985.
- 42 Tennessee's Water Quality Criteria and Stream Use Classifications for Interstate and Intrastate Streams, Tennessee Water Quality Control Board: Department of Health and Environment, 1987.
- 43 Texas Surface Water Quality Standards, Texas Water Commission, Rule Change, 1988.
- 44 Utah Standards of Quality for Waters of the State, Wastewater Disposal Regulations: Part II, State of Utah Department of Health: Division of Environmental Health, 1988.
- 46 Virginia Water Quality Standards, State Water Control Board, 1987.
- 48 Water Quality Standards, West Virginia Legislative Rules, State Water Resources Board, 1985.
- 51 Water Quality Standards for American Samoa, 1984, pp. 16-18.
- 52 Water Quality Standards of the District of Columbia, Chapter 42, Department of Consumer and Regulatory Affairs, 1985, Section 4206.1.
- 53 Revised Guam Water Quality Standards, Guam Environmental Protection Agency, 1984, pp. 7, 12-13.
- 54 Commonwealth of Northern Mariana Islands Marine and Fresh Water Quality Standards, Commonwealth Register, Vol. 8 No. 5, 1986, pp. 4464-4468.
- 55 Puerto Rico Water Quality Standards Regulation. Environmental Quality Board, 1983.
- 56 Marine and Fresh Water Quality Standard Regulations, Trust Territory, 1986, pp. 5, 8-10.

- 57 Water Quality Standards for Coastal Waters of the Virgin Islands, Title 12, Chapter 7, Subchapter 186, 1985, p. 263.

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- 2 Pages 706:1005-1009, November 7, 1986
- 3 Pages 711:1002-1003, 1016-1021, February 7, 1986
- 4 Pages 716:1004-1005, August 30, 1985
- 6 Pages 726:1005-1006, March 22, 1985, 726:1011, August 22, 1986
- 7 Pages 731:1002, 1006-1007, May 14, 1982
- 8 Pages 736:1001, 1006-1010, March 28, 1986
- 9 Pages 746:1010.1-1010.2, September 5, 1986
- 10 Pages 751:0504-0505, December 27, 1985
- 11 Page 756:1002, September 20, 1985
- 13 Pages 766:0505-0506, 0514, March 28, 1986, 766:0507-0508, May 25, 1984
- 14 Pages 771:1002, 1013-1017, January 10, 1986, 771:1003-1006, August 10, 1984, 771:1007-1009, December 26, 1980
- 15 Pages 776:1005-1006, February 13, 1987
- 16 Pages 781:1011-1012, March 27, 1987
- 17 Pages 786:1007-1009, November 29, 1985
- 18 Pages 791:1005-1006, January 18, 1985
- 19 Pages 796:0104-0109, 0127-0128, April 18, 1986
- 20 Page 801:1002, April 19, 1985
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- 22 Pages 811:1003-1004, February 13, 1987
- 23 Pages 816:1003-1006, 1009-1010, June 25, 1982
- 24 Pages 821:1002-1003, October 25, 1985

- 26 Pages 831:1004-1009, April 19, 1985
- 27 Pages 836:1003-1006, March 27, 1987
- 28 Pages 841:1001, 1011, 1013, 1087, February 22, 1985, 841:1005, 1008, 1025, 1065, June 29, 1984
- 29 Pages 846:1002-1004, 1008-1009, October 5, 1984
- 30 Pages 851:1004, 1009-1010, 1017-1018, 1021, April 11, 1986
- 32 Pages 861:1007-1015, 1032-1035, November 29, 1985
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- 40 Pages 906:1004, 1006-1009, November 29, 1985
- 41 Pages 911:1003-1005, March 22, 1985
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- 49 Page 951:1002, March 13, 1987
- 50 Page 956:1005, July 5, 1985
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State and Water Use

Arsenic Criteria Values

Alabama¹

All

Not specified

All

Minimum conditions narrative: State waters shall be free from substances attributable to sewage, industrial wastes or other wastes in concentrations or combinations which are toxic or harmful to human, animal or aquatic life to the extent commensurate with the designated usage of such waters.

Public Water Supply

Toxic substances narrative: Only such amounts, whether alone or in combination with other substances as will not render the waters unsafe or unsuitable as a source of water supply for drinking or food-processing purposes, or injurious to fish, wildlife and aquatic life, or adversely affect the aesthetic value of waters for any use under this classification.

Swimming and Other
Whole Body Water-
Sports

Toxic substances narrative: Only such amounts, whether alone or in combination with other substances or wastes, as will not render the water unsafe or unsuitable for swimming and water-contact sports; be injurious to fish, wildlife and aquatic life or, where applicable, shrimp and crabs; impair the palatability of fish, or where applicable, shrimp and crabs; impair the waters for any other usage established for this classification or unreasonably affect the aesthetic value of waters for any use under this classification.

Shellfish Harvesting

Toxic substances narrative: Only such amounts, whether alone or in combination with other substances, as will not be injurious to fish and aquatic life, including shrimp and crabs; affect the marketability of fish and shellfish, including shrimp and crabs; exceed one-tenth of the 96-hour median tolerance limit for fish, aquatic life or shellfish, including shrimp and crabs.

Fish and Wildlife

Toxic substances narrative: Only such amounts, whether alone or in combination with other substances, as will not be injurious to fish and aquatic life, including shrimp and crabs in estuarine or salt waters or the propagation thereof; not to exceed one-tenth of the 96-hour median tolerance limit for fish and aquatic life, including shrimp and crabs in salt and estuarine waters, except that other limiting concentrations may be used when factually justified and approved by the Commission.

State and Water Use

Arsenic Criteria Values

Agricultural & Industrial
Toxic substances narrative: Only such amounts as will not render the waters unsuitable for agricultural irrigation, livestock watering, industrial cooling, industrial process water supply purposes, and fish survival, nor interfere with downstream water uses.

Industrial Operations
Toxic substances narrative: Only such amounts as will not render the waters unsuitable for industrial cooling and industrial process water supply purposes, nor interfere with downstream water uses.

Navigation
Toxic substances narrative: Only such amounts as will not render the waters unsuitable for agricultural irrigation, livestock watering, industrial cooling, and industrial process water supply purposes, where applicable, nor interfere with downstream water uses.

Alaska²

All

Not specified

I. Fresh Water

(A) Water Supply

(i) Drinking, Culinary & Food Processing.

Toxic substances narrative: Shall not exceed Alaska Drinking Water Standards or EPA Quality Criteria for Water.

(ii) Agricultural incl. Irrigation and Stock Watering

Toxic substances narrative: Same as I.(A)(i) where contact with a product destined for subsequent human consumption is present. Same as I. (C) or FWPCA Water Quality Criteria (WQC/FWPCA) as applicable to substances for stockwaters. Concentrations for irrigation waters shall not exceed (WQC/FWPCA) or WQC 1972.

(iii) Aquaculture

Toxic substances narrative: Shall not individually or in combination exceed 0.01 times the lowest measured 96-hour LC_{50} for life stages of species identified by the department as being the most sensitive, biologically important to the situation or exceed criteria cited in EPA Quality Criteria for Water or Alaska Drinking Water Standards whichever concentration is less. Substances shall not be present or exceed concentrations which individually or in combination impart undesirable odor or taste to fish or other aquatic organisms as determined by either bioassay or organoleptic tests.

State and Water Use

Arsenic Criteria Values

(iv) Industrial, Including Any Water Supplies Used in Association With a Manufacturing or Production Enterprise (other than Food Processing), Including Mining, Placer Mining, Energy Production or Development.

Toxic substances narrative: Substances shall not be present which pose hazards to worker contact.

(B) Water Recreation
(i) Contact Recreation.

Toxic substances narrative: Same as I.(A)(i).

(ii) Secondary Recreation

Toxic substances narrative: Substances shall not be present which pose hazards to incidental human contact.

(C) Growth and Propagation of Fish, Shellfish, Other Aquatic Life, and Wildlife Including Waterfowl and Furbearers

Toxic substances narrative: Shall not individually or in combination exceed 0.01 times the lowest measured 96-hour LC₅₀ for life stages of species identified by the department as being the most sensitive, biologically important to the location, or exceed criteria cited in EPA Quality Criteria for Water or Alaska Drinking Water Standards whichever concentration is less. Substances shall not be present or exceed concentrations which individually or in combination impart undesirable odor or taste to fish or other aquatic organisms as determined by either bioassay or organoleptic tests.

II. Marine Water

(A) Water Supply

(i) Aquaculture

Toxic substances narrative: Same as I.(A)(iii).

(ii) Seafood Processing

Toxic substances narrative: Shall not exceed EPA Quality Criteria for Water as applicable to the substance.

(iii) Industrial, Including Any Water Supplies Used in Association With a Manufacturing or Production Enterprise (other than Food Processing) Including Mining, Placer Mining, Energy Production or Development.

Toxic substances narrative: Same as I.(A)(iv).

(B) Water Recreation
(i) Contact Recreation

Toxic substances narrative: Shall not exceed EPA, Quality Criteria for Water as applicable to constituent.

State and Water Use

Arsenic Criteria Values

(ii) Secondary
Recreation

Toxic substances narrative: Same as I.(B)(ii).

(C) Growth and Propagation of Fish, Shellfish, Aquatic Life and Wildlife Including Seabirds, Waterfowl and Furbearers.

Toxic substances narrative: Same as I.(C).

(D) Harvesting For Consumption of Raw Mollusks or Other Raw Aquatic Life

Toxic substances narrative: Same as I.(C) but excluding the phrase "or Alaska Drinking Water Standards."

Arizona³

Domestic, Recreation, Aquatic Life and Wildlife

0.050 S mg/l (S = filterable residue)

Agricultural

2.000 T mg/l (T = total residues)

West Fork of the Little Colorado River above Government Springs

0.01 mg/l dissolved

Oak Creek and Its West Fork

20 ug/l dissolved

All Effluent Dominated Waters

0.05 mg/l dissolved

All

Toxic substances narrative: All surface waters shall be free from toxic, corrosive, or other deleterious substances attributable to domestic or industrial waste or other controllable sources at levels or in combinations sufficient to be toxic to human, animal, plant, or aquatic life. With respect to fish toxicity, receiving waters outside mixing zones shall not have a concentration of toxic materials exceeding 1/10 of the 96-hour LC50, where the bioassay is conducted using fish inhabiting the receiving waters and where water quality conditions (temperature, hardness, pH, dissolved oxygen, etc.) approximate those of the stream or lake as closely as practical. Compliance shall be indicated when survival of test group organisms is not less than that of the control group organisms exposed to an appropriate water sample.

State and Water Use

Arsenic Criteria Values

a. No person shall cause toxic substances to be present at concentrations which interfere with designated protected uses.

b. Compliance with a. (above) shall be determined on a site-specific basis for each discharge.

c. To determine compliance with this Section and other water quality standards, and to determine whether toxic, carcinogenic, mutagenic, teratogenic, corrosive or otherwise deleterious substances attributable to pollutants, effluent, sewage or waste in concentrations or combinations which interfere directly or indirectly with protected uses are being discharged, the Department may require chemical, physical, biological, radiological or other testing by dischargers.

Arkansas⁴

All

Not specified

All

Toxic materials shall not be present in receiving waters, after mixing, in such quantities as to be toxic to human, animal, plant or aquatic life or to interfere with the normal propagation, growth and survival of the indigenous aquatic biota. Within the mixing zone there may be a zone of initial dilution which exceeds the acute toxicity. In no instance shall the entire mixing zone be acutely toxic. Compounds known to be persistent, cumulative, carcinogenic or to exhibit synergism with other waste or stream components shall be addressed on a case-by-case basis. Permitting of all toxic materials shall be in accordance with the toxic implementation strategy found in the Continuing Planning Process.

