Hopi Water Quality Standards

August 29, 1997

Ordinance # ___ of the Hopi Tribe

Title II
Hopi Water Quality Standards

Table of Contents

List of Acronyms and Abbreviations

A&W_c: Aquatic and wildlife (cold water habitat)

A&W_e: Aquatic and wildlife (ephemeral habitat)

A&W_{edh}: Aquatic and wildlife (effluent-dominated habitat)

A&W_w: Aquatic and wildlife (warm water habitat)

AgI: Agricultural irrigation

AgL: Agricultural livestock watering

CU: Color units

CFU: Colony forming units

DO: Dissolved oxygen

DWS: Domestic water source

EDW: Effluent-dominated water

EPA: U.S. Environmental Protection Agency

FBC: Full body contact

FDA: U.S. Food and Drug Administration

FC: Fish consumption

FTU: Formazin turbidity units (see American Public Health Association, *Standard Methods for the Examination of Water and Wastewater*)

GWR: Ground-water recharge

IND: Industrial water supply use

MCL: Maximum contaminant level

µg/L: Micrograms per liter

mg/L: Milligrams per liter

NNS: No numerical standard

NTU: Nephelometric turbidity units, a measure of turbidity in water

ONRW: Outstanding natural resource water

PBC: Partial body contact

PCB: Polychlorinated biphenyl

PCC: Primary contact ceremonial use

pCi: Picocurie

WTP: Water treatment plant

WWTP: Wastewater treatment plant

Chapter 1. Introduction, Authority, Applicability, General Provisions, and Exclusions

Section 1.101 Authority

Pursuant to Section 518 of the Clean Water Act[i], and Tribal Ordinance #___, the Hopi Water Quality Code, the Tribal Council of the Hopi Tribe, a federally recognized tribe of Indians, hereby enacts the Hopi Water Quality Standards.

Section 1.102 Purposes, Applicability and Exclusion

A. The purposes of the Hopi Water Quality Standards (hereinafter Standards) are as follows:

1. to designate the existing and attainable uses for which the surface waters of the Hopi Tribe shall be protected;
2. to prescribe water quality standards (narrative and numeric) imposed in order to sustain the designated uses;
3. to prescribe water quality standards (narrative and numeric) imposed in order to protect ground water;
4. to ensure that degradation of existing water quality does not occur; and
5. to promote the health, social welfare and economic well-being of the Hopi people.

These purposes shall be accomplished by incorporating the Standards established herein into the permitting and management process for point source dischargers and nonpoint source generators, by using those standards to determine when a designated use is threatened, and by using (1) current treatment technologies to control point sources and (2) best management practices to control nonpoint sources of pollution.

B. The Standards apply to all Hopi waters, inclusive of all waters within the exterior boundaries of the Hopi Indian Reservation, and water situated wholly or partly within or bordering upon the Reservation, whether public or private, except for private waters that do not combine with other surface or ground waters. The criteria apply to substances attributable to discharges, nonpoint sources, or instream activities. The criteria shall not apply to natural phenomena not brought about by human activity.

C. The Standards are consistent with Section 101(a)(2) of the Clean Water Act (33 U.S.C. Section 1251(a)(2)), which declares that "it is the national goal that, wherever attainable, an interim goal of water quality which provides for the protection and propagation of fish, shellfish, and wildlife and provides for recreation in and on the water be achieved by July 1, 1983 . . . ." In addition to these uses, primary contact ceremonial use, groundwater recharge, and agricultural and livestock water supply use are other beneficial uses of the Hopi waters. The Standards provide that any contamination that may result from such uses shall not lower the quality of the water below that which is required for recreation; protection and propagation of fish, shellfish and wildlife, primary contact ceremonial use, and agricultural and livestock water supply use or below the narrative and numeric criteria designated to protect ground water.

Section 1.103 Enforcement and Antidegradation

A. Enforcement of the Water Quality Standards established herein is the duty and responsibility of the Director of the Hopi Water Resources Program, who shall be designated as the Hopi Water Quality Control Officer. The Hopi Water Quality Control Officer shall work in cooperation with the U.S. Environmental Protection Agency (EPA) and other agencies of the federal government or of the State of Arizona.

B. The antidegradation policy for Hopi waters and the procedures for implementing it are set forth in Chapter 2 herein.

Section 1.104 Periodic Review and Revision

Pursuant to Section 303(c)(1) of the Clean Water Act (33 U.S.C. Section 1313(c)), the Hopi Tribe shall hold public hearings at least once each 3-year period for the purpose of reviewing and, as appropriate, amending the Standards. The Standards shall be reviewed once every 3 years following enactment. Revisions shall incorporate relevant scientific and engineering advances.

Section 1.105 Surface Water Use Designations, Tributary Streams

A. The Hopi Tribe shall issue and approve surface water designations for Hopi waters and shall determine the suitability of bodies of water for recreational or other purposes. A Hopi surface water that is not listed in Chapter 5 but that is tributary to a listed water shall be protected by the water quality standards that have been established for the nearest downstream water listed in Chapter 5 that is not an effluent-dominated water. Where the nearest downstream listed water is an ephemeral water, the aquatic and wildlife (ephemeral habitat) ($A\&W_e$) and partial body contact (PBC) standards (see Chapter 4 for discussion of designated uses) shall apply only to that portion of the tributary that is an ephemeral water. The aquatic and wildlife ($A\&W_w$) and full body contact (FBC) standards shall apply to that portion of the tributary that is not an ephemeral water.

B. Standards particular to a use shall be protected at all times, including periods of low flow rates. Where this low flow value is zero due to natural discharge fluctuations, all discharges shall meet standards for the designated uses. For standing water bodies, standards particular to a use shall be maintained whenever the water body is suitable for the use. The General Standards (Chapter 3) shall be maintained at all times and shall apply to streams, lakes, reservoirs, canals, drains, ground water, ponds, springs, and wetlands, whether perennial, ephemeral, or intermittent in nature. The standards assigned to a body of water shall be the most stringent standards required to protect all uses designated for that body of water. Reservoirs constructed outside Hopi surface waters used for domestic wastewater treatment are exempt from these standards, provided, however, that the water released from any such reservoir meets the standards that apply to the receiving body of water.

Section 1.106 Point and Non-Point Discharges

The Standards shall be the basis for managing discharges attributable to point and nonpoint sources of pollution. The Standards are not used to control, and are not invalidated by, natural conditions or acts of nature.

Section 1.107 Attainability and Modification

In the event that monitoring of water quality identifies reaches where attainable water quality is less than that which is required by the Standards, then the Hopi Tribe may modify the Standards to reflect attainability. Modification thereof shall be within the sole discretion of the Hopi Tribe, but shall be subject to the provisions of the Clean Water Act (33 U.S.C. Section 1251(a)(2)) and shall be carried out in accordance with use-attainability analysis procedures.

Section 1.108 New Data, Errors, and Exclusion

A. The Standards may be revised from time to time, or as the need arises, or as the result of updated scientific information.

B. Errors resulting from inadequate and erroneous data or human or clerical oversight will be subject to correction by the Hopi Tribe. The discovery of such errors does not render the remaining and unaffected standards invalid. If any provision of the Standards, or the application of any provision of these Standards to any person or circumstance, should be held to be invalid, the application of such provision to other persons and circumstances and the remainder of the Standards shall not be affected thereby.

C. The Standards prescribed herein do not apply to waste treatment systems, including ponds, lagoons, and constructed wetlands that are a part of such waste treatment systems. This exclusion applies only to man-made bodies of water that neither are originally created in a Hopi surface water nor result from the impoundment of a Hopi surface water.

Chapter 2. Antidegradation Policy and Implementation Plan

Section 2.101 Antidegradation Policy

A. Existing uses shall be protected; that is, the level of water quality necessary to protect existing uses shall be maintained.

B. Where existing water quality exceeds levels necessary to support propagation of fish and wildlife and recreation in and on the water, that level of water quality shall nonetheless be maintained and protected unless it is found, except in unique waters, after full satisfaction of governmental and public participation requirements, that a lower level of water quality is required in order to accommodate important economic or social development in the area of or downgradient of the waters. In no case shall water quality be decreased below that necessary to fully maintain the designated beneficial uses. In allowing such degradation of water quality, the Hopi Tribe shall impose the most protective statutory and regulatory requirements for point sources and shall impose best management practices for nonpoint sources.

C. Where high quality waters constitute an outstanding national or tribal resource, or waters of exceptional recreational or ecological significance, the water quality and uses of those unique water bodies shall be maintained and protected by controls on water quality, maintenance of natural flow regimes, and protection of instream habitats, or as set forth in Chapter 7.

D. In those cases where potential water quality impairments associated with thermal discharge are involved, the antidegradation policy and implementation method shall be consistent with Section 316 of the Clean Water Act, as amended (33 U.S.C. Section 1326 (1987)).

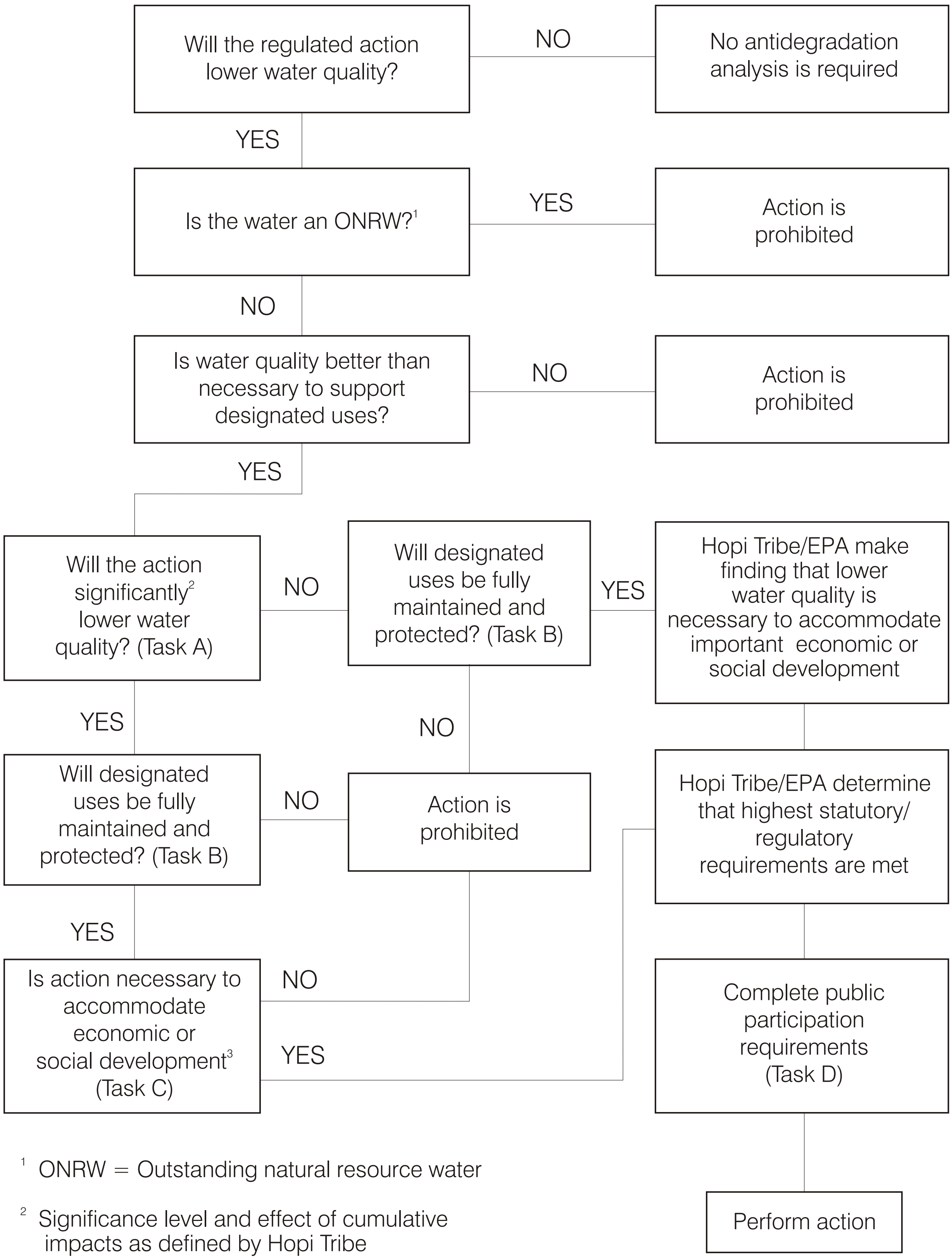
Section 2.102 Implementation Plan

A. Acting under the authority delegated by the Hopi Tribal Council, pursuant to the Hopi Water Quality Code, the Hopi Water Resources Program shall implement the Hopi Water Quality Standards, including the antidegradation policy, by establishing and maintaining controls on the introduction of pollutants into surface and ground waters. In addition, the Tribal Council may adopt additional regulations for enforcement of these water quality standards. More particularly, the Water Resources Program shall do the following:

    1. Monitor water quality to assess the effectiveness of pollution controls and to determine whether water quality standards are being attained.
    2. Obtain information as to the impact of effluents on receiving waters.
    3. Advise prospective dischargers of discharge and/or permit requirements.
    4. Review the adequacy of the existing database and obtain additional data when required.
    5. Assess the probable impact of effluents on receiving waters in light of designated uses and numeric and narrative standards.
    6. Require the highest and best degree of wastewater treatment practicable and commensurate with protecting and maintaining designated uses and existing water quality.

7. Develop water quality-based effluent limitations and comment on technology-based effluent limitations, as appropriate, for inclusion in any federal permit issued to a discharger pursuant to Section 402 of the Clean Water Act (33 U.S.C. Section 1342).
8. Require that these effluent limitations or any other appropriate limitations applicable to mining or other activities be included in any such permit as a condition for Tribal certification pursuant to Section 401 of the Clean Water Act (33 U.S.C. Section 1341).
9. Coordinate water pollution control activities with other local, state, tribal, and federal agencies, as appropriate.
10. Develop and pursue inspection and enforcement programs in order to ensure that dischargers comply with requirements of the Hopi Water Quality Standards and any requirements promulgated thereunder, and in order to support the enforcement of federal permits by the EPA.
11. Provide continuing technical training for wastewater treatment facility operators through training and certification programs.
12. Pursue funds to assist in the construction of publicly owned wastewater treatment facilities through the construction grants and revolving funds program authorized by the Clean Water Act (33 U.S.C. Section 1281) and other federal funds available for the purpose.
13. Encourage, in conjunction with other agencies, voluntary implementation of best management practices to control nonpoint sources of pollutants to achieve compliance with the Standards.
14. Require that sufficient instream flows be maintained to meet the narrative and numeric criteria specified herein.
15. Require that surface and ground-water withdrawals do not cause degradation of unique surface or ground-water bodies.
16. Examine existing and future Hopi policies pertaining to septic systems, solid waste disposal, range management practices, and any other relevant activities to ensure that these policies are sufficient to meet the criteria specified herein.
17. Ensure that ground-water withdrawals do not occur in quantities that will cause degradation of springs or riparian habitat.
18. Conduct an antidegradation analysis for regulated actions that may potentially impair water quality, as detailed in Figure 1.

Figure 1. Antidegradation Flow Chart



[1] ONRW = Outstanding natural resource water

[2] Significance level and effect of cumulative impacts as defined by Hopi Tribe

[3] Based on criteria defined by Hopi Tribe

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19. Evaluate the effectiveness of best management practices to prevent or abate nonpoint sources of pollution.
20. Ensure that the provisions for public participation required by the Clean Water Act are followed.

Unless and until the EPA delegates to the Hopi Tribe primary responsibility for National Pollutant Discharge Elimination System (NPDES) permitting, the EPA will develop and issue the permits for discharges on Hopi lands, and these permits shall comply with these standards. Enforcement of these standards shall be through implementation of the NPDES.

Chapter 3. General Standards

Section 3.101

The following General Standards apply to all surface and ground waters of the Hopi Tribe, including intermittent and ephemeral streams, provided, however, that where Chapters 4 and 5 set stricter standards for designated water bodies, the stricter standards supersede the General Standards:

A. Stream Bottom Deposits: Surface waters shall be free from contaminants from other than natural causes that may settle and have a deleterious effect on the aquatic biota or that will significantly alter the physical or chemical properties of the water or the bottom sediments.
B. Floating Solids, Oil, and Grease: Surface waters shall be free from objectionable oils, scum, foam, grease, and other floating materials and suspended substances of a persistent nature resulting from other than natural causes (including visible films of oil, globules of oil, grease, or solids in or on the water, or coatings on stream banks). As a guideline, oil and grease discharged into surface waters shall not exceed 10 mg/liter average or 15 mg/liter maximum.
C. Color: Surface waters shall be free from the true color-producing materials (other than those resulting from natural causes) that create an aesthetically undesirable condition. Color shall not impair the designated and other attainable uses of a water body. Color-producing substances from other than natural sources are limited to concentrations equivalent to 70 color units (CU).
D. Odor and Taste: Contaminants from other than natural causes are limited to concentrations that do not impart unpalatable flavor to fish, that do not result in offensive odor or taste arising from the water, and that do not otherwise interfere with the designated and other attainable uses of a water body. Taste and odor-producing substances from other than natural origins shall not interfere with the production of a potable water supply by modern treatment methods.

E. Nuisance Conditions: Plant nutrients or other substances stimulating algal growth from other than natural causes shall not be present in concentrations that produce objectionable algal densities or nuisance aquatic vegetation, or that result in a dominance of nuisance species instream, or that cause nuisance conditions in any other fashion. Phosphorus and nitrogen concentrations shall not be permitted to reach levels that result in man-induced eutrophication problems. As a guideline, total phosphorus shall not exceed 100 µg/L instream or 50 µg/L in lakes and reservoirs, except in waters highly laden with natural silts or color that reduces the penetration of sunlight needed for plant photosynthesis, or in other waters where it can be demonstrated that algal production will not interfere with or adversely affect designated and other attainable uses. Alternative or additional nutrient limitations for surface waters may be established by the Hopi Tribe and incorporated into water quality management plans.