California⁵

Domestic Water Supply 0.1

Agricultural (other than Livestock Watering) in Basin 2 only 2.0

Livestock Watering in Basin 2 only 1.0

State and Water Use

Arsenic Criteria Values

All Uses in Brian Creek 0.05
Basin (part of Basin 6A)
only

Ocean Waters only 0.008 - 6-month Median

 0.032 - Daily Maximum

 0.08 - Instantaneous Maximum

All

All waters shall be maintained free of toxic substances in concentrations that are toxic to, or that produce detrimental physiological responses in human, plant, animal, or aquatic life. Compliance with this objective will be determined by use of indicator organisms, analyses of species diversity, population density, growth anomalies, bioassays of appropriate duration or other appropriate methods as specified by the Regional Board.

The survival of aquatic life in surface waters subjected to a waste discharge, or other controllable water quality factors, shall not be less than that for the same water body in areas unaffected by the waste discharge, or when necessary for other control water that is consistent with the requirements for "experimental water" as described in "Standard Methods for the Examination of Water and Wastewater", latest edition. As a minimum, compliance with this objective as stated in the previous sentence shall be evaluated with a 96-hour bioassay.

In addition, effluent limits based upon acute bioassays of effluents will be prescribed where appropriate, additional numerical receiving water objectives for specific toxicants will be established as sufficient data become available, and source control of toxic substances will be encouraged.

Colorado⁶

Aquatic Life (1)(3)(4) Acute = 360 ug/l
 Chonic = 150 ug/l

Agriculture (2) 100 ug/l 30-day avg.

Drinking Water Supply (2) 50 ug/l 1-day avg.

All

Except where authorized by permits, BMP's or plans of operation approved by the Division, State waters shall be free from substances attributable to human-caused point source or nonpoint source discharges in amounts,

concentrations or combinations which are harmful to beneficial uses or toxic to humans, animals, plants, or aquatic life.

Footnotes:

(1) Metals for aquatic life use are stated as dissolved unless otherwise specified.

(2) Metals for agriculture and domestic uses are stated as total recoverable unless otherwise specified.

(3) Hardness values to be used in equations are in mg/l as calcium carbonate. The hardness values used in calculating the appropriate metal standard should be based on the lower 95 per cent confidence limit of the mean hardness value at the periodic low flow criteria as determined from a regression analysis of site-specific data. Where insufficient site-specific data exists to define the mean hardness value at the periodic low flow criteria, representative regional data shall be used to perform the regression analysis. Where a regression analysis is not appropriate, a site-specific method should be used. In calculating a hardness value, regression analyses should not be extrapolated past the point that data exist.

(4) Both acute and chronic numbers adopted as stream standards are levels not to be exceeded more than once every three years on the average.

Connecticut⁷

All

Not specified

All

Toxic substances narrative: General Policy 11. The waters shall be free from chemical constituents in concentrations or combinations which would be harmful to human, animal or aquatic life for the most sensitive and governing water use class. Criteria for chemical constituents contained in guidelines published by the U.S. Environmental Protection Agency shall be considered. In areas where fisheries are the governing consideration and numerical limits have not been established, bioassays may be necessary to establish limits on toxic substances. The recommendations for bioassay procedures contained in "Standard Methods for the Examination of Water and Wastewater" and the application factors contained in EPA water quality guidelines shall be considered.

For surface waters classified as public drinking water, the raw water sources must be maintained at a quality as defined by criteria developed by the U.S.

State and Water Use

Arsenic Criteria Values

EPA in accordance with the Safe Drinking Water Act (P.A. 93-523) or the State of Connecticut (Section 19-13-B102 of the Regulations of Connecticut State Agencies), whichever is more stringent, so that criteria for finished water can be met after conventional treatment.

Coastal and Marine
Water Uses
(Classes SA, SB, & SC)

Toxic substances narrative: None in concentrations or combinations which would be harmful to human, animal or aquatic life or which would make the waters unsafe or unsuitable for fish or shellfish or their propagation, impair the palatability of same, or impair the waters for any other uses. (See General Policy 11. above)

Delaware⁸

All

Not specified

General Stream
Criteria

Toxic substances narrative: All surface waters of the State shall be free from substances attributable to wastes of industrial, municipal, agricultural or other anthropogenic origin, such as any pollutants, including those of a toxic nature, that may interfere with attainment of designated uses of the water, impart undesirable odors, tastes, or colors to the water or to aquatic life found therein, endanger public health, or result in dominance of nuisance species.

Stream Quality
Criteria (General
Criteria For
Freshwater and
Saltwater Streams)

Toxic substances narrative: None in concentrations that may interfere with attainment of designated uses of the water, endanger public health, or result in dominance of nuisance species. The following EPA publications, or any other sources deemed acceptable by the Department, may be used as guidelines for applying these Standards to discharges in the State:

- (1) Water Quality Criteria 1972 (March, 1973),
- (2) Quality Criteria For Water (July, 1976),
- (3) Water Quality Criteria Documents, (EPA-440/5-80-015 through 5-80-079), published in 1980,
- (4) Water Quality Criteria Documents, (EPA-440/5-84-028 through 5-84-033, and 5-85-001), published in 1985.

Public Water Supply

Waters shall be free from substances (except natural impurities) that, alone or in combination with other substances, result in concentrations of toxic substances in the treated water that may be harmful to

human health. The EPA Water Quality Criteria Documents, (EPA-440/5-80-015 through 5-80-079) published in 1980, (or other sources as determined by the Department) shall be used as guidelines in the determination of acceptable concentrations.

ERES Waters

Toxic substances narrative: Shall not exceed natural levels.

(ERES = Exceptional Recreational or Ecological Significance)

Florida⁹

All

0.05 mg/l

All

Minimum criteria for surface waters: All surface waters of the State shall at all times at all places be free from:

Domestic, industrial, agricultural, or other man-induced non-thermal components of discharges which, alone or in combination with other substances or in combination with other components of discharges (whether thermal or non-thermal);

Are acutely toxic; or

Are present in concentrations which are carcinogenic, mutagenic, or teratogenic to human beings or to significant, locally occurring, wildlife or aquatic species; or

Pose a serious danger to the public health, safety, or welfare.

All

General criteria for toxic substances (applied to all surface waters except within zones of mixing): Substances in concentrations which injure, are chronically toxic to, or produce adverse physiological or behavioral response in humans, animals, or plants - none shall be present.

Georgia¹⁰

All

Instream concentrations shall not exceed 50 ug/l except within established mixing zones.

All

Toxic substances narrative: All waters shall be free from toxic substances discharged from municipalities, industries or other sources in amounts, concentrations

State and Water Use

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or combinations which are harmful to humans, animals or aquatic life.

Drinking Water Supplies

Toxic substances narrative: No material or substance in such concentration that, after treatment, would exceed the requirements of the Environmental Protection Division and the latest edition of Federal Drinking Water Standards.

Recreation, Fishing, Propagation of Fish, Shellfish, Game and Other Aquatic Life

Toxic wastes narrative: None in concentrations that would harm man, fish and game or other beneficial aquatic life.

Agricultural

Toxic substance narrative: None in concentrations that would interfere with or adversely affect uses for general agricultural purposes or would prevent fish survival.

Industrial

Toxic substance narrative: None in concentrations that would prevent fish survival or interfere with legitimate and beneficial industrial uses.

Navigation

Toxic substance narrative: None in concentrations that would damage vessels, prevent fish survival or otherwise interfere with commercial navigation.

Hawaii¹¹

All

Not specified

All

Toxic substances narrative: All waters shall be free of substances attributable to domestic, industrial, or other controllable sources as follows: toxic substances at levels or combinations sufficient to be toxic or harmful to human, animal, plant or aquatic life or in amounts sufficient to interfere with any beneficial use of the water.

As a minimum, a phytoplankton bioassay test or a 96-hour bioassay shall be required. Survival of test organisms shall not be less than that in controls which utilize appropriate experimental water.

Idaho¹²

All

Not specified

Domestic Water Supply

Max. allowable concentration - 0.050 mg/l

The following general water quality standards will apply to waters of the State, both surface and

State and Water Use

Arsenic Criteria Values

underground, in addition to the water quality standards set forth for specifically classified waters. As a result of man-caused point or nonpoint source discharge, waters of the State must not contain:

.01 Hazardous Materials: (see Section 01-2003,19.) in concentrations found to be of public health significance or to adversely affect designated or protected beneficial uses.

.02 Deleterious Materials: (see Section 01-2003,07.) in concentrations that impair designated or protected beneficial uses without being hazardous.

Illinois¹³

General Use

1.0 mg/l

Toxic substances narrative: Any substance toxic to aquatic life shall not exceed one-tenth of the 96-hour median tolerance limit (96-hr. TL_m) for native fish or essential fish food organisms, except for US EPA registered pesticides approved for aquatic application and applied pursuant to specified conditions.

Public and Food
Processing Water
Supply

0.05 mg/l

Secondary Contact and
Indigenous Aquatic
Life

1.0 mg/l

Effluent Standards

0.25 mg/l

No person shall cause or allow the concentration of arsenic in any effluent to exceed the above level, subject to the averaging rules contained in Section 304.104(a).

Indiana¹⁴

All

Not specified

All

Toxic substances narrative: All waters at all times and at all places, including the mixing zone, shall meet the minimum conditions of being free from substances attributable to municipal, industrial, agricultural, and other land use practices or other discharges which are in amounts sufficient to injure,

State and Water Use

Arsenic Criteria Values

be acutely toxic to or otherwise produce serious adverse physiological responses in humans, animals, aquatic life or plants. As a guideline, toxic substances should be limited to the 96-hour median lethal concentration (LC50) for biota significant to the indigenous aquatic community or other representative organisms. This subsection shall not apply to the chemical control of aquatic plants or animals when that control is subject to approval by the Indiana Department of Natural Resources as provided by the Fish and Wildlife Act (IC 1971, 14-2-1).

At all times, all waters outside of mixing zones shall be free of substances in concentrations which on the basis of available scientific data are believed to be sufficient to injure, be chronically toxic to, or be carcinogenic, mutagenic, or teratogenic to humans, animals, aquatic life, or plants.

Aquatic Life

These standards are applicable at any point in the waters outside of the mixing zone:

Toxic substances narrative: Concentrations shall not exceed one-tenth of the 96-hour median lethal concentration for important indigenous aquatic species or other representative organisms.

Contaminants which are known to be bioaccumulative and toxic, on the basis of available scientific data, shall not be present in concentrations which would result in the bioaccumulation or bioconcentration of such contaminants or their degradation products in important indigenous aquatic species to Federal Food and Drug Administration action levels or levels producing deleterious effects prohibited in subsection (a).

Potable Supply

Chemical substances narrative: The chemical constituents in the waters shall not be present after conventional treatment in such levels as to prevent meeting the Drinking Water Standards adopted by the Board.

Ohio River Main Stem
and the Interstate
Portion of the Wabash
River

0.05 mg/l

Lake Michigan and
Contiguous Harbor
Areas

Not to exceed 50 ug/l at any time

Toxic substances narrative: Concentrations shall not exceed one-tenth of the 96-hour median lethal

State and Water Use

Arsenic Criteria Values

concentration (LC₅₀) for important indigenous aquatic species and those artificially propagated by the Indiana Department of Natural Resources. More stringent application factors shall be used when justified on the basis of available evidence and approved by the Board after public notice and opportunity for a hearing.

Concentrations of organic contaminants which can be demonstrated to be persistent, to have a tendency to bioconcentrate in the aquatic biota, and are likely to be toxic on the basis of available scientific evidence, shall be limited as determined by the Board after public notice and an opportunity for a hearing.

Grand Calumet River;
Indiana Harbor

Toxic substances narrative: Concentrations shall not exceed one-tenth of the 96-hour median lethal concentration (LC₅₀) for important indigenous aquatic species. More stringent application factors shall be used, when justified, on the basis of available scientific evidence and approved by the Board after public notice and opportunity for a hearing.

Organic contaminants which can be demonstrated to be persistent, to have a tendency to bioconcentrate in the aquatic biota, and are likely to be toxic on the basis of available scientific evidence, shall not be present in concentrations which would result in the bioaccumulation or bioconcentration of such contaminants or their degradation products in important indigenous aquatic species to Federal Food and Drug Administration action levels or levels which on the basis of available scientific evidence are believed to be sufficient to injure, be chronically toxic to, or be carcinogenic, mutagenic, or teratogenic to humans, animals, or plants.

Natural Spawning,
Rearing or Imprinting
Areas; Migration
Routes for Salmonid
Fishes

440 ug/l maximum

Iowa 15

Wildlife, Fish, Aquatic
and Semiaquatic Life,
Secondary Contact
(Class B)

0.1 mg/l

Toxic substances narrative: All substances toxic or detrimental to aquatic life shall be limited to non-toxic or non-detrimental concentrations in surface water.

State and Water Use

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Potable Water Supply
(Class C)

0.05 mg/l

Toxic substances narrative: All substances toxic to humans or detrimental to treatment process shall be limited to non-toxic or non-detrimental concentrations in the surface water.

All

Toxic substances narrative: All waters, at all times, at all places shall be free from substances attributable to wastewater discharges or agricultural practices in concentrations or combinations which are toxic or harmful to human, animal, or plant life.

Kansas¹⁶

All

Not specified

All

General criteria: All surface waters shall be free, at all times, from the harmful effects of substances that originate from artificial sources and that produce any public health hazards or nuisance conditions, or impairment of uses. The harmful effects may result from any concentration of a substance that causes toxic effects, alone or in combination with other artificial or natural substances. Such substances shall be limited to concentrations in the receiving water that will not be harmful to human, animal, or plant life.

Aquatic Life

Toxic substances narrative:

(i) The waters of the state shall not be toxic as a result of the effects of substances originating from artificial sources, whether alone or in combination with other artificial or natural substances.

(ii) Criteria for the protection of predators, in terms of toxic levels in fish, published in "Water Quality Criteria" (National Academy of Engineering, 1973), which is hereby adopted by reference, shall be used as guidelines in assessing toxicity due to bioaccumulation.

(iii) When criteria for single compounds have not been published or are incomplete, or when complex mixtures can result in interactions among substances, the department shall utilize laboratory and field bioassessment methods and procedures to establish site-specific water quality criteria.

Domestic Water Supply

Any concentration of a substance from artificial sources that, alone or in combination with other

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artificial or natural substances, causes toxic effects on humans shall be limited to non-harmful concentrations.

Consumptive Recreation Substances that can bioaccumulate through bioconcentration or biomagnification to toxic levels in aquatic life, semiaquatic life or wildlife consumed by humans shall be limited in surface waters to concentrations that will result in no harm to humans upon consumption. FDA action levels defined in K.A.R. 28-16-28b(b)(19) for toxic substances in fish flesh, which are hereby adopted by reference, shall be used as guidelines to determine protection of this use.

Agricultural Irrigation 0.1 mg/l

Agricultural Livestock 0.2 mg/l

Kentucky¹⁷

All

Surface waters shall not be aesthetically or otherwise degraded by substances that injure, are toxic to or produce adverse physiological or behavioral responses in humans, animals, fish, and other aquatic life.

Warmwater Aquatic
Habitat, Coldwater
Aquatic Habitat

Toxic substances narrative:

1. The allowable instream concentration of toxic substances which are noncumulative or nonpersistent (half-life of less than 96 hours) shall not exceed 0.1 of the 96-hour median lethal concentration (LC₅₀) of a representative indigenous aquatic organism(s).

2. The allowable instream concentration of toxic substances which are bio-accumulative or persistent, including pesticides, when not specified elsewhere in this section, shall not exceed 0.01 of the 96-hour median lethal concentration (LC₅₀) of a representative indigenous aquatic organism(s).

3. Where specific application factors have been determined for a toxic substance such as an acute/chronic ratio or water effect ratio, they may be used instead of the 0.1 and 0.01 factors listed in this subsection upon approval by the cabinet.

4. 50 ug/l

Mixing Zones

Toxic substances narrative: Concentrations of toxic substances which exceed the ninety-six (96) hour LC50 tests for representative indigenous aquatic organisms are not allowed at any point within the mixing zone. A zone of initial dilution may be assigned on a case-by-case basis at the discretion of the cabinet.

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Concentrations of toxic substances which exceed one-third (1/3) the ninety-six (96) hour LC50 or other appropriate LC50 tests for representative indigenous aquatic organisms are to be met at the edge of the zone of initial dilution. Chronic criteria for the protection of aquatic life are to be met at the edge of the allowable mixing zone.

Louisiana¹⁸

All

Not specified

General criteria narrative: All waters shall be free from such concentrations of substances attributable to wastewater or other discharges sufficient to injure, be toxic or produce demonstrated adverse physiological response in humans, animals, fish, shellfish, wildlife, or plants.

Toxic substances narrative: Shall not be present in quantities that alone or in combination will be toxic to plant or animal life. Concentrations of persistent toxic substances for which no numerical criteria are given in the Standards shall not exceed the 96-hour LC50/100 (one-hundredth of the 96-hour LC50). Persistent toxic substances are defined herein as refractory substances subject to very limited or no biodegradation and/or detoxification and subject to food chain bioaccumulation; they include but are not limited to pesticides, PCB's and heavy metals that are designated by EPA as priority pollutants. Concentrations of non-persistent, biodegradable toxic substances for which no numerical criteria are given in the standards, shall not exceed the 96-hour LC50/10 (one-tenth of the 96-hour LC50). Bioassay techniques comparable with those given in the latest edition of "Standards Methods for the Examination of Water and Wastewater" will be used in evaluating toxicity using specific methods, dilutions, and species of aquatic animals best suited to the area of concern.

Maine¹⁹

All

Not specified

All

There shall be no disposal of any matter or substance that contains chemical constituents which are harmful to humans, animals or aquatic life or which adversely affect any other water use in the classes.

Classes B-1, B-2, C,
D, SD

There shall be no disposal of sewage, industrial wastes or other wastes in such waters, except those which

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have received treatment for the adequate removal of waste constituents including, but not limited to, solids, color, turbidity, taste, odor or toxic material, such that these treated wastes will not lower the standards or alter the usages of these classifications, nor shall such disposal of sewage or waste be injurious to aquatic life or render such dangerous for human consumption.

Classes SA, SB-1,
SB-2, SC

There shall be no toxic wastes, deleterious substances, colored or other waste or heated liquids discharged to waters of these classifications either singly or in combinations with other substances or wastes in such amounts or at such temperatures as to be injurious to edible fish or shellfish or to the culture or propagation thereof, or which in any manner shall adversely affect the flavor, color, odor or sanitary condition thereof; and otherwise none in sufficient amounts to make the waters unsafe or unsuitable for bathing or impair the waters for any other best usage as determined for the specific waters which are assigned to these classes.

All

Toxic substances narrative: No person, firm, corporation or other legal entity shall place, deposit, discharge or spill, directly or indirectly, onto the inland or tidal waters of this State, or on the ice thereof, or on the banks thereof so that the same may flow or be washed into such waters, or in such manner that the drainage therefrom may flow into such waters:

Any other toxic substance in any amount or concentration greater than that identified or regulated, including complete prohibition of such substance, by the board. In identifying and regulating such toxic substances, the board shall take into account the toxicity of the substance, its persistence and degradability, the usual or potential presence of any organism affected by such substance in any waters of the State, the importance of such organism and the nature and extent of the effect of such substance on such organisms, either alone or in combination with substances already in the receiving waters or the discharge.

Maryland²⁰

All

Not specified

All

Toxic substances narrative: The waters of this State may not be polluted by high-temperature, toxic,

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corrosive, or other deleterious substances attributable to sewage, industrial waste, or other waste in concentrations or combinations which:

- (a) Interfere directly or indirectly with water uses; or
- (b) Are harmful to human, animal, plant or aquatic life.

Toxic materials criteria are established to protect freshwater aquatic life, saltwater aquatic life or human health.

Massachusetts²¹

All

Not specified

For each class, the most sensitive beneficial uses are identified and minimum criteria for water quality in the water column are established. In interpreting and applying the minimum criteria in 314 CMR 4.03(4), the Division shall consider local conditions including, but not limited to:

- (a) The characteristics of the biological community;
- (b) Temperature, weather, flow, and physical and chemical characteristics; and
- (c) Synergistic and antagonistic effects of combinations of pollutants.

The Division will use the EPA criteria established pursuant to Section 304(a)(1) of the Federal Act, as guidance in establishing case-by-case discharge limits for pollutants not specifically listed in these standards but included under the heading "Other Constituents" in 310 CMR 4.03(4), for identifying bioassay application factors and for interpretations of narrative criteria. Where the minimum criteria specifically listed by the Division in this part differ from those contained in the federal criteria, the provisions of the specifically listed criteria in these standards shall apply.

All

Toxic substances narrative: Waters shall be free from pollutants in concentrations or combinations that:

- (a) Exceed the recommended limits on the most sensitive receiving water use;

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(b) injure, are toxic to, or produce adverse physiological or behavioral responses in humans or aquatic life; or

(c) exceed site-specific safe exposure levels determined by bioassay using sensitive species.

Michigan²²

All

Not specified

All

R 323.1057 Toxic substances narrative: Rule 57.

(1) Toxic substances shall not be present in the waters of the state at levels which are or may become injurious to the public health, safety, or welfare; plant and animal life; or the designated uses of those waters. Allowable levels of toxic substances shall be determined by the commission using appropriate scientific data.

(2) All of the following provisions apply for purposes of developing allowable levels of toxic substances in the surface waters of the state applicable to point source discharge permits issued pursuant to Act No. 245 of the Public Acts of 1929, as amended, being §323.1 et seq. of the Michigan Compiled Laws:

(a) Water quality-based effluent limits developed pursuant to this subrule shall be used only when they are more restrictive than technology-based limitations required pursuant to R 323.2137 and R 323.2140.

(b) The toxic substances to which this subrule shall apply are those on the 1984 Michigan critical materials register established pursuant to Act No. 245 of the Public Acts of 1929, as amended, being §323.1 et seq. of the Michigan Compiled Laws; the priority pollutants and hazardous chemicals in 40 C.F.R. §122.21, appendix D (1983); and any other toxic substances as the commission may determine are of concern at a specific site.

(c) Allowable levels of toxic substances in the surface water after a discharge is mixed with the receiving stream volume specified in R 323.1082 shall be determined by applying an adequate margin of safety to the MATC, NOAEL, or other

appropriate effect end points, based on knowledge of the behavior of the toxic substance, characteristics of the receiving water, and the organisms to be protected.

(d) In addition to restrictions pursuant to subdivision (c) of this subrule, a discharge of carcinogens, not determined to cause cancer by a threshold mechanism, shall not create a level of risk to the public health greater than 1 in 100,000 in the surface water after mixing with the allowable receiving stream volume specified in R 323.1082. The commission may require a greater degree of protection pursuant to R 323.1098 where achievable through utilization of control measures already in place or where otherwise determined necessary.

(e) Guidelines shall be adopted pursuant to Act No. 306 of the Public Acts of 1969, as amended, being §24.201 et seq. of the Michigan Compiled Laws, setting forth procedures to be used by staff in the development of recommendations to the commission on allowable levels of toxic substances and the minimum data necessary to derive such recommendations. The commission may require the applicant to provide the minimum data when otherwise not available for derivation of the allowable levels of toxic substances.

(f) For existing discharges, the commission may issue a scheduled abatement permit pursuant to R 323.2145 upon a determination by the commission that the applicant has demonstrated that each of the following conditions is met:

(i) Immediate attainment of the allowable level of a toxic substance is not economically or technically feasible.