F. Pathogens: Waters shall be free from pathogens. Waters used for irrigation of table crops (e.g., lettuce) shall be free of salmonella and shigella species.

G. Turbidity: Turbidity attributable to other than natural causes shall not reduce light transmission to a point at which aquatic biota are inhibited or to a point that causes an unaesthetic and substantial visible contrast with the natural appearance of the water. Specifically, turbidity shall not exceed 5 nephelometric turbidity units (NTU, a measure of turbidity in water) over background when background turbidity is 50 NTU or less, with no more than a 10-percent increase when background turbidity is more than 50 NTU.

H. Mixing Zones: Where effluent is discharged into surface waters, a continuous zone shall be maintained in which the water is of adequate quality to allow the migration of aquatic life with no significant effect on their population. The cross-sectional area of wastewater mixing zones shall generally be less than one quarter of the cross-sectional area or flow volume of the receiving stream. Mixing zones in lakes may be assessed and limited on a case-by-case basis. Unmixed zones containing permitted effluent shall not be allowed at locations of recreational or ceremonial use (see Chapter 4). Water quality standards shall be maintained throughout zones of passage. Zones of passage in lakes and intermittent streams may be designated on a site-specific basis. The water quality in a zone of passage shall not be permitted to fall below the standards for the designated water body(ies) within which the zone is contained. With regard to toxicity in mixing zones, see Subsection 3.O. Mixing zones are prohibited in ephemeral waters or where there is no water for dilution.

I. Radioactive Materials: Concentrations of radioactive constituents shall not exceed the concentration caused by naturally occurring materials. The combined dissolved concentration of radium-226 and radium-228 and the concentration of strontium-90 shall not exceed 5 picocuries per liter and 8 picocuries per liter, respectively. Gross alpha particle concentrations, including radium-226 but excluding radon and uranium, shall not exceed 15 picocuries per liter. The tritium concentration shall not exceed 20,000 picocuries per liter. The gross beta radiation concentration shall not exceed 50 picocuries per liter. The average annual concentration of beta particles and of photon radioactivity from man-made radionuclides in drinking water shall not produce an annual dose equivalent to the total body or any internal organ greater than 4 millirem per year.

J. Temperature: The introduction of heat by other than natural causes shall not increase the temperature in a stream, outside a mixing zone, by more than 2.7°C (5°F), based upon the monthly average of the maximum daily temperatures measured at mid-depth or 3 feet (whichever is less) outside the mixing zone. In lakes, the temperature of the water column or epilimnion (if thermal stratification exists) shall not be raised more than 1.7°C (3°F) above that which existed before the addition of heat of artificial origin, based upon the average of temperatures taken from the surface to the bottom of the lake, or surface to the bottom of the epilimnion (if stratified). The normal daily and seasonal variations that were present before the addition of heat from other than natural sources shall be maintained. In no case shall man-introduced heat be permitted when the maximum temperature specified for the reach (20°C/68°F for cold water fisheries and 32.2°C/90°F for warm water fisheries) would thereby be exceeded. High water temperatures caused by unusually high ambient air temperatures are not violations of these standards.

K. Salinity/Mineral Quality (total dissolved solids, chlorides, and sulfates): Existing mineral quality shall not be altered by municipal, industrial, and instream activities, or other waste discharges, so as to interfere with the designated or attainable uses for a water body. An increase of more than one-third over naturally occurring levels shall not be permitted.

L. pH: The following water quality standards for pH, expressed in standard units, shall not be violated by other than natural causes:

L. pH: The following water quality standards for pH, expressed in standard units, shall not be violated by other than natural causes:

pH	DWS	FBC, PBC, PCC, A&W [2]	AgI	AgL
Maximum	9.0	9.0	9.0	9.0
Minimum	5.0	6.5	4.5	6.5
Maximum change due to discharge	NNS	0.5	NNS	NNS

M. Dissolved oxygen: If a stream or other water body is capable of supporting aquatic biota, the dissolved oxygen standard will be a minimum of 6 mg/L.

N. Fecal coliform: The following water quality standards for fecal coliform, expressed in colony forming units per 100 milliliters of water (cfu/100 mL), shall not be exceeded:

1.

Fecal coliform	FBC, PCC	DWS, PBC, A&W[ii], AgI, AgL
30-day geometric mean (5 sample minimum)	200	1000
10% of samples for a 30-day period	400	2000
Single sample maximum	800	4000

2.

Fecal coliform in effluent-dominated waters	All designated uses
30-day geometric mean (5 sample minimum)	200
10% of samples for a 30-day period	400
Single sample maximum	800

O. Toxic Substances:

1. Toxic substances shall not be present in receiving waters in quantities that are toxic to human, animal, plant, or aquatic life, or in quantities that interfere with the normal propagation, growth, and survival of the sensitive indigenous aquatic biota. Within the mixing zone, there shall be no acute toxicity. There shall be no chronic toxicity at the edge of the mixing zone. For toxic substances lacking EPA-published criteria, biomonitoring data may be used to determine compliance with this narrative standard in accordance with EPA standard acute and chronic biological test protocols. These protocols can be found in

Methods for Measuring the Acute Toxicity of Effluents to Aquatic Organisms, EPA-600/4-90/027, and *Short Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms*, EPA-600/4-89/001. Additional guidelines can be found in the EPA documents *Technical Support Document for Water Quality-Based Toxics Control*, *Third Round Permitting Strategy*, and *Quality Criteria for Water*. The requirements for waters receiving toxic substances that are known to be persistent, bioaccumulative, carcinogenic, and/or synergistic with other waste stream components shall be addressed on a case-by-case basis.

2. The numerical water quality standards that apply for toxic substances for specific uses are listed in the Appendix to these Water Quality Standards. These standards are adopted from the Arizona Water Quality Standards for Navigable Waters. As new criteria documents for toxic substances are published by EPA, these will become incorporated into and made a part of the Appendix of the Hopi Water Quality Standards, during triennial review, and the numeric criteria established by EPA shall equally apply. Numeric criteria for carcinogens will reflect a risk level of one in one million (10^{-6}).
3. For specific segments where the above criteria may need to be recalculated using appropriate species or water quality factors, the Hopi Tribe may, after public participation and EPA approval, adopt site-specific criterion modifications.
4. Because pesticides and polychlorinated biphenyls (PCBs) can accumulate in bottom sediments and tissues of aquatic organisms, sediment and tissue analyses shall be used when appropriate to complement water analyses. Chemical concentration levels in tissues of aquatic organisms that exceed FDA action limits shall require investigation.

Chapter 4. Water Body Uses and Standards Specific to the Uses

Section 4.101 Applicability of Uses and Standards

The water quality standards prescribed in this chapter and in the Appendix to these Standards apply to all Hopi surface waters listed in Chapter 5 and their tributaries. The numeric standards for toxic substances specific to the uses are listed in the Appendix.

Section 4.102 Specific Water Quality Uses and Standards

The following Water Quality Standards and Uses are hereby established:

A. Aquatic and Wildlife (Cold Water Habitat) ($A\&W_c$). A cold water habitat is a stream reach, lake, or impoundment where water temperature and other characteristics are suitable for support and propagation of animals, plants and other organisms, including salmonids.

Standards specific to the use are as follows:

1. Dissolved oxygen minimum: 7 mg/L
2. Temperature maximum: 20°C (68°F)
3. pH range: 6.5 to 9.0
4. Un-ionized ammonia (as N) maximum: 0.03 mg/L
5. Total residual chlorine maximum: 0.011 mg/L

B. Aquatic and Wildlife (Warm Water Habitat) ($A\&W_w$). A warm water habitat is a stream reach, lake, or impoundment where water temperature and other characteristics are suitable for support and propagation of animals, plants, or other organisms (excluding salmonids).

Standards specific to the use are as follows:

1. Dissolved oxygen minimum: 6 mg/L
2. Temperature maximum: 32.2°C (90°F)
3. pH range: 6.5 to 9.0
4. Un-ionized ammonia (as N) maximum: 0.04 mg/L
5. Total residual chlorine maximum: 0.011 mg/L

C. Aquatic and Wildlife (Ephemeral) ($A\&W_e$). An ephemeral habitat is a stream reach, lake, or other water body where water temperature and other characteristics are periodically suitable for support and propagation of animals, plants, or other organisms (excluding salmonids).

Standards specific to the use are as follows:

1. Dissolved oxygen minimum: 6 mg/L
2. Temperature maximum: 32.2°C (90°F)
3. pH range: 6.5 to 9.0
4. Un-ionized ammonia (as N) maximum: 0.04 mg/L
5. Total residual chlorine maximum: 0.011 mg/L

D. Primary Contact Ceremonial (PCC). Primary contact ceremonial means the use of a spring, stream reach, lake, or other water body for religious or traditional purposes by members of the Hopi Tribe; such use involves immersion and intentional or incidental ingestion of water, and it requires protection of sensitive and valuable aquatic life and riparian habitat.