(ii) No prudent alternative exists.

(iii) During the period of scheduled abatement, the permitted discharge will be consistent with the protection of the public health, safety, and welfare.

(iv) Reasonable progress will be made toward compliance with this rule over the term of the permit, as provided for in a schedule in the permit.

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Minnesota²³

Domestic (Classes A, B, & C) 0.01 mg/l

Domestic (Class D) 0.05 mg/l

All For contaminants other than heat, the 96-hour median tolerance limit for indigenous fish and fish food organisms should not be exceeded at any point in the mixing zone.

All Toxic substances narrative: No discharges at levels acutely toxic to humans or other animals or plant life, or directly damaging to real property.

Agriculture and Wildlife (Class B) Toxic substances narrative: None at levels harmful either directly or indirectly.

Limited Resource Value Waters Unspecified substances shall not be allowed in such quantities or concentrations that will impair the specified uses.

Mississippi²⁴

Public Water Supply 0.05 mg/l

All Toxic substances narrative: Waters shall be free from substances attributable to municipal, industrial, agricultural or other discharges in concentrations or combinations which are toxic or harmful to humans, animals or aquatic life.

There shall be no substances added, whether alone or in combination with other substances, that will impair the use of waters from that which it is classified. The concentration of toxic pollutants shall not exceed one-tenth (1/10th) of the 96-hour median tolerance limit based on available data. The concentration of toxic pollutants that are cumulative and/or persistent may be further limited on a case-by-case basis, where such data is available.

Available references to be used in determining toxicity limitations shall include, but not be limited to, Quality Criteria for Water (Section 304(a)), Federal Regulations under Section 307, and Federal Regulations under Section 1412 of the Public Health Service Act as amended by the Safe Drinking Water Act (Pub. L. 93-523). The use of such information should be limited to that part applicable to the indigenous aquatic community found in the State of Mississippi.

State and Water UseArsenic Criteria ValuesMissouri²⁵

Aquatic Life	20 ug/l
Drinking Water Supply	50 ug/l
Irrigation	100 ug/l
Effluent Limitations for Subsurface Waters	<p>If aquifer recharges surface water designated for Aquatic Life protection: 20 ug/l</p> <p>When aquifer does not recharge surface water designated for Aquatic Life protection: 50 ug/l</p>
Groundwater	<p>If aquifer recharge has an effect on surface water designated for Aquatic Life protection: 20 ug/l</p> <p>If aquifer recharge has a negligible effect on surface water designated for Aquatic Life protection: 50 ug/l</p>
All	The waters of the state shall be free from substances or conditions that have a harmful effect on human, animal, or aquatic life.
Classified Waters	<p>Toxic substances narrative: Water contaminants shall not cause the limits in Table A of the Missouri Water Quality Standards (including the values listed above) for the toxic form of metals and other toxic substances to be exceeded. Concentrations of such substances in bottom sediments or waters shall not harm benthic organisms and shall not accumulate through the food chain in harmful concentrations, nor shall Food and Drug Administration maximum fish tissue levels for fish consumption be exceeded. More stringent criteria may be imposed if there is evidence of additive or synergistic effects. Effluent toxicity studies or site-specific instream biological studies performed, recognized, or sanctioned by the commission may be used to develop alternative effluent limits not based on Table A values.</p> <p>Other potentially toxic substances for which sufficient toxicity data are not available may not be released to waters of the state until safe levels are demonstrated through adequate bioassay studies.</p>

State and Water Use

Arsenic Criteria Values

Montana²⁶

All	Not completely specified
Clark Fork River (Segments classified as C-1 and C-2)	50 ug/l maximum instantaneous concentration
Water Supply (Class A- Closed)	Toxic substances narrative: No increases of toxic or other deleterious substances, pesticides and organic and inorganic materials including heavy metals, above naturally occurring concentrations, are allowed.
Water Supply (Classes A-1, B-1, B-2, B-3)	Toxic substances narrative: Concentrations of toxic or other deleterious substances which would remain in the water after conventional water treatment must not exceed the maximum contaminant levels set forth in the 1975 National Interim Primary Drinking Water Standards (40 CFR Part 141) or subsequent revisions or the 1979 National Secondary Drinking Water Standards (40 CFR Part 143) or subsequent revisions.
Fish, Aquatic Life, Wildlife, Agriculture, Recreation in and on the Water (Class C-3)	Same as above
Fish, Aquatic Life, Wildlife, Agriculture Recreation in and on the Water (Classes C-1, C-2)	Toxic substances narrative: Concentrations of toxic or other deleterious substances must not exceed levels which render the waters harmful, detrimental or injurious to public health.
Agricultural and Industrial (other than Food Processing) (Class E)	Toxic substances narrative: Concentrations of toxic or deleterious substances, pathogens, pesticides and organic and inorganic materials including heavy metals, must be less than those demonstrated to be deleterious to livestock or plants or to humans who may consume such livestock or plants or to adversely affect other indicated uses.
All Classes (except A- Closed and E)	The maximum allowable concentrations of toxic or deleterious substances also must not exceed acute or chronic problem levels as revealed by bioassay or other methods. The values listed in EPA Water Quality Criteria documents (Federal Register Vol. 45, No. 231, Friday, November 28, 1980, pages 79318 - 79379) shall be used as a guide to determine problem levels unless local conditions make these values inappropriate. In accordance with section 75-5-306(1), MCA, it is not necessary that wastes be treated to a purer condition than the natural condition of the receiving water.

State and Water Use

Arsenic Criteria Values

Nebraska²⁷

All

Not completely specified

Aquatic Life

Toxic substances narrative: Surface waters of the State shall be free from toxic substances in toxic amounts. No toxic substances alone or in combination with other substances in concentrations rendering the receiving water unsafe or unsuitable for aquatic life will be allowed. (In implementing these criteria, the Department will follow procedures outlined in the State's Continuing Planning Process which comply with the federal water quality standards, 40 C.F.R. §131.11 (1986)).

Public Drinking Water

0.05 mg/l

Toxic substances narrative: Wastes or toxic substances introduced directly or indirectly by human activity in concentrations that would degrade the use (i.e., would produce undesirable physiological effects in humans) shall not be allowed.

Agricultural

Toxic substances narrative: Wastes or toxic substances introduced directly or indirectly by human activity in concentrations that would degrade the use (i.e., would produce undesirable physiological effects in crops or livestock) shall not be allowed.

Aesthetics and Public Health

Surface waters shall be free of radionuclides or toxic substances in concentrations or combinations which may produce undesirable physiological responses in humans.

Nevada²⁸

All

0.05 mg/l

All

Toxic substances narrative: Waters must be free from toxic substances attributable to domestic or industrial waste or other controllable sources at levels or combinations sufficient to be toxic to human, animal, plant or aquatic life or in amounts sufficient to interfere with any beneficial use of the water.

The presence of toxic materials in a water must be evaluated by use of a 96-hour bioassay. Survival of test organisms must not be less than that in control tests which utilize appropriate control water. The test organisms and control water must be specified by the department. In addition, acute bioassays may be required to determine effluent limitations and the

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exact test method to be used must be defined by the department. Failure to determine presence of toxic materials by these methods shall not preclude determination of excessive levels of toxic materials on the basis of other criteria or methods.

Wastes from municipal, industrial or other controllable sources containing arsenic, barium, boron, cadmium, chromium, cyanide, fluoride, lead, selenium, silver, copper and zinc that are reasonably amenable to treatment or control must not be discharged untreated or uncontrolled into the waters of Nevada (including the Colorado River System). In addition, the limits for concentrations of the chemical constituents must provide water quality consistent with the mandatory requirements of the 1962 Public Health Service Drinking Water Standards.

Drinking Water Supply
(with treatment by
disinfection only)
Suitable For Aquatic
Life Habitat, Wildlife
Propagation, Agricul-
tural, Recreation,
Boating, Esthetics
(Class A)

None (zero)

Drinking Water Supply
(with treatment by
disinfection and fil-
tration only), Agri-
cultural, Aquatic
Life and Wildlife
Propagation, Recrea-
tion, Industrial and
Esthetics (Class B)

Toxic substances narrative: Only such amounts as will not render receiving waters injurious to fish or wildlife or impair the receiving waters for any beneficial uses established for this class.

Drinking Water Supply
(following complete
treatment) Agricul-
tural, Aquatic Life,
Wildlife Propagation,
Recreation, Esthetics
and Industrial (Class C)

Same as above

Boating and Esthetics,
Aquatic Life, Wildlife
Propagation, Agricul-
tural and Industrial
(except for Food
Processing Purposes)
(Class D)

Toxic substances narrative: Only such amounts as will not impair receiving waters for any beneficial use established for this class.

State and Water Use

Arsenic Criteria Values

New Hampshire²⁹

All

Not specified

Water Supply
(Class A)

Toxic substances narrative: No potentially toxic substances unless naturally occurring.

All Other Uses
(Classes B and C)

Toxic substances narrative: No potentially toxic substances in toxic concentrations or combinations.

Fish Life

Toxic substances narrative: All surface waters of the state shall be free from chemicals and other materials and conditions inimical to fish life or to maintenance of fish life.

All

Substances potentially toxic are evaluated in accordance with EPA's published water quality criteria for 64 toxic substances dated November 1980. Toxic limits are to be set utilizing bioassay procedures as outlined in CFR Vol. 45, No. 231, November 28, 1980.

When establishing limits on toxic substances for the protection of aquatic life, "Appendix B - Guidelines for Deriving Water Quality Criteria for the Protection of Aquatic Life and Its Uses," CFR Vol. 45, No. 231, November 28, 1980, will be utilized. Bioassay procedures and analysis shall be consistent with "Methods for Measuring Acute Toxicity of Effluents" (third edition) published by EPA, or equivalent protocol as approved by the Commission.

Bioassay procedures and application factors used in establishing limits on toxic substances shall, as a minimum, be no less rigorous than the recommendations for bioassays and application factors contained in the National Technical Advisory Committee's report to the Secretary of the Interior on Water Quality Criteria, April 1, 1968 or latest revision thereof.

New Jersey³⁰

All

Toxic substances narrative: Toxic substances in waters of the State shall not be at levels that are toxic to humans or the aquatic biota, or that bioaccumulate in the aquatic biota so as to render them unfit for human consumption.

FW-1 Waters

Surface water quality criteria shall be maintained as to quality in their natural state.

PL Waters

Surface water quality criteria shall be maintained as to quality in their existing state or that quality

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necessary to attain or protect the designated uses, whichever is more stringent.

FW-2 Waters

50 ug/l

None which would cause standards for drinking water to be exceeded after appropriate treatment.

FW-2, SE, and SC Waters

Toxic substances narrative: None, either alone or in combination with other substances, in such concentrations as to affect humans or be detrimental to the natural aquatic biota, produce undesirable aquatic life, or which would render the waters unsuitable for the designated uses.

Toxic substances shall not be present in concentrations that cause acute or chronic toxicity to aquatic biota, or bioaccumulate within an organism to concentrations that exert a toxic effect on that organism or render it unfit for consumption.

The concentrations of nonpersistent toxic substances in the State's waters shall not exceed one-twentieth (0.05) of the acute definitive LC50 or EC50 value, as determined by appropriate bioassays conducted in accordance with N.J.A.C. 7:18.

The concentrations of persistent toxic substances in the State's waters shall not exceed one-hundredth (0.01) of the acute definitive LC50 or EC50 value, as determined by appropriate bioassays conducted in accordance with N.J.A.C. 7:18.

Zones 1C-6

General criteria narrative: The waters shall not contain substances attributable to municipal, industrial, or other discharges in concentrations or amounts sufficient to preclude the specified water uses to be protected. Within this requirement the waters shall be substantially free from substances in concentrations or combinations which are toxic or harmful to human, animal, plant, or aquatic life, or that produce color, taste, or odor in the water, or that taint fish or shellfish flesh.

In no case shall concentrations of substances exceed those values given for rejection of water supplies in the United States Public Health Service Drinking Water Standards.

State and Water UseArsenic Criteria ValuesNew Mexico³¹

All

Not specified

All

Toxic substances narrative: Toxic substances such as, but not limited to, pesticides, herbicides, heavy metals, and organics, shall not be present in receiving waters in concentrations which will change the ecological conditions of receiving waters to an extent detrimental to man or other organisms of direct or indirect commercial, recreation, or aesthetic value. Toxicities of substances in receiving waters will be determined by appropriate bioassay techniques, or other acceptable means, for the particular form of aquatic life which is to be preserved with the concentrations of toxic substances not to exceed 5% of the LC-50 provided that: toxic substances which, through uptake in the aquatic food chain and/or storage in plant and animal tissues, can be magnified to levels which are toxic to man or other organisms, shall not be present in concentrations which result in this biological magnification or exceed 1% of the LC-50. Waters designated for use as domestic water supplies shall not contain substances in concentrations that exceed drinking water standards set forth in Section 202.B of the New Mexico Regulations Governing Water Supplies.

New York³²AA; AA-s; A; A-s
(Human)

50 ug/l

AA; AA-s; A; A-s
(Aquatic)

190*

B; C

190*

D

360*

SA; SB; SC

63*

SD

120*

* = Dissolved arsenic form

GA

0.025 mg/l

Effluent Standards for
Discharges to Class GA
Waters

0.05 mg/l

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Fresh Surface Waters

Toxic substances narrative: None in amounts that will be injurious to fishlife or which in any manner shall adversely affect the flavor, color or odor thereof, or impair the waters for any best usage as determined for the specific waters which are assigned to each class.

Saline Surface Waters
Classes SA, SB, SC

Toxic substances narrative: None in amounts that will interfere with use for primary (SA and SB) or secondary (SC) contact recreation or that will be injurious to edible fish or shellfish or the culture or propagation thereof, or which in any manner shall adversely affect the flavor, color, odor or sanitary condition thereof or impair the waters for any best usage as determined for the specific waters which are assigned to each class.

Saline Surface Waters
Class SD

Toxic substances narrative: None alone or in combination with other substances or wastes in sufficient amounts to prevent survival of fish life or impair the waters for any other best usage as determined for the specific waters which are assigned to this class.

Class A-Special Waters
International Boundary
Waters

Toxic substances narrative: None in amounts that will interfere with use for primary contact recreation or that will be injurious to the growth and propagation of fish, or which in any manner shall adversely affect the flavor, color, or odor thereof or impair the waters for any other best usage as determined for the specific waters which are assigned to this class.

Class I
Secondary Contact
Recreation and Any
Other Usage Except
Primary Contact
Recreation and
Shellfish for Market
Purposes

Toxic substances narrative: None in amounts that will interfere with use for secondary contact recreation or that will be injurious to edible fish or shellfish or the culture or propagation thereof, or which in any manner shall adversely affect the flavor, color, odor or sanitary condition thereof or impair the waters for any best usage as determined for the specific waters which are assigned to this class.

Class II
All Uses Not Primarily
For Recreation, Shell-
fish Culture or the
Development of Fish

Toxic substances narrative: None alone or in combination with other substances or wastes in sufficient amounts to be injurious to edible fish and shellfish, or the culture or propagation thereof, or which shall in any manner affect the flavor, color, odor or sanitary condition of such fish or shellfish so as to injuriously affect the sale thereof, or which shall cause any injury to the public and private shellfisheries of this State.

Class GA
Fresh Ground Waters
Potable Water Supply

Toxic substances narrative: None which may impair the quality of the ground waters to render them unsafe or unsuitable for a potable water supply or which may cause or contribute to a condition in contravention of

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standards for other classified waters of the State.

Class GSA
Saline Waters
Conversion To Fresh
Potable Waters; Source
of Potable Mineral
Waters; Raw Material
For the Manufacture of
Sodium Chloride

Toxic substances narrative: None which may impair the waters for use as sources of saline waters for the best usage or as to cause or contribute to a condition in contravention of standards for other classified waters of the State.

Class GSB
Receiving Water For
Disposal of Wastes

Toxic substances narrative: None which may be deleterious, harmful, detrimental or injurious to the public health, safety or welfare or which may cause or contribute to a condition in contravention of standards for other classified waters of the State.

North Carolina³³

Fresh Surface Waters 50 ug/l

Tidal Salt Waters 50 ug/l

All

Toxic substance narrative [Rule .0208(a)]: The concentration of toxic substances in the receiving water, (either alone or in combination, when affirmatively demonstrated to be non-bioaccumulative) when not specified elsewhere in this Section, shall not exceed the concentration specified by the fraction of the 96-hour LC50 value which predicts a no effect chronic level (as determined by the use of established acute/chronic ratios). If an acceptable acute/chronic ratio is not available, then that toxic substance shall not exceed one-one hundredth (0.01) of the 96-hour LC50 or if it is affirmatively demonstrated that a toxic substance has a half-life of less than 96 hours or is not bioaccumulative, the maximum concentration shall not exceed one-twentieth (0.05) of the 96-hour LC50. If it is affirmatively demonstrated that the standard for a particular toxic substance as specified in Rule .0211 or .0212 of this Section is inappropriate for a specific stream segment, the commission may revise the applicable standard on a case-by-case basis in accordance with the provisions of Section 143-214.1 of the General Statutes of North Carolina.

Fresh Surface Waters

Toxic substances narrative [Rule .0211(b)(3)(L)]: Only such amounts, whether alone or in combination with other substances or wastes as will not render the waters injurious to public health, secondary recreation, or to aquatic life and wildlife (either through chronic or acute exposure or through

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bioaccumulation), or impair the waters for any designated uses; any toxic substance or complex waste will be considered acutely toxic at instream waste concentrations greater than one third of the 96-hour LC50 value; acceptable levels of chronic exposure may be determined by test procedures deemed appropriate by the director.

Tidal Salt Waters

Toxic substances narrative [Rule .0212(b)(3)(L)]: Only such amounts, whether alone or in combination with other substances or wastes as will not render the waters injurious to aquatic life and wildlife, or impair the waters for any designated uses.

North Dakota³⁴

Classes I, IA and II 0.05 mg/l

Class III Industrial and Agricultural Uses Only 0.1 mg/l

All

Toxic substances narrative: Free from substances attributable to municipal, industrial, or other discharges or agricultural practices in concentrations or combinations which are toxic or harmful to human, animal, plant or resident aquatic biota.

Mixing zones narrative: The 96-hour LC 50 for indigenous or resident fish and fish food organisms shall not be exceeded at any point in the mixing zone.

Sampling and testing narrative: Bioassay tests shall be performed in accordance with procedures outlined in the latest edition of "Standard Methods for the Examination of Water and Wastewater", published by the American Public Health Association, or in accordance with tests or analytical procedures that have been found to be equal or more applicable by the Department or the Environmental Protection Agency. Bioassay studies shall be made using a sensitive resident species.

Ohio³⁵

All Lake Erie Uses 0.050 mg/l

All Ohio River Uses 0.05 mg/l

Aquatic Life Habitat 190 ug/l (30-day ave.)

Nuisance Prevention 360 ug/l (max.)

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Public Water Supply 50 ug/l (max.)

Agricultural Water Supply 100 ug/l (max.)

All General narrative: Free from substances entering the waters as a result of human activities in concentrations that are toxic or harmful to human, animal or aquatic life and/or are rapidly lethal in the mixing zone.

Antidegradation policy: Present ambient water quality in state resource waters will not be degraded for all substances determined to be toxic or to interfere with any designated use as determined by the director of Ohio Environmental Protection Agency.

Toxic substances narrative: All pollutants or combinations of pollutants not specifically mentioned in this rule, shall not exceed water quality criteria derived according to the procedures set forth in "Draft Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Life and Its Uses," United States Environmental Protection Agency, July 5, 1983, or, if insufficient data prevent the use of this procedure, shall not exceed, at any time, one-tenth, or, for pollutants or combinations of pollutants which are known to be persistent toxicants in the aquatic environment, one one-hundredth of the ninety-six-hour median tolerance limit (TLm) or LC₅₀ for any representative aquatic species. However, more stringent application factors shall be imposed where justified by "Ambient Water Quality Criteria," documents, United States Environmental Protection Agency, 1980; "Quality Criteria for Water," U.S. Environmental Protection Agency, 1976; "Water Quality Criteria 1972," "National Academy of Sciences" and "National Academy of Engineering," 1973; or other scientifically based publications.

The median tolerance limit (TLm) or LC₅₀ shall be determined by static or dynamic bioassays performed in accordance with methods outlined in "Standard Methods for the Examination of Water and Wastewater," fifteenth edition, "American Public Health Association," "American Water Works Association" and the "Water Pollution Control Federation, 1981"; or performed in accordance with procedures outlined in "Methods of Acute Toxicity Tests with Fish, Macroinvertebrates and Amphibians," United States Environmental Protection Agency 660/3-75-009. Tests will be conducted using actual effluent, receiving

water and representative aquatic species whenever possible.

Ohio River

Free from substances in concentrations which are toxic or harmful to humans, animals, or fish and other aquatic life which would in any manner adversely affect the flavor, color, odor, or edibility of fish and other aquatic life, wildlife or livestock or which are otherwise detrimental to the designated uses.

Toxic substances narrative:

(a) Non-cumulative substances - not to exceed one-tenth (0.1) the ninety-six-hour LC_{50} of representative important species indigenous to the Ohio River.

(b) Cumulative substances - not to exceed one one-hundredth (0.01) of the ninety-six-hour LC_{50} of representative important species indigenous to the Ohio River.

(c) Other limiting concentrations may be used when justified on the basis of available evidence and approved by the appropriate regulatory agency or agencies.

Oklahoma³⁶

All

Public and Private
Water Supplies

Not specified

0.10 mg/l

The surface waters of the State which are designated as public and private water supplies shall be maintained so that they will not be toxic, carcinogenic, mutagenic, or teratogenic to humans.

Fish and wildlife
Propagation

Toxic substances narrative: Assigning concentration limits for the Fish and Wildlife Propagation beneficial use is very complex. Limits are generally assigned based upon laboratory bioassay work designed to determine the 96-hour LC_{50} for a particular aquatic species. There are several physical, chemical and biological problems which arise when attempts are made to develop water quality standards based upon single maximum concentration values. For this reason, numerical concentration limits are developed in this section for specified toxics. For toxics not specified, or where data is not available in Table 1 (Segment Specific Criteria) of the Oklahoma Water Quality Standards, concentrations for nonpersistent toxic substances listed in Appendix C (Oklahoma Water Quality Standards) shall not exceed 0.1 of the 96-hour LC_{50} for sensitive indigenous species. Concentrations

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of persistent toxicants listed in Appendix C shall not exceed 0.05 of the 96-hour LC₅₀ for sensitive indigenous species. Concentrations of bioaccumulative toxicants listed in Appendix C shall not exceed 0.01 of the 96-hour LC₅₀ for sensitive indigenous species. Bioassay data for Pimephales promelas (fathead minnow) and/or Lepomis macrochirus (bluegill) shall be used in determining compliance with the above criteria.

Toxicity to Aquatic Organisms: The surface waters of the State outside the mixing zone but within the zone of passage shall be maintained so that they will not be toxic to fishes and other terrestrial and aquatic life. Toxic substances in surface waters of the State shall not be present in quantities which allow significant bioaccumulation and/or biomagnification in the food chain. If substances exhibit synergistic effects when combined, toxicity tests described in this section may be used to detect the increased toxicity.