Standards specific to the use are as follows:

1. Fecal coliform[iii]

   Geometric mean maximum: 200 cfu/100 mL (geometric mean calculation based on a minimum of five samples taken over a maximum of 30 days)

   Single sample maximum: 800 cfu/100 mL
2. Turbidity[3] shall not exceed 25 NTUs.

3. The open water shall be free from algae in concentrations causing a nuisance condition or causing gastrointestinal or skin disorders.
4. Concentrations of the substances listed in the Appendix to these Standards shall not exceed the numeric water quality standards for full body contact.

E. Full Body Contact (FBC). Full body contact means the use of a surface water that causes the human body to come into direct contact with the water to the point of complete submergence. The use is such that ingestion of the water is likely to occur and certain sensitive body organs, such as the eyes, ears or nose, may be exposed to direct contact with the water.

   Standards specific to the use are:

   1. Fecal coliform[3]

      Geometric mean maximum: 200 cfu/100 mL (geometric mean calculation based on a minimum of five samples taken over a maximum of 30 days)

      Single sample maximum: 800 cfu/100 mL
   2. pH range: 6.6 to 9.0
   3. The open water shall be free from algae in concentrations causing a nuisance condition or causing gastrointestinal or skin disorders.

F. Partial Body Contact (PBC). Partial body contact means the use of a stream reach, spring, reservoir, and other water body in which contact with the water may, but need not, occur and in which the probability of ingesting water is minimal; examples are fishing and boating.

   Standards specific to the use are:

   1. Fecal coliform:[3]

      Geometric mean maximum: 1,000 cfu/100 mL (geometric mean calculation based on a minimum of five samples taken over a maximum of 30 days)

      Single sample maximum: 4,000 cfu/100 mL
   2. The open water shall be free from algae in concentrations causing a nuisance condition or causing gastrointestinal or skin disorders.

G. Agricultural Irrigation (AgI) and Agricultural Livestock Watering (AgL). Agricultural irrigation means the use of surface waters for irrigation of crops. Agricultural livestock watering means the use of surface waters as a supply for water consumption by livestock.

   Standards specific to the uses are:

   1. Fecal coliform:[3]

      Geometric mean maximum: 1000 colonies/100 mL (geometric mean calculation based on a minimum of five samples taken over a maximum of 30 days)

      Single sample maximum: 2000 colonies/100 mL

2. Concentration of the following substances shall not exceed the following criteria:

Substance	Livestock	Irrigation
Aluminum	5.0 mg/L	5.0 mg/L
Boron	5.0 mg/L	0.75 mg/L
Cobalt	1.0 mg/L	0.05 mg/L
Fluoride	2.0 mg/L	1.0 mg/L
Lithium	--	2.5 mg/L
Molybdenum	--	0.01 mg/L
Vanadium	0.1 mg/L	0.1 mg/L

H. Fish Consumption (FC). Fish consumption is the use of a surface water by humans for harvesting aquatic organisms for consumption. Harvestable aquatic organisms include, but are not limited to, fish, clams, turtles, crayfish, and frogs. There are no standards specific to the use except as listed in the Appendix. The General Standards (Chapter 3) apply.

I. Industrial Water Supply (IND). Industrial water supply use means use with reference to the production of goods or services for profit. There are no standards specific to the use. The General Standards (Chapter 3) apply.

J. Ground-Water Recharge (GWR). Ground-water recharge use means any surface water that recharges ground water. Surface waters designated as ground-water recharge must meet the standards for the aquifer being recharged as well as the surface water standards.

K. Domestic Water Source (DWS). Domestic water source use means the use of a surface or ground water as a potable water supply. The general standards in Chapter 3 and the narrative standards in the Appendix apply.

Chapter 5. Designated Uses for Water Bodies of the Hopi Reservation

Section 5.101 Streams

The uses are listed below for all perennial, intermittent and ephemeral streams that pass through the Hopi Reservation, including all tributaries, branches, springs, standing waters, and wetlands thereof:

Name	Designated Use
Dinnebito Wash	$A\&W_w$, PBC, AgL, AgI, GWR
Jeddito Wash	$A\&W_w$, PBC, AgL, AgI, GWR
Moencopi Wash	$A\&W_w$, PBC, AgL, AgI, PCC, GWR
Oraibi Wash	$A\&W_w$, PBC, AgL, AgI, GWR
Polacca Wash	$A\&W_w$, PBC, AgL, AgI, GWR
Wepo Wash	$A\&W_e$, PBC, AgL, AgI, GWR
All other streams	$A\&W_w$, PBC, AgL, AgI, GWR

Section 5.102 Lakes

The uses are listed below for lakes and reservoirs on the Hopi Reservation:

Name	Designated Use
Keams Canyon (Beaver Dam)	$A\&W_w$, FBC, AgI, FC
Middle Reservoir	$A\&W_w$, FBC, AgI
Pasture Canyon Reservoir	$A\&W_w$, FBC, AgI, FC
Tuvi Reservoir	$A\&W_w$, FBC, AgI
All other lakes and reservoirs	$A\&W_w$, FBC, AgI

Section 5.103 Springs

The uses are listed below for springs on the Hopi Reservation:

Name	Designated Use
Augba Spring (Akpi)	$A\&W_w$, PBC, DWS, PCC
Bacavi Spring	$A\&W_w$, PBC, DWS, PCC, AgI
Blue Canyon	$A\&W_w$, PBC
Burro Spring-North	$A\&W_w$, PBC, AgL
Burro Spring-South	$A\&W_w$, PBC, AgL
Comar Spring	$A\&W_w$, PBC, AgL
Coyote Spring	$A\&W_w$, PBC, AgI, AgL
Drag Spring	$A\&W_w$, PBC
Flute Spring	$A\&W_w$, PBC, PCC
Honie Spring	$A\&W_w$, PBC, DWS, PCC, AgL
Hotevilla Spring	$A\&W_w$, PBC, DWS, PCC, AgI

Name	Designated Use
Kalbito	A&W_w
Keams Canyon Source Springs	A&W_w, PBC, AgI
Keams Canyon Springs	A&W_w, PBC, DWS
Little Burro Spring	A&W_w, PBC, AgL
Little Field Spring	A&W_w, PBC, AgI
Lamova (Lavavi)	A&W_w, PBC, PCC, AgI
Moencopi Spring	A&W_w, PBC, DWS, PCC
Nee De Mise Betoh	A&W_w, PBC, AgL
Polacca Spring	A&W_w, PBC, AgI, AgL
Redrock Spring Well	A&W_w, PBC, DWS, PCC, AgL
Rock Ledge Spring	A&W_w, PBC, AgL
Sand Spring	A&W_w, PBC, AgL
Sand Springs-North	A&W_w, PBC, DWS, AgL
Sand Springs-South	A&W_w, PBC, AgL
Shonto Spring	A&W_w, PBC, AgL
Shonto Well Spring	A&W_w, PBC, AgL
Side Rock Well Spring	A&W_w, PBC, AgL
Snowbird Spring	A&W_w, PBC, AgL
Sweet Water Spring	A&W_w, PBC, AgL
Tepva Spring	A&W_w, PBC, AgI, AgL
Wepo Spring No. 1	A&W_w, PBC, AgI, AgL
Wepo Spring No. 2	A&W_w, PBC, AgI
Whisky Spring	A&W_w, PBC, AgL

All springs not included on this list shall be protected for the following uses: A&W_w, PBC, AgL.

D. The uses are listed below for ground water on the Hopi Reservation.

Name	Designated Use
N-aquifer	DWS, AgI, AgL
All other aquifers	AgI, AgL

Chapter 6. Sampling and Analyses

Section 6.101

Methodology: Sample collection, preservation, and analysis used to determine water quality and to maintain the standards set forth in Chapters 3 and 4 of these Water Quality Standards shall be performed in accordance with procedures prescribed by the latest EPA authoritative analytical reference, including but not limited to the latest editions of any of the following authorities:

- American Public Health Association, Standard Methods for the Examination of Water and Wastewater
- "Methods for Chemical Analysis of Water and Wastes"
- "EPA Guidelines Establishing Test Procedures for the Analysis of Pollutants"

Section 6.102

Bacteriological Surveys: When a minimum of five samples per day are collected in a 30-day period, the monthly geometric mean is used in assessing attainment of standards. When less than five samples are collected in a 30-day period, no single sample shall exceed the applicable upper limit for bacterial density set forth in Chapter 4.

Section 6.103 Sampling Procedures

A. Streams: Stream monitoring stations below waste discharges shall be located a sufficient distance downstream to ensure adequate vertical and lateral mixing.

B. Reservoirs: Sampling stations in reservoirs shall be located where the attainment of a water quality standard is to be assessed, but at least 250 feet from a waste discharge. Water quality measurements shall be taken at depth intervals in the water column at a sampling station. For toxic substances and nutrients, the entire water column shall be monitored. For dissolved oxygen in stratified lakes, measurements shall be made in the epilimnion. In nonstratified lakes measurements shall be made at intervals throughout the entire water column.

C. Biological Surveys: Any biological assessment program shall be established in accordance with EPA's *Rapid Bioassessment Protocols for Use in Streams and Rivers: Benthic Macroinvertebrates and Fish*. As needed, artificial collection sites shall be installed in lowland streambeds to determine potential species diversity under improved stream conditions.

Chapter 7. Unique Waters

Section 7.101 Designation and Classification

A. The designation and classification of a Hopi surface water as a unique water shall be by rule.

B. To maintain and protect existing water quality in a unique water, the Tribal Council may adopt, by rule, site-specific water quality standards.

C. Any person may nominate a Hopi surface water for classification as a unique water by filing a petition for rule adoption with the Hopi Tribe Water Resources Program. A petition for rule adoption to classify a Hopi surface water as a unique water shall include:

   1. A map and a description of the water
   2. A written statement in support of the nomination, including specific reference to the applicable criteria for unique waters classification as prescribed in Subsection D of this section
   3. Supporting evidence demonstrating that one or more of the applicable unique waters criteria prescribed in Subsection D of this section has been met
   4. Relevant water quality data

D. A Hopi surface or ground water may be classified as a unique water by the Water Resources Program after a public hearing and upon a finding that the water is an outstanding tribal resource water based upon one of the following criteria:

   1. The water is of exceptional recreational, traditional, or ecological significance because of its unique attributes, including but not limited to attributes related to the geology, flora, fauna, water quality, aesthetic values, or the wilderness characteristics of the water.
   2. Threatened or endangered species are known to be associated with the water and the existing water quality is essential to the maintenance and propagation of a threatened or endangered species, or the water provides critical habitat for a threatened or endangered species. Threatened or endangered species are identified on the following lists which are hereby incorporated by reference and are on file with the Office of the Secretary of State of Arizona and with the Arizona Department of Environmental Quality:
      a. Endangered and Threatened Wildlife and Plants, 50 CFR, §§ 17.11 and 17.12 (revised as of July 15, 1991)
      b. "Threatened Native Wildlife of Arizona," Arizona Game and Fish Department (July 21, 1988)
      c. List of protected groups of plants prescribed in Arizona Administration Code (A.A.C.) R3-1-615 and A.A.C. R3-1-616 (January 17, 1989)
      d. List of Migratory Birds, 50 CFR §10.13 (April 5, 1985)
      e. "Endangered and Threatened Species of Arizona," U.S. Fish & Wildlife Service (Summer 1991)

E. The following Hopi surface waters are hereby classified as unique waters:
   In the Moencopi Wash watershed, from Blue Canyon Springs to the confluence of Begashibito Wash.
F. The following Hopi ground waters are classified as unique waters:
   The N-aquifer and all areas recharging the N-aquifer. The N-aquifer includes water-bearing units of the Navajo Sandstone, the Kayenta Formation, the Wingate Sandstone, and all springs emanating from these units.
G. The following water quality standards apply to the listed unique waters. Water quality standards prescribed in this subsection supplement or supersede the water quality standards prescribed in Chapters 3 and 4.

Parameter	Standard
Fecal Coliform	400 cfu/100 mL (single sample maximum)
pH	no change due to discharge
Temperature	no increase due to discharge
Dissolved oxygen	no decrease due to discharge
Total dissolved solids	no increase due to discharge

Chapter 8. Definitions

Unless otherwise provided, or unless the context requires another definition, the definitions set forth in this chapter shall apply to the terms used throughout Title II, "Water Quality Standards."

Acute Toxicity: Toxicity that exerts short-term unacceptable impacts on representative sensitive organisms with a duration of exposure generally less than or equal to 96 hours.

Agricultural irrigation: The use of a water for the irrigation of crops.

Agricultural livestock watering: The use of a water as a supply of water for consumption by livestock.

Algae: Simple plants without roots, stems, or leaves that contain chlorophyll and are capable of photosynthesis.

Annual mean: The arithmetic mean of monthly values determined over a consecutive 12-month period, provided that monthly values are determined for at least 3 months. The monthly value shall be the arithmetic mean of all values determined in a calendar month.

Antidegradation: The policy set forth in U.S. Environmental Protection Agency Water Quality Standards Regulations under the Clean Water Act whereby existing uses and the level of water quality necessary to maintain those uses is maintained and protected (see 40 CFR Section 131.12 (1987)).

Aquatic and wildlife (cold water habitat): The use of a water by animals, plants, or other organisms, including salmonids, for habitation, growth, or propagation.

Aquatic and wildlife (effluent-dominated water): The use of an effluent-dominated water by animals, plants or other organisms for habitation, growth, or propagation.

Aquatic and wildlife (ephemeral): The use of an ephemeral water by animals, plants, or other organisms, excluding fish, for habitation, growth, or propagation.

Aquatic and wildlife (warm water habitat): The use of a water by animals, plants, or other organisms, excluding salmonids, for habitation, growth, or propagation.

Aquatic biota: Animal and plant life in the water.

Attainable use: A use of a surface or ground water body which has the level of water quality and other characteristics that are needed to support the use, or which would have the level of water quality and other characteristics needed to support the use upon implementation of and compliance with the pertinent narrative and numeric standards in the Hopi Water Quality Standards.

Best management practices: Practices undertaken to control, restrict, and diminish nonpoint sources of pollution that are consistent with the purposes of the Hopi Water Quality Standards and with the narrative and numeric standards contained therein; measures, sometimes structural, that are determined to be the most effective practical means of preventing or reducing pollution of water bodies from nonpoint sources.

Carcinogenic: Cancer producing.

Chronic toxicity: Toxicity that exerts sublethal negative effects such as impairment of growth or reproduction, or which becomes lethal after long-term exposure, generally measured in a 28-day test on representative sensitive organisms.

Clean Water Act: The Federal Water Pollution Control Act, as amended by the Water Quality Act of 1987 (and no future amendments), which is incorporated by reference and is on file with the Office of the Secretary of State.

Cold water habitat: A stream reach, lake, or impoundment where water temperature and other characteristics are suitable for support and propagation of cold water fish such as brown trout, cutthroat trout, brook trout, or rainbow trout.

Color: True color as well as apparent color. True color is the color of the water from which turbidity has been removed. Apparent color includes not only the color due to substances in solution (true color), but also that color due to suspended matter.

Criteria: Elements of water quality standards that are expressed as pollutant concentrations or levels, or narrative statements representing a water quality that supports a designated use.

Cumulative: Increasing by successive additions.

Designated uses: Those uses set forth in the water quality standards herein.

Dissolved oxygen: The amount of oxygen dissolved in water or the amount of oxygen available for biochemical activity in water, commonly expressed as a concentration in milligrams per liter.

Domestic water source: The use of a water as a potable water supply. Coagulation, sedimentation, filtration, disinfection, or other treatments may be necessary to yield a finished water suitable for human consumption. This also applies to small water sources not normally covered under the provisions of the Safe Drinking Water Act.

Drinking water: Water that meets the general standards set forth in Chapter 3 and that only requires disinfection in order to be usable for drinking or cooking.

Effluent: Discharge into surface waters from other than natural sources.

Effluent-dominated water: A navigable water that consists primarily of discharges of treated wastewater and that has been classified as an effluent-dominated water by the Tribal Council.

Ephemeral stream: A stream or reach that flows briefly only in direct response to precipitation or snowmelt in the immediate locality, the channel bed of which is always above the water table in the surrounding area.

Epilimnion: The layer of water that overlies the thermocline of a lake and that is subject to the action of wind.

Eutrophication: The maturation of a body of water, involving increasing concentrations of dissolved nutrients and seasonal oxygen deficiency.

Existing uses: Those uses actually attained in a surface water body on or after November 28, 1975, whether or not they are referred to in the Hopi Water Quality Standards, or a use that the existing water quality will allow.

FDA Action Limits: Levels promulgated by the U.S. Food and Drug Administration (FDA) concerning concentrations of substances in food.

Fecal coliform bacteria: Gram negative, non-spore-forming rod-shaped bacteria that are present in the gut or the feces of warm-blooded animals. Fecal coliform bacteria generally include organisms that are capable of producing gas from lactose broth in a suitable culture medium within 24 hours at $44.5 \pm 0.2°C$.

Fish consumption: The use of a surface water by humans for harvesting aquatic organisms for consumption. Harvestable aquatic organisms include, but are not limited to, fish, clams, turtles, crayfish, and frogs.

Fish culture: The production of cold water or warm water fish in a hatchery or rearing station.

Full body contact: The use of a surface water that causes the human body to come into direct contact with the water to the point of complete submergence. The use is such that ingestion of the water is likely to occur and certain sensitive body organs, such as the eyes, ears, or nose, may be exposed to direct contact with the water.

Geometric mean: The antilog of the log of a set of numbers. The geometric mean is calculated using the following formula.

$$G.M._{y} = \sqrt[n]{(Y_1)(Y_2)(Y_3)\ldots(Y_n)}$$

Ground-water recharge: The use of a surface water as a source of recharge to ground water.

Hardness: The sum of the calcium and magnesium concentrations, expressed as calcium carbonate ($CaCO_3$) in milligrams per liter.

Hopi surface waters: The surface waters of the Hopi Reservation. Referred to as "navigable waters" in U.S. Environmental Protection Agency documents.

Indigenous: Produced, growing, or living naturally in a particular region or environment.

Industrial water supply use: The use of water with reference to the production of goods or services for profit.