No toxicity shall be allowed downstream from the mixing zone as determined by a forty-eight (48) hour static test using appropriate laboratory animals conducted in accordance with "Methods for Measuring the Acute Toxicity of Effluents to Freshwater and Marine Organisms," EPA-600/4-85-013 (Rev. March, 1985).

In addition, no toxicity shall be allowed as measured using in-situ bioassay with sensitive indigenous fishes ("An In-Situ Method for Evaluating Acute Toxicity in Aquatic Environment." Noble Foundation and Okla. Dept. Wildl. Cons. Symposium on Pond Mgt., Okla. City, Aug. 1985). In-situ testing must be conducted over a period of ninety-six (96) hours unless statistically significant differences in mortality occur in a shorter period of time. Toxicity of waters may be determined using statistical differences for a total mortality between control and presumed impact sites. Chronic toxicity shall not be allowed in waters of the State ("Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms," EPA-600/4-85-014). If significant mortality does not occur at the presumed impact site within ninety-six (96) hours, a benthic macroinvertebrate survey may be performed to determine low-level persistent toxicity.

Primary Contact
Recreation

The water shall not contain chemical, physical or biological substances in concentrations that are irritating to skin or sense organs or are toxic or cause illness upon ingestion by human beings.

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Secondary Contact
Recreation

Waters shall be maintained to be free from human pathogens in numbers which may produce adverse health effects in humans.

All

Mixing zones narrative: The concentration of toxic substances in a mixing zone shall not exceed the 96-hour LC₅₀ for sensitive indigenous species.

Oregon³⁷

All

General water quality standards applicable to all waters except where superseded (below) by special water quality standards applicable to specifically designated waters.

Not specified

All

Special water quality standard applicable to: North Coast-Lower Columbia Basin, Mid Coast Basin, Umpqua Basin, South Coast Basin, Rogue Basin, Willamette Basin, Sandy Basin, Hood Basin, Deschutes Basin, John Day Basin, Umatilla Basin, Walla Walla Basin, Grande Ronde Basin, Powder Basin, Malheur River Basin, Owyhee Basin, Malheur Lake Basin, Goose and Summer Lakes Basin, and Klamath Basin:

0.01 mg/l

The creation of tastes or odors or toxic or other conditions that are deleterious to fish to other aquatic life or affect the potability of drinking water or the palatability of fish or shellfish shall not be allowed.

Where industrial, commercial, or agricultural effluents contain quantities of potentially toxic elements, treatment requirements shall be determined utilizing appropriate bioassays.

Pennsylvania³⁸

All

0.05 mg/l

All

General water quality criteria narrative: Water shall not contain substances attributable to point or nonpoint source waste discharges in concentration or amounts sufficient to be inimical or harmful to the water uses to be protected or to human, animal, plant, or aquatic life.

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Rhode Island³⁹

Minimum Data Base Guidelines

	U.S.EPA Acute	U.S.EPA Chronic	R.I.DEM Acute	R.I.DEM Chronic
Fresh Water Aquatic Life	440	9.8	52	1.2
Saltwater Aquatic Life	120	63		

all units in ug/l

Class A

The limits prescribed by the United States Environmental Protection Agency will be used where not superseded by more stringent State requirements.

Classes B and C

The ambient concentration of a pollutant in a water body designated as suitable for fish and/or wildlife habitat shall not exceed the R.I. DEM Ambient Water Quality Guidelines for the protection of aquatic organisms from chronic effects, unless the chronic guideline is modified by the Director based on results of bioassay tests conducted in accordance with the terms and conditions provided in Appendix C.

Class D

The ambient concentration of a pollutant in a water body designated as suitable for fish migration shall not exceed the R.I. DEM Ambient Water Quality Guidelines for the protection of aquatic organisms from acute effects, unless the acute guideline is modified by the Director based on results of bioassay tests conducted in accordance with the terms and conditions provided in Appendix C.

Classes A, B, C, D

Waters shall be free from chemical constituents in concentrations or combinations which could be harmful to human, animal, or aquatic life for the appropriate most sensitive and governing water class use or unfavorably alter the biota.

Class SA

None in concentrations or combinations which would be harmful to human, animal or aquatic life or which would make the waters unsafe or unsuitable for fish or shellfish or their propagation, impair the palatability of same, or impair the waters for any other uses.

Class SB

None in concentrations or combinations which would be harmful to human, animal or aquatic life or which would make the waters unsafe or unsuitable for fish or shellfish or their propagation, or impair the water for any other usage assigned to this Class.

Class SC

None in concentrations or combinations which would be harmful to human, animal or aquatic life or which

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would make the waters unsafe or unsuitable for fish or shellfish or their propagation, or impair the water for any other usage assigned to this Class. The ambient concentration of a pollutant in a water body designated as suitable for fish and/or wildlife habitat shall not exceed the R.I. DEM Ambient Water Quality Guidelines for the protection of aquatic organisms from chronic effects, unless the chronic guideline is modified by the Director based on results of bioassay tests conducted in accordance with the terms and conditions provided in Appendix C.

Classes A, B, C, D,
SA, SB, SC

If an aquatic toxicity value has not been established in the R.I. DEM Ambient Water Quality Guidelines, then the level of any "priority pollutant" shall not exceed the "detection limits" in the ambient water unless the discharger demonstrates to the satisfaction of the Director that a higher concentration will not adversely effect the most sensitive use of the water body.

Classes A, B, C, D are fresh waters.

Classes SA, SB, SC are sea waters.

South Carolina⁴⁰

All

Not specified

All

Toxic substances narrative: All ground waters and surface waters of the State shall at all times, regardless of flow, be free from toxic substances attributable to sewage, industrial waste, or other waste in concentrations or combinations which interfere with classified water uses (except within mixing zones as described in D.(5) of the South Carolina Water Quality Standards), existing water uses or which are harmful to human, animal, plant or aquatic life.

Classes AA and SAA

Toxic substances narrative: Natural conditions will be maintained and protected as feasible, within the Department's statutory authority.

Classes A-Trout and
B-Trout

Toxic substances narrative: None alone or in combination with other substances or wastes in sufficient amounts to be injurious to reproducing trout populations or in any manner adversely affect the taste, color, odor, or sanitary condition thereof or impair the waters for any other best usage as determined for the specific waters which are assigned to this class.

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Classes A and SB

Toxic substances narrative: None alone or in combination with other substances or wastes in sufficient amounts to make the waters unsafe or unsuitable for primary contact recreation or to impair the waters for any other best usage as determined for the specific waters which are assigned to this class.

Classes B and SC

Toxic substances narrative: None alone or in combination with other substances or wastes in sufficient amounts to be harmful to the survival of freshwater (B) and marine (SC) fauna and flora or the culture or propagation thereof; to adversely affect the taste, color, odor, or sanitary condition of fish for human consumption; to make the (B) waters unsafe or unsuitable for a source of drinking water supply after conventional treatment; to make the waters unsafe or unsuitable for secondary contact recreation; or to impair the waters for any other best usage as determined for the specific waters which are assigned to this class.

Class SA

Toxic substances narrative: None alone or in combination with other substances or wastes in sufficient amounts to adversely affect the taste, color, odor, or sanitary condition of clams, mussels, or oysters for human consumption; or impair the waters for any other best usage as determined for the specific waters which are assigned to this class.

Class GA

Toxic substances narrative: None allowed

Class GB

Chemicals narrative: As set forth in the State Primary Drinking Water Regulations R.61-58.5 B.(2).

Class GC

Toxic substances narrative: None which interfere with any existing use of an underground source of drinking water.

South Dakota⁴¹

Domestic Water Supply

0.05 mg/l

The applicable criterion is to be maintained at all times, without exception.

All

Toxic substances narrative: Substances which produce concentrations of any substance toxic to humans, animals, plants, or aquatic life may not be discharged or caused to be discharged into any lake or stream. Toxicity of nonbioaccumulative pollutants to aquatic life shall be determined in accordance with §74:03:02:06. Toxicity of bioaccumulative pollutants shall be determined using bioassay methods in accordance with §74:03:02:06 and additional data on

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the rates and effects of bioaccumulation so that the aquatic community and those organisms including man which use those aquatic organisms for food are protected against potential adverse health effects. Toxic concentrations shall be specified in terms of 24-hour and 30-day average concentrations or maximum concentrations allowed or both. Where numerical criterion has been established for a toxic substance in §§74:03:02:33 to 74:03:02:45, inclusive, the provisions of this section do not apply to that substance.

Tennessee⁴²

All

Not specified

Domestic Water Supply

Toxic substances narrative: The waters shall not contain toxic substances, whether alone or in combination with other substances, which will produce toxic conditions that materially affect the health and safety of man or animals, or impair the safety of conventionally treated water supplies. Available references to be used in determining such conditions shall include, but not be limited to: Quality Criteria for Water (Section 304(a) of PL 92-500); Federal Regulations under Section 307 of PL 92-500; and Federal Regulations under Section 1412 of the Public Health Service Act as amended by the Safe Drinking Water Act (PL 93-523).

Industrial Water Supply

Toxic substances narrative: The waters shall not contain toxic substances whether alone or in combination with other substances, which will adversely affect industrial processing.

Fish and Aquatic Life

Toxic Substances Narrative: The waters shall not contain substances or combination of substances including disease causing agents which, by way of either direct exposure or indirect exposure through food chains may cause death, disease, behavioral abnormalities, cancer, genetic mutations, physiological malfunctions (including malfunctions in reproduction), physical deformations, or restrict or impair growth in fish or aquatic life or their offspring. In no event shall the diversity or productivity of biota significant to the aquatic community of the receiving stream be decreased. References to be used in determining toxicity limitations shall include but not be limited to: Quality Criteria for Water (Section 304(a) of Public Law 92-500), Federal Regulations under Section 307 of Public Law 92-500, and Federal Regulations under Section 1412 of the Public Health Service Act as

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amended by the Safe Drinking Water Act (Public Law 93-523). The use of such information should be limited to that part applicable to the aquatic community found within the receiving stream or waters under consideration.

Recreation

Toxic substances narrative: The water shall not contain toxic substances whether alone or in combination with other substances, that will render the waters unsafe or unsuitable for water contact activities, or will propose toxic conditions that will adversely affect man or animal.

Irrigation

Toxic substances narrative: The waters shall not contain toxic substances that will produce toxic conditions that will affect the water for irrigation.

Livestock Watering
and Wildlife

Toxic substances narrative: The waters shall not contain toxic substances whether alone or in combination with other substances, that will produce toxic conditions that will affect the water for livestock watering and wildlife.

Effluent Limitations
(Industrial Wastewater
Treatment Plants)

1.0 mg/l

Texas⁴³

All Fresh Water

Acute = 360 ug/l
Chronic = 190 ug/l

All

(d) Toxic parameters. Surface waters will not be toxic to man, or to terrestrial or aquatic life. Additional standards requirements for toxic materials are specified in §307.6 of this title (relating to Toxic Materials).

§307.6. TOXIC MATERIALS.

(a) Application. Standards and procedures set forth in this section apply to all water in the state, except as indicated in §307.8 of this title (relating to Application of Standards) and §307.9 of this title (relating to Determination of Standards Attainment).

(b) General provisions.

(1) Water in the state shall not be acutely toxic to aquatic life except in small zones of initial dilution at discharge points, in accordance with §307.8 (relating to Application of Standards).

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(2) Water in the state with designated or existing aquatic life uses shall not be chronically toxic to aquatic life, except in mixing zones and below critical low-flow conditions, in accordance with §307.8 of this title (relating to Application of Standards).