Intermittent stream: A stream or reach of a stream that flows only at certain times of the year, when receiving flow from springs, melting snow, or localized precipitation.

LC-50: The concentration of a substance that is lethal to 50 percent of the test organisms within a defined time period.

Marginal cold water fishery: A stream reach, lake, or impoundment where water temperature and other characteristics are suitable for support of cold water fish (such as brown trout, cutthroat trout, brook trout, or rainbow trout), but where temperature and other characteristics may not always be suitable for propagation of cold water fish.

Micrograms per liter (μg/L): The concentration at which one microgram is contained in a volume of one liter; one microgram per liter is equivalent to one part per billion (ppb) at unit density.

Milligrams per liter (mg/L): The concentration at which one milligram is contained in a volume of one liter; one milligram per liter is equivalent to one part per million (ppm) at unit density.

Mixing zone: A three-dimensional zone in which discharged effluent mixes with the receiving water and within which there is a gradation of water quality.

Narrative standard: A standard or criterion expressed in words rather than numerically.

National Pollutant Discharge Elimination System: The point source discharge permit program established by Section 402 of the Clean Water Act.

Natural conditions: Characteristics that are not man-induced that are related to water quality; the levels of pollutants present in ambient water that are from natural, as opposed to man-induced, sources.

Ninetieth percentile: The value that may not be exceeded by more than 10 percent of the observations in a consecutive 12-month period.

Nonpoint source: A source of pollution that is not a discernible, confined, and discrete conveyance; a diffuse source that flows across natural or man-made surfaces, such as run-off from agricultural, construction, mining, or silvicultural activities, or from urban areas.

Nuisance condition: A condition involving uncontrolled growth of aquatic plants, usually caused by excessive nutrients in the water.

Nutrient: A chemical element or inorganic compound taken in by green plants and used in organic synthesis.

Oil: Petroleum in any form, including but not limited to crude oil, gasoline, kerosene, fuel oil, diesel oil, lubricating oil, or sludge.

Partial body contact: The use of a surface water that may cause the human body to come into direct contact with the water, but normally not to the point of complete submergence. The use is such that ingestion of the water is not likely to occur, nor will sensitive body organs such as the eyes, ears, or nose normally be exposed to direct contact with the water; examples are fishing and boating.

Perennial stream: A stream or reach of a stream that flows continuously throughout the year, the upper surface of which is generally lower than the water table of the region adjoining the stream.

Persistent: Resistant to degradation or change.

pH: The negative logarithm of the effective hydrogen-ion concentration in gram equivalents per liter; a measure of the acidity or alkalinity of a solution, increasing with increasing alkalinity and decreasing with increasing acidity.

Picocurie: That quantity of radioactive material producing 2.22 nuclear transformations per minute.

Point source: Any discernible, confined, and discrete conveyance from which pollutants are or may be discharged into a water body; does not include return flows from irrigated agriculture.

Primary contact ceremonial use: The use of a stream, spring, reservoir, impoundment, or other water body for religious or traditional purposes by members of the Hopi Tribe; such use involves immersion, and intentional or accidental ingestion of water, and it requires protection of sensitive and valuable aquatic life and riparian habitat.

Recreational uses: The full body contact and partial body contact designated uses.

Regional Administrator: The regional administrator of Region IX of the U.S. Environmental Protection Agency.

Segment: A water quality standards segment, the surface waters of which have common hydrologic characteristics or flow regulation regimes, possess common natural physical, chemical, and biological characteristics, and exhibit common reactions to external stresses, such as the discharge of pollutants.

Synergism: Cooperative action of discrete agents such that the total effect is greater than the sum of the effects taken independently.

Technology-based controls: The application of technology-based effluent limitations as required under Section 301(b) of the Clean Water Act.

Thermal Stratification: Horizontal layers of different densities produced in a lake and caused by temperature.

Total nitrogen: The sum of the concentrations of ammonia (NH_3), ammonium ion (NH_4^+), nitrite (NO_2^-), nitrate (NO_3^-), and dissolved and particulate organic nitrogen expressed as elemental nitrogen.

Total phosphorus: All the phosphorus present in the sample, regardless of form, as measured by a persulfate digestion procedure.

Toxic: Those pollutants, or combination of pollutants, which after discharge and upon exposure, ingestion, inhalation, or assimilation into any organism, either directly from the environment or indirectly by ingestion through food chains, may cause death, disease, behavioral abnormalities, cancer, genetic mutations, physiological malfunctions (including malfunctions in reproduction), or physical deformations in such organisms or their offspring.

Toxicity: State or degree of being toxic or poisonous; producing lethal or sublethal adverse effects on representative sensitive organisms, due to exposure to toxic materials.

Turbidity: A measure of the amount of suspended material, particles, or sediment that has the potential for adverse impacts on aquatic biota.

Unique water: A Hopi water that has been classified as an outstanding Tribal resource water by the Tribal Council.

Use-attainability analysis: A structured scientific assessment of the factors affecting attainment of a use for a body of water, such assessment may include physical, chemical, biological, and economic factors, such as those referred to in 40 CFR Section 131.10(g), and guidance for which may be found in U.S. Environmental Protection Agency, *Technical Support Manual: Waterbody Surveys and Assessments for Conducting Use-Attainability Analyses* (Volume 1 - Streams; Volume 2 - Estuarine Systems; Volume 3 - Lake Systems).

Warm water fishery: A stream reach, lake, or impoundment where water temperature and other characteristics are suitable for support and propagation of warm water fish such as large-mouth black bass, small-mouth black bass, crappie, white bass, bluegill, flathead catfish, or channel catfish.

Water Contaminant: Any substance that alters the physical, chemical, or biological qualities of water.

Water quality-based controls: Effluent limitations, as provided under Section 301(b)(1)(C) of the Clean Water Act, which are developed and imposed on point-source discharges in order to protect and maintain applicable water quality standards. These controls are more stringent than the technology-based effluent limitations required under other paragraphs of Section 301(b).

Wetlands: Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands include swamps, marshes, bogs, cienegas, tinajas, and similar areas.

Zone of passage: The portion of the receiving water outside the mixing zone (where water quality throughout is the same as that of the receiving water).

Notes:

i. 33 U.S.C. Section 1377 (enacted February 4, 1987).

ii. Includes $A\&W_c$, $A\&W_w$, and $A\&W_e$

iii. Fecal coliform and turbidity both can vary suddenly and unpredictably. Accordingly, fecal coliform and turbidity effluent limits that would be allocated to dischargers in order for the standards set forth herein to be met shall apply regardless of instantaneous natural background levels.

As an alternative to fecal coliform, the Hopi Tribe may adopt and apply standards for E. coli at a geometric mean maximum of 47 colonies/100 mL and a single sample maximum of 88 colonies/100 mL, in accordance with an illness rate of 4 per 1,000 exposures.

Appendix

Numeric Water Quality Standards

Appendix A - Numeric Water Quality Standards

PARAMETERS		DWS[1] (µg/L)	FC[1] (µg/L)	FBC[1] (µg/L)	PBC[1] (µg/L)	A&Wc Acute[2] (µg/L)	A&Wc Chronic[3] (µg/L)	A&Ww Acute[2] (µg/L)	A&Ww Chronic[3] (µg/L)	A&Wedw Acute[2] (µg/L)	A&Wedw Chronic[3] (µg/L)	A&We Acute[2] (µg/L)	A&We Chronic[3] (µg/L)	AgI[1] (µg/L)	AgL[1] (µg/L)
Acenaphthene		420	2600	8400	8400	850	550	850	550	850	550	NNS	NNS	NNS	NNS
Acenaphthylene		0.003	0.002	0.12	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
Acrolein		110	750	1300	1300	34	30	34	30	34	30	NNS	NNS	NNS	NNS
Acrylonitrile	c	0.06	0.64	2.6	1400	3800	250	3800	250	3800	250	NNS	NNS	NNS	NNS
Alachlor	c1	2	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
Aldrin	c	0.002	0.0003	0.08	4.2	2.0	NNS	2.0	NNS	2.0	NNS	4.5	NNS	1	1
Ammonia		NNS	NNS	NNS	NNS	b	b	b	b	NNS	NNS	NNS	NNS	NNS	NNS
Anthracene		2100	6300	420000	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
Antimony (as Sb)		2.8 T	140 T	56 T	56 T	88 D	30 D	88 D	30 D	1000 D	600 D	NNS	NNS	NNS	NNS
Arsenic (as As)	c2	50 T	3.1 T	50 T	2800 T	360 D	190 D	360 D	190 D	360 D	190 D	440 D	230 D	2000 T	200 T
Asbestos	c	a	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
Atrazine		3	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
Barium (as Ba)		1000 D	NNS	1000 D	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
Benzene	c1	5	120	48	470	2700	180	2700	180	11000	700	NNS	NNS	NNS	NNS
Benzidine	c	0.0002	0.0007	0.006	420	1300	89	1300	89	1300	89	10000	640	0.01	0.01
Benzo (a) anthracene	c	0.003	0.00008	0.12	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
Benzo (a) pyrene	c	0.003	0.002	0.12	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
Benzo (ghi) perylene		0.003	0.00001	0.12	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
Benzo (k) fluoranthene	c	0.003	0.00001	0.12	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
3,4-Benzofluoranthene	c	0.003	0.00004	0.12	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
Beryllium (as Be)	c	0.008 T	0.21 T	0.33 T	700 T	65 D	5.3 D	65 D	5.3 D	65 D	5.3 D	NNS	NNS	NNS	NNS
BHC-alpha	c	0.006	0.03	0.22	NNS	1600	130	1600	130	1600	130	1600	130	NNS	NNS
BHC-beta	c	0.02	0.02	0.78	NNS	1600	130	1600	130	1600	130	1600	130	NNS	NNS
BHC-delta	c	NNS	NNS	NNS	NNS	1600	130	1600	130	1600	130	1600	130	NNS	NNS
BHC-gamma (lindane)	c	0.20	0.02	1	2500	2.0	0.08	3.4	0.28	7.6	0.61	11	0.9	NNS	NNS
Bis(2-chloroethoxy) methane		NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
Bis(2-chloroethyl) ether	c	0.03	1.4	1.3	NNS	120000	6700	120000	6700	120000	6700	NNS	NNS	NNS	NNS
Bis(2-chloroisopropyl) ether		280	15000	5600	5600	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
Bis-(2-ethylhexyl) phthalate	c	2.5	7.4	100	280000	400	360	400	360	400	360	3100	360	NNS	NNS
Boron (as B)		NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	1000 T	NNS
Bromoform		TTHM	80	180	2800	15000	10000	15000	10000	15000	10000	NNS	NNS	NNS	NNS
4-Bromophenyl phenyl ether		NNS	NNS	NNS	NNS	180	14	180	14	180	14	NNS	NNS	NNS	NNS
Butyl benzyl phthalate		1400	5000	28000	28000	1700	130	1700	130	1700	130	NNS	NNS	NNS	NNS
Cadmium (as Cd)		5 T	83 T	70 T	70 T	d D	d D	d D	d D	d D	d D	d D	d D	50 T	50 T
Carbofuran		40	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
Carbon tetrachloride	c2	5	5.5	11	8000	18000	1100	18000	1100	18000	1100	NNS	NNS	NNS	NNS
Chlordane	c3	2	0.001	2	110	2.4	0.004	2.4	0.21	2.4	0.21	3.2	0.45	NNS	NNS
Chlorine (Total residual)		NNS	NNS	NNS	NNS	11	5.0	11	5.0	11	5.0	NNS	NNS	NNS	NNS
Chlorobenzene		100	500	2800	2800	9800	620	9800	620	NNS	NNS	NNS	NNS	NNS	NNS
Chlorodibromomethane		TTHM	12	17	2800	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
Chloroethane		NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
2-Chloroethyl vinyl ether		NNS	NNS	NNS	NNS	180000	9800	180000	9800	180000	9800	NNS	NNS	NNS	NNS
Chloroform		TTHM	590	230	1400	14000	900	14000	900	14000	900	NNS	NNS	NNS	NNS
2-Chloronapthalene		560	13000	11000	11000	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
2-Chlorophenol		35	2100	700	700	2200	150	2200	150	2200	150	NNS	NNS	NNS	NNS

PARAMETERS	DWS[1] (µg/L)	FC[1] (µg/L)	FBC[1] (µg/L)	PBC[1] (µg/L)	A&Wc Acute[2] (µg/L)	A&Wc Chronic[3] (µg/L)	A&Ww Acute[2] (µg/L)	A&Ww Chronic[3] (µg/L)	A&Wedw Acute[2] (µg/L)	A&Wedw Chronic[3] (µg/L)	A&We Acute[2] (µg/L)	A&We Chronic[3] (µg/L)	AgI[1] (µg/L)	AgL[1] (µg/L)
3-methyl-4-Chlorophenol	NNS	NNS	NNS	NNS	15	4.7	15	4.7	15	4.7	48000	15000	NNS	NNS
4-Chlorophenyl phenyl ether	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
Chromium (as Cr)	100 T	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	1000 T	1000 T
Chromium (as Cr III)	NNS	67000 T	140000 T	140000 T	e D	e D	e D	e D	e D	e D	e D	e D	NNS	NNS
Chromium (as Cr VI)	NNS	3400 T	700 T	700 T	16 D	11 D	16 D	11 D	16 D	11 D	34 D	23 D	NNS	NNS
Chrysene c	0.003	0.0001	0.12	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
Copper (as Cu)	1000 D	NNS	5200 D	5200 D	f D	f D	f D	f D	f D	f D	f D	f D	5000 T	500 T
Cyanide	140 T	210000 T	3100 T	3100 T	22 T	5.2 T	41 T	9.7 T	41 T	9.7 T	84 T	19 T	NNS	200 T
DDD c	0.15	0.0009	5.8	NNS	1.1	0.001	1.1	0.02	1.1	0.02	1.1	0.02	0.001	0.001
DDE c	0.1	0.0006	4.1	NNS	1.1	0.001	1.1	0.02	1.1	0.02	1.1	0.03	0.001	0.001
DDT c	0.1	0.0005	4.1	700	1.1	0.001	1.1	0.001	1.1	0.001	1.1	0.006	0.001	0.001
Dibenzo (ah) anthracene c	0.003	0.00003	0.12	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
1,2-Dichlorobenzene	600	2800	13000	13000	790	300	1200	470	1200	470	5900	2300	NNS	NNS
1,3-Dichlorobenzene	94	1200	13000	13000	2500	970	2500	970	2500	970	NNS	NNS	NNS	NNS
1,4-Dichlorobenzene	75	1200	13000	13000	560	210	2000	780	2000	780	6500	2500	NNS	NNS
3,3-Dichlorobenzidine c	0.08	0.09	3.1	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
Dichlorobromomethane	TTHM	10	11	2800	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
Dichlorobromopropane c3	0.2	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
1,1-Dichloroethane	NNS	NNS	14000	14000	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
1,2-Dichloroethane c4	5	120	15	10000	59000	41000	59000	41000	59000	41000	NNS	NNS	NNS	NNS
1,1-Dichloroethylene c5	7	4.5	7	1300	15000	950	15000	950	15000	950	NNS	NNS	NNS	NNS
1,2-cis-Dichloroethylene	70	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
1,2-trans-Dichloroethylene	100	13000	2800	2800	68000	3900	68000	3900	68000	3900	NNS	NNS	NNS	NNS
2,4-Dichlorophenol	21	810	420	420	1000	88	1000	88	1000	88	NNS	NNS	NNS	NNS
Dichlorophenoxyacetic acid	70	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
1,2-Dichloropropane c6	5	NNS	200	200	26000	9200	26000	9200	26000	9200	NNS	NNS	NNS	NNS
1,3-Dichloropropene	2.1	360	60	60	3000	1100	3000	1100	3000	1100	NNS	NNS	NNS	NNS
Dieldrin c	0.002	0.0002	0.09	7	2.5	0.002	2.5	0.002	2.5	0.005	4.0	0.9	1	1
Diethyl phthalate	5600	110000	110000	110000	26000	1600	26000	1600	26000	1600	NNS	NNS	NNS	NNS
Dimethyl phthalate	70000	2800000	14000000	NNS	17000	1000	17000	1000	17000	1000	NNS	NNS	NNS	NNS
2,4-Dimethylphenol	140	2200	28000	NNS	1000	310	1000	310	1100	310	150000	43000	NNS	NNS
2,4-Dinitrophenol	14	5400	280	280	110	9.2	110	9.2	110	9.2	NNS	NNS	NNS	NNS
2-methyl-4,6-Dinitrophenol	2.7	120	550	NNS	310	24	310	24	310	24	NNS	NNS	NNS	NNS
2,4-Dinitrotoluene c	0.009	0.02	0.38	NNS	15000	970	15000	970	15000	970	NNS	NNS	NNS	NNS
2,6-Dinitrotoluene	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
2,3,7,8-TCDD (Dioxin) c	0.0000002	0.000000004	0.000009	NNS	0.01	0.005	0.01	0.005	0.12	0.01	0.1	0.01	NNS	NNS
1,2-Diphenylhydrazine c	0.04	0.25	1.8	NNS	130	11	130	11	130	11	NNS	NNS	NNS	NNS
Di-n-butyl phthalate	700	2300	14000	14000	470	35	470	35	470	35	1100	84	NNS	NNS
Di-n-octyl phthalate	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
Endosulfan sulfate	0.35	0.78	70	NNS	0.22	0.06	0.22	0.06	0.22	0.06	3.0	1.5	NNS	NNS
Endosulfan-alpha	0.35	0.92	70	NNS	0.22	0.06	0.22	0.06	0.22	0.06	3.0	1.5	NNS	NNS
Endosulfan-beta	0.35	0.92	70	NNS	0.22	0.06	0.22	0.06	0.22	0.06	3.0	1.5	NNS	NNS
Endrin	0.2	1.1	40	40	0.18	0.002	0.2	0.08	0.2	0.08	0.7	0.3	0.004	0.004
Endrin aldehyde	2.1	0.81	420	NNS	0.18	0.002	0.2	0.08	0.2	0.08	0.7	0.3	NNS	NNS
Ethlybenzene	700	110000	64000	64000	23000	1400	23000	1400	23000	1400	NNS	NNS	NNS	NNS
Ethylene dibromide c7	0.05	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
Fluoranthene	280	130	5600	5600	2000	1600	2000	1600	2000	1600	NNS	NNS	NNS	NNS