(3) Water in the state shall be maintained to preclude adverse toxic effects on human health resulting from contact recreation, consumption of aquatic organisms, or consumption of drinking water after reasonable treatment. In addition to other provisions of this section, permitted discharges or other controllable sources shall not cause maximum contaminant levels for public drinking water supplies, as established in the federal Safe Drinking Water Act (42 United States Code 300f et seq.), to be exceeded after reasonable treatment by a water supply treatment plant. The commission will utilize available investigative and regulatory means to identify and control sources of toxic pollutants which cause or could potentially cause the following guidelines to be exceeded:

(A) EPA maximum contaminant levels for drinking water supplies; and

(B) U.S. Food and Drug Administration Action Levels for toxic concentrations in fish and shellfish tissue.

Utah⁴⁴

Domestic Source

0.05 mg/l

Aquatic Wildlife

190 µg/l - 4 day average
360 µg/l - 1 hour average

Agriculture

0.1 mg/l

All

Toxic substances narrative: It shall be unlawful, and a violation of these regulations, for any person to discharge or place any waste or other substance in such a way as will be or may become offensive; or conditions which produce undesirable aquatic life or which produce objectionable tastes in edible aquatic organisms; or concentrations or combinations of substances which produce undesirable physiological responses in desirable resident fish, or other desirable aquatic life, as determined by bioassay or other tests performed in accordance with standard procedures determined by the Committee.

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Vermont⁴⁵

All

Not specified

Toxic substances narrative: The waters of the state shall be managed so as to prevent the discharge of radioactive or toxic wastes in concentrations, quantities or combinations that may create a significant likelihood of an adverse impact on human health or acute or chronic toxicity to aquatic biota, fish or wildlife. Unless otherwise specified by these rules, the Secretary shall determine limits for discharges containing radioactive or toxic wastes based on the results of biological toxicity assessments and the appropriate available scientific data, including but not limited to:

1. The current edition of the EPA publications "Quality Criteria for Water" and the 1980 Ambient Water Quality Criteria Documents ("White Books")
2. The Vermont State Health Regulation, Part 5, Chapter 3 "Radiological Health", effective as of 12/10/77
3. 10 CFR 50, Appendix I

In establishing such limits the Secretary shall give consideration to the potential for bioaccumulation as well as any antagonistic or synergistic relationship that may exist between the wastes being discharged and the concentration of other wastes or constituents in the receiving waters. The discharge of radioactive wastes shall not exceed the lowest limits which are reasonably achievable.

Virginia⁴⁶

Public Water Supply 0.05 mg/l

Surface Water	Freshwater	190 µg/l	trivalent, dissolved
(Chronic Criteria For the Protection of Aquatic Life)	Saltwater	36 µg/l	inorganic

All

All State waters shall be free from substances attributable to sewage, industrial waste, or other wasted in concentration, amounts, or combinations which contravene established standards or interfere directly or indirectly with reasonable, beneficial uses of such water or which are inimical or harmful to human, animal, plant or aquatic life. Specific substances to be controlled include, but are not

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limited to: floating debris, oil, scum, and other floating material; toxic substances; substances that settle to form sludge deposits, and substances which nourish undesirable or nuisance aquatic plant life. Effluents which tend to raise the temperature of the receiving water will also be controlled.

Washington⁴⁷

All

Not specified

Extraordinary (Class AA) and Lake Class Waters

Toxic substances narrative: Toxic, radioactive, or deleterious material concentrations shall be less than those which adversely affect public health, the natural aquatic environment, or the desirability of the water for any use.

Excellent (Class A), Good (Class B), Fair (Class C) Waters

Toxic substances narrative: Toxic, radioactive, or deleterious material concentrations shall be below those of public health significance, or which may cause acute or chronic toxic conditions to the aquatic biota, or which may adversely affect any water use.

All

Deleterious concentrations of toxic, or other nonradioactive materials, shall be determined by the department in consideration of the Quality Criteria for Water, published by US EPA 1976, and as revised, as the authoritative source for criteria and/or other relevant information, if justified.

West Virginia⁴⁸

Category A

50 ug/l

Category B & C

440 ug/l

Other Categories

100 ug/l

All

No sewage, industrial wastes or other wastes present in any of the waters of the State shall cause or materially contribute to concentrations of materials harmful, hazardous or toxic to man, animal, or aquatic life.

Wisconsin⁴⁹

All

Not specified

All

Toxic substances narrative: Substances in concentrations or combinations which are toxic or harmful to humans shall not be present in amounts

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found to be of public health significance, nor shall substances be present in amounts which are acutely harmful to animal, plant or aquatic life.

Fish and Aquatic Life

Toxic substances narrative: Unauthorized concentrations of substances are not permitted that alone or in combination with other materials present are toxic to fish or other aquatic life. The determination of the toxicity of a substance shall be based upon the available scientific data base. References to be used in determining the toxicity of a substance shall include, but not be limited to:

1. "Quality Criteria for Water". EPA-440/9-76-003. United States Environmental Protection Agency, Washington, D.C., 1976, and
2. "Water Quality Criteria 1972". EPA-R3-73-033. National Academy of Sciences, National Academy of Engineering. United States Government Printing Office, Washington, D.C., 1974.
3. Questions concerning the permissible levels, or changes in the same, of a substance, or combination of substances, of undefined toxicity to fish and other biota shall be resolved in accordance with the methods specified in "Water Quality Criteria 1972", "Standard Methods for the Examination of Water and Wastewater", 14th Edition, 1975 (American Public Health Association, New York) or other methods approved by the department of natural resources.

Public Water Supply

Toxic substances narrative: The intake water supply will be such that by appropriate treatment and adequate safeguards it will meet the Public Health Service Drinking Water Standards, 1962.

Concentrations of other constituents must not be hazardous to health.

Wyoming⁵⁰

All

Not specified

All

Toxic substances narrative: Toxic or potentially toxic materials attributable to or influenced by the activities of man shall not be present in any Wyoming surface waters in concentrations or combinations which would damage or impair the normal growth, function or reproduction of human, animal, plant or aquatic life. Unless otherwise specified in these Standards, maximum allowable concentrations shall be based on the latest

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edition of Quality Criteria for Water, published by EPA or its successor agency, and/or more generally accepted scientific information.

In those cases where maximum allowable concentrations must be determined through bioassay, the appropriate protocol and application factors as outlined in the latest edition of Standard Methods for the Examination of Water and Wastewater or other methods approved by the EPA shall be used. The bioassay shall be conducted with an ecologically or economically important sensitive resident specie in the most sensitive portion of its life cycle, if applicable, as a test organism. Makeup water for the analysis should be constituted so as to approximate the most probable chemical and physical characteristics of the receiving water in question. The observed 96-hour LC50 is then to be multiplied by an application factor, where established by EPA, to determine the "safe" concentrations for the compound in question. Where appropriate application factors have not yet been established, the method for deriving said application factor shall be that described in the latest edition of Standard Methods or other methods approved by EPA.

Toxic substances specifically designed to kill or eliminate problem-causing aquatic life (such as mosquito larvae or heavy plant growth in irrigation ditches) may be added to surface waters of the State provided such substances are administered in accordance with label directions. However, compliance with label directions shall not exempt any person from the penalty provisions of W.S. 35-11-901(b).

This Section shall not apply to the use of fish toxicants by the Wyoming Game and Fish Department.

American Samoa 51

All Fresh Surface Water, Embayments, Open Coastal Water and Oceanic Waters (shall apply as a minimum within the zone of mixing)

Free from substances and conditions or combinations thereof attributable to sewage, industrial wastes, or other activities of man which may be toxic to humans, other animals, plants, and aquatic life.

Substances of unknown toxicity:

(a) All effluents containing materials attributable to the activities of man shall be considered harmful and not permissible until acceptable bioassay tests have shown otherwise. It is the obligation of the person producing the effluent to demonstrate that it is harmless, at the request of the Environmental Quality Commission.

(b) Compliance with Section VI, A-4 of these standards will be determined by use of indicator organisms, analysis of species diversity, population density, growth anomalies, bioassays of appropriate duration or other appropriate methods as specified by the Environmental Quality Commission.

(c) The survival of aquatic life in any waters shall not be less than that for the same water body in areas unaffected by sewage, industrial wastes or other activities of man, or, when necessary, for other control water that is consistent with the requirements for "Experimental Water" as described in Standard Methods for the Examination of Water and Wastewater (latest available edition). As a minimum, compliance with the objective as stated in the previous sentence shall be evaluated with a 96 hour bioassay.

(d) In addition, effluent limits based upon acute bioassays of effluents will be prescribed where appropriate, additional numerical receiving water limits including the water quality criteria used to support toxic effluent standards identified under

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Section 307 (a) of the Federal Water Pollution Control Act of 1972, as amended, will apply; further, numerical receiving water limits for specific toxicants will be established as sufficient data becomes available; and source control of toxic substances will be encouraged.

District of Columbia⁵²

All

Toxic substances narrative: The waters of the District shall be free from substances attributable to point or non-point sources discharged in concentrations that injure, are toxic to or produce adverse physiological or behavioral responses in humans, plants or animals.

Those criteria listed under the category of Toxics shall be applicable only to protection of the designated beneficial use for periods of less than ninety-six (96) hours. The determination of the criteria needed to protect the beneficial use for a longer period of time shall be made on a case-by-case basis and may be more stringent.

Class C (Aquatic Life, Waterfowl, Shore Birds, and Water Oriented Wildlife)

0.09 mg/l

Class D (Public Water Supply)

0.000002 mg/l

a risk factor of 10^{-6} is associated with the criterion; the preferred level is absolutely none.

Waters shall be free from toxicants and other substances in concentrations that cannot be reduced to levels safe for distribution by the existing or presently proposed water treatment facilities which use these waters.

Class G (Groundwaters)

Waters shall be free from toxicants and other substances in concentrations which might present a health hazard or render the groundwaters unusable.

Guam⁵³

All

General Criteria: All waters shall be free from substances, conditions or combinations thereof attributable to domestic, commercial and industrial discharges or agricultural, construction and land-use practices or other human activities that are toxic or harmful to humans, animals, plants or desirable aquatic life.

Analytical testing methods for these criteria shall be in accordance with the most recent editions of Standard Methods for the Examination of Water and Wastewater (APHA, AWWA, WPCF), Methods for Chemical Analysis of Water and Wastes (U.S. Environmental Protection Agency), and other methods acceptable to GEPA and possessing adequate procedural precision and accuracy.

Effects of toxic or other deleterious substances at levels or combinations sufficient to be toxic or harmful to human, animal, plant or aquatic life or in amounts sufficient to interfere with any beneficial use of the water, shall be evaluated as a minimum, by use of a 96-hour bioassay as described in the most recent edition of Standard Methods for the Examination of Water and Wastewater. Survival of test organisms shall not be less than that of controls which utilize appropriate water. Failure to determine the presence of toxic substances by this method shall not preclude determination of excessive levels of toxic substances on the basis of other criteria or methods.

All

Toxic substances narrative: In order to provide maximum protection for the propagation of fish and wildlife, concentrations of toxic substances (persistent or non-persistent, cumulative or non-cumulative); (a) shall not exceed 0.05 of the 96-hour LC_{50} at any time or place, nor should the 24-hour average concentration exceed 0.01 of the 96-hour LC_{50} or, (b) shall not exceed levels calculated by multiplying the appropriate application factor by the 96-hour LC_{50} values determined by using the most sensitive species of aquatic organism affected. Whichever value (a or b) is less shall be the maximum allowable concentration, unless this value exceeds the Maximum Numerical Limit, then the numerical limit shall constitute the maximum allowable concentration.

NOTE: Whenever natural concentrations of any toxic substance or element occur and exceed the limits established in these standards, this greater concentration shall constitute the limit, provided that this natural concentration was not directly affected by man-induced causes.

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Maximum Conc. level		Application Factor
mg/l	ug/l	
0.01	10.0	0.01

Free from toxic or other deleterious substances at levels or in combinations sufficient to be toxic or harmful to human, animal, plant, or aquatic life, or in amounts sufficient to interfere with any beneficial use of the water.

1 Surface Waters

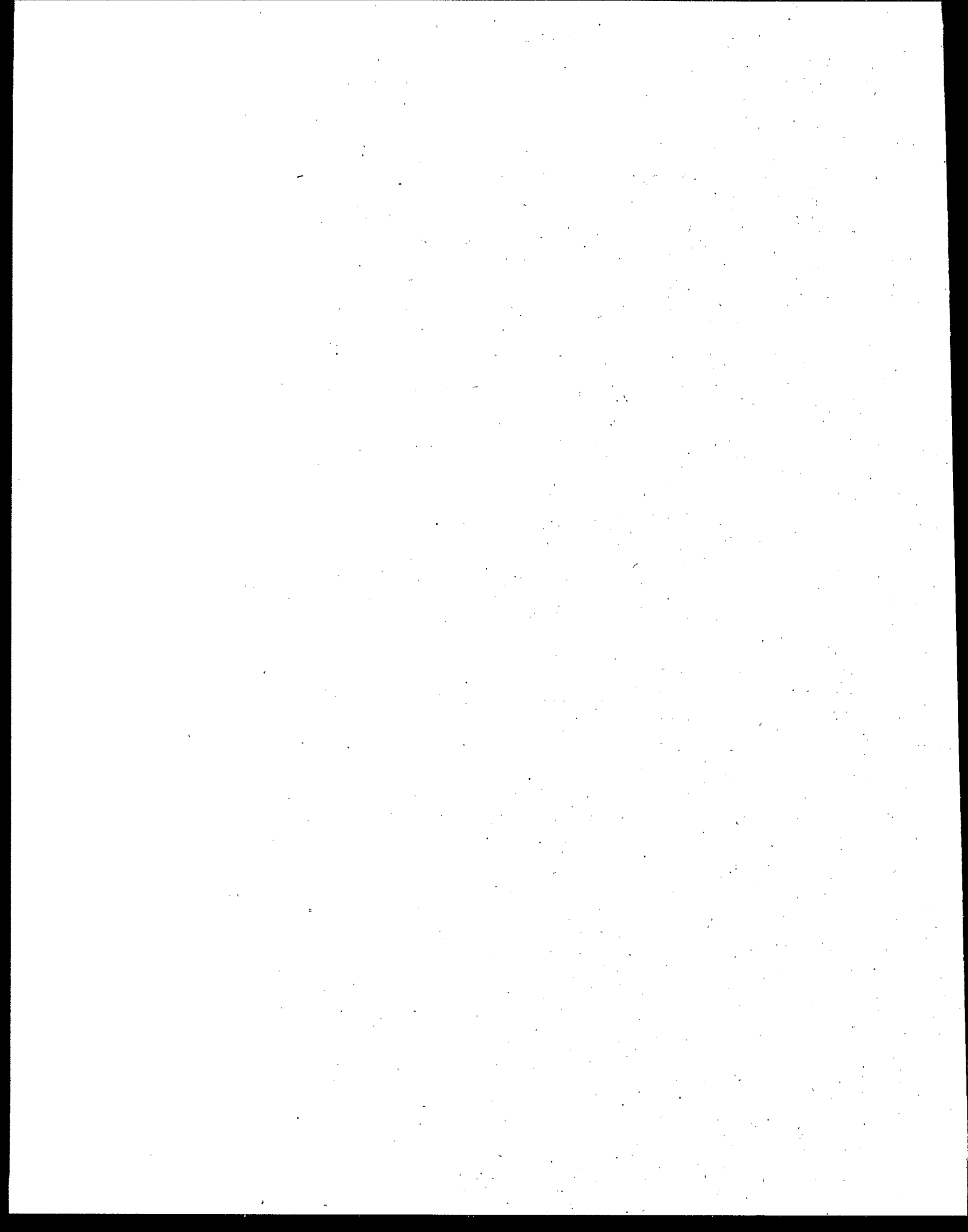
Toxic substances narrative: Criteria for toxic substances are given as either a maximum concentration or are determined by multiplying the stated application factor by the concentration determined to be lethal to 50% of the most sensitive indigenous organism after 96 hours of exposure (96 LC₅₀). The 96 LC₅₀ values shall be determined by using the bioassay procedures consistent with those described in the latest edition of Standard Methods for the Examination of Water and Wastewater.

The 96 LC₅₀ values shall be determined by using the most sensitive indigenous organism to the substance in question. When both an application factor and a maximum concentration are given, the lesser of the two resulting concentrations shall constitute the water quality standards.

General Toxic Standards: No substance or combination of substances including oil and petroleum products shall be present in surface water in amounts that exceed 0.01 times the 96 LC₅₀ concentration unless it can be demonstrated to the Department that a higher concentration has no adverse effect, chronic or acute, on the intended uses of the water body in question.

General Considerations: Analytical testing methods for these criteria shall be in accordance with the most recent editions of Standard Methods for the Examination of Water and Wastewater, and other methods published by knowledgeable authorities and possessing adequate procedural precision and accuracy.

Effects of toxic or other deleterious substances at levels or combinations sufficient to interfere with any beneficial use of the water, shall be evaluated as a minimum by the use of a 96-hour bioassay as described in the most recent editions of Standard Methods for the Examination of Water and Wastewater. Survival of test organisms shall not be less than that in controls which utilize appropriate water. Failure



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to determine presence of toxic substances by this method shall not preclude determination of excessive levels of toxic substances on the basis of other criteria or methods.

Pollutant discharges shall be controlled so as to protect not only the waters receiving the discharge directly, but also those waters into which the initial receiving waters may flow.

Puerto Rico⁵⁵

SB, SC (Coastal Waters) 150.0 ug/l

SD (Surface Waters) 50.0 ug/l

All

Toxic substances narrative: The waters of Puerto Rico shall not contain any substance in a concentration which is toxic or which produces undesirable physiological responses in human, fish or other animal life, and plants.

The waters of Puerto Rico shall not contain two or more substances whose combination is toxic or which will produce chronic or other undesirable physiological responses in humans, fish or other animal life and plants.

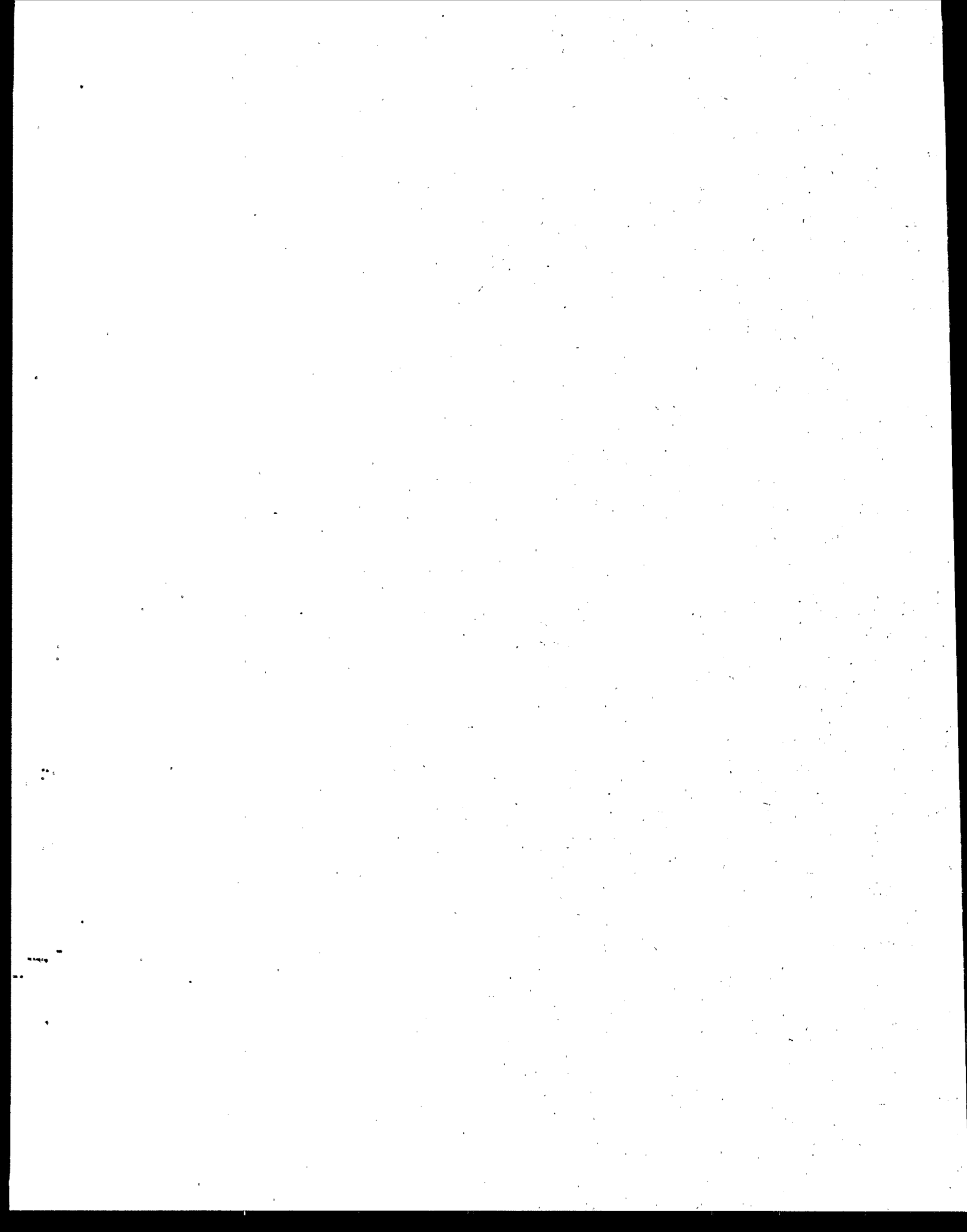
Trust Territory⁵⁶

All

Free from substances and conditions attributable to the activities of man that may be toxic or cause irritation to humans, animals, or plants.

	Marine		Class 1
<u>Limit</u>	<u>Factor</u>		<u>Limit</u>
0.01 mg/l	0.01		0.050 mg/l

Toxic substances narrative: Criteria for toxic substances are given as either a maximum concentration or are determined by multiplying the stated application factor by the concentration determined to be lethal to 50% of the most sensitive indigenous organism after 96 hours of exposure (96 LC). 96 LC values shall be determined by using bioassay procedures consistent with those described in the latest edition of Standard Methods for the Examination of Water and Wastewater. 96 LC 50 values shall be determined by using the most sensitive indigenous organism to the substance in question. When both an application factor and a maximum concentration are given, the lesser of the two shall constitute the



State and Water Use

Arsenic Criteria Values

water quality standard.

No substance or combination of substances shall be present in surface waters in amounts that exceed 0.01 times the 96 LC₅₀ concentration unless it can be demonstrated to the Board that a higher concentration has no adverse effect, chronic or acute, on the intended uses of the water body in question.

General considerations:

(1) All methods of sample collection, preservation, and analysis used to determine compliance with these standards shall be in accordance with those specified in the current edition of Standard Methods for the Examination of Water and Wastewater or methods specified by the EPA in 40 CFR Part 136, as appropriate.

Samples should be collected at approximately equal intervals and under those conditions of tide, rainfall, and time of day when pollution is most likely to be a maximum.

(2) Whenever natural conditions are of a lower quality than an assigned water quality criteria, the natural conditions shall constitute the water quality criteria.

(3) Whenever 2 numeric criteria are in conflict, the more stringent criteria shall constitute the water quality criteria.

(4) Pollutant discharges to either surface or ground waters shall be controlled so as to protect not only the receiving water but also those waters into which the initial receiving waters may flow.

Virgin Islands⁵⁷

All

All surface waters shall be free of substances attributable to municipal, industrial, or other discharges or wastes in concentrations or combinations which are toxic or which produce undesirable physiological responses in human, fish, and other animal life, and plants.