PARAMETERS	DWS[1] (µg/L)	FC[1] (µg/L)	FBC[1] (µg/L)	PBC[1] (µg/L)	A&Wc Acute[2] (µg/L)	A&Wc Chronic[3] (µg/L)	A&Ww Acute[2] (µg/L)	A&Ww Chronic[3] (µg/L)	A&Wedw Acute[2] (µg/L)	A&Wedw Chronic[3] (µg/L)	A&We Acute[2] (µg/L)	A&We Chronic[3] (µg/L)	AgI[1] (µg/L)	AgL[1] (µg/L)
Fluorene	280	580	5600	5600	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
Fluoride	4000	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
Heptachlor c8	0.400	0.0002	0.31	20	0.52	0.004	0.52	0.004	0.58	0.013	0.9	0.1	NNS	NNS
Heptachlor epoxide c8	0.200	0.0001	0.15	2	0.52	0.004	0.52	0.004	0.58	0.013	0.9	0.1	NNS	NNS
Hexachlorobenzene c	0.02	0.002	0.83	100	6.0	3.7	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
Hexachlorobutadiene c	0.45	0.52	18	280	45	8.2	45	8.2	45	8.2	NNS	NNS	NNS	NNS
Hexachlorocyclopentadiene	49	550	1000	1000	3.5	0.3	3.5	0.3	3.5	0.3	NNS	NNS	NNS	NNS
Hexachloroethane c	2.5	4.8	100	140	490	350	490	350	490	350	850	610	NNS	NNS
Indeno (1,2,3-cd) pyrene c	0.003	0.000003	0.12	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
Isophorone c	8.5	520	340	28000	59000	43000	59000	43000	59000	43000	NNS	NNS	NNS	NNS
Lead (as Pb)	50 T	NNS	NNS	NNS	g D	g D	g D	g D	g D	g D	g D	g D	10000 T	100 T
Manganese (as Mn)	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	10000	NNS
Mercury (as Hg)	2.1 T	0.6 T	42 T	42 T	2.4 D	0.01 D	2.4 D	0.01 D	2.4 D	0.01 D	2.4 D	0.01 D	NNS	10 T
Methoxychlor	40	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
Methyl bromide	9.8	7500	200	200	5500	360	5500	360	5500	360	NNS	NNS	NNS	NNS
Methyl chloride c	5.7	1800	230	2800	270000	15000	270000	15000	270000	15000	NNS	NNS	NNS	NNS
Methylene chloride c	4.7	480	190	27000	97000	5500	97000	5500	97000	5500	NNS	NNS	NNS	NNS
Naphthalene	NNS	NNS	560	560	1100	210	3300	600	3300	600	NNS	NNS	NNS	NNS
Nickel (as Ni)	140 T	400 T	2800 T	2800 T	h D	h D	h D	h D	h D	h D	h D	h D	NNS	NNS
Nitrate (as N)	10000	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
Nitrate/nitrite (Total as N)	10000	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
Nitrite (as N)	1000	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
Nitrobenzene	3.5	600	70	70	13000	850	13000	850	13000	850	NNS	NNS	NNS	NNS
2-Nitrophenol	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
4-Nitrophenol	NNS	NNS	NNS	NNS	4100	3000	4100	3000	4100	3000	NNS	NNS	NNS	NNS
N-nitrosodimethylamine c	0.0007	2.1	0.03	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
N-nitrosodiphenylamine c	7.1	12	290	NNS	2900	200	2900	200	2900	200	NNS	NNS	NNS	NNS
N-nitrosodi-n-propylamine c	0.005	0.51	0.2	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
PCBs c9	0.5	0.00009	0.18	NNS	2.0	0.01	2.0	0.02	2.0	0.02	11	2.5	0.001	0.001
Pentachlorophenol	210	29000	2000	2000	i	i	i	i	i	i	i	i	NNS	NNS
Phenanthrene	0.003	0.0005	0.12	NNS	30	6.3	30	6.3	54	6.3	NNS	NNS	NNS	NNS
Phenol	4200	6500000	84000	84000	5100	730	7000	1000	7000	1000	180000	26000	NNS	NNS
Pyrene	210	1100	4200	4200	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
Selenium (as Se)	50 T	9000	420	420 T	20 T	2.0 T	20 T	2.0 T	50 T	2 T	33 T	2.0 T	20 T	50 T
Silver (as Ag)	NNS	NNS	NNS	NNS	j D	NNS	j D	NNS	j D	NNS D	j D	NNS D	NNS	NNS
Styrene c9	100	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
Sulfides	NNS	NNS	NNS	NNS	100	NNS	100	NNS	100	NNS	100	NNS	NNS	NNS
1,1,2,2-Tetrachloroethane c	0.17	11	7	450	4700	3200	4700	3200	4700	3200	NNS	NNS	NNS	NNS
Tetrachloroethylene c10	5.00	11	35	4000	2600	280	6500	680	6500	680	15000	1600	NNS	NNS
Thallium (as Tl)	0.63 T	44 T	3700 T	3700 T	700 D	150 D	700 D	150 D	700 D	150 D	NNS	NNS	NNS	NNS
Toluene	1000	90000	42000	42000	8700	180	8700	180	8700	180	NNS	NNS	NNS	NNS
Toxaphene c9	3.0	0.0008	3.0	1000	0.73	0.0002	0.73	0.02	0.73	0.02	11	1.5	0.005	0.005
2,4,5-TP (m)	50	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
1,2,4-Trichlorobenzene	NNS	NNS	2800	2800	750	130	1700	300	NNS	NNS	NNS	NNS	NNS	NNS
1,1,1-Trichloroethane	200	160000	13000	13000	2600	1600	2600	1600	2600	1600	NNS	NNS	NNS	NNS
1,1,2-Trichloroethane c11	0.61	31	25	560	18000	12000	18000	12000	18000	12000	NNS	NNS	NNS	NNS
Trichloroethylene c12	5.0	78	110	NNS	20000	1300	20000	1300	20000	1300	NNS	NNS	NNS	NNS

PARAMETERS		DWS[1] (µg/L)	FC[1] (µg/L)	FBC[1] (µg/L)	PBC[1] (µg/L)	A&Wc Acute[2] (µg/L)	A&Wc Chronic[3] (µg/L)	A&Ww Acute[2] (µg/L)	A&Ww Chronic[3] (µg/L)	A&Wedw Acute[2] (µg/L)	A&Wedw Chronic[3] (µg/L)	A&We Acute[2] (µg/L)	A&We Chronic[3] (µg/L)	AgI[1] (µg/L)	AgL[1] (µg/L)
2,4,6-Trichlorophenol	c	3.2	4.9	130	NNS	160	25	160	25	160	25	3000	460	NNS	NNS
Trihalomethanes, Total	c	100	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
Uranium (as Ur)		35 D	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
Vinyl chloride	c13	2.0	620	80	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
Xylenes (Total)		10000	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS	NNS
Zinc (as Zn)		5000 T	NNS	28000	28000	k D	k D	k D	k D	k D	k D	k D	k D	10000 T	25000 T

µg/L - micrograms per liter

a - The standard to protect this use is 7 million fibers (longer than 10 micrometers) per liter.

b - Values for ammonia are contained in separate tables located at the end of Appendix A.

c - Indicates that the parameter is a known, probable or possible human carcinogen and that the standards to protect DWS, FC and FBC are based on carcinogenicity. A "c" by itself indicates that the excess cancer risk level for the DWS designated use is 1×10^{-6}. A "c" followed by a number indicates that the excess cancer risk level for the DWS designated use only is greater than 1×10^{-6}. These excess cancer risk levels, multiplied by 10^{-6} are: c1=5; c2=17; c3=67; c4=13; c5=117; c6=10; c7=125; c8=50; c9=100; c10=7; c11=8; c12=2; and c13=133. The excess cancer risk level for the FC and FBC designated uses is 1×10^{-6}.

d - Cadmium - A&Wc acute standard: $e^{(1.128 [\ln(Hardness)] - 3.828)}$

A&Wc chronic standard: $e^{(0.7852 [\ln(Hardness)] - 3.490)}$

A&Ww acute standard: $e^{(1.128 [\ln(Hardness)] - 2.0149)}$

A&Ww chronic standard: $e^{(0.7852 [\ln(Hardness)] - 3.490)}$

A&Wedw acute standard: $e^{(1.128 [\ln(Hardness)] - 2.0149)}$

A&Wedw chronic standard: $e^{(0.7852 [\ln(Hardness)] - 3.490)}$

A&We acute standard: $e^{(1.128 [\ln(Hardness)] - 0.9691)}$

A&We chronic standard: $e^{(0.7852 [\ln(Hardness)] - 3.490)}$

(See Footnote 4)

e - Chromium III - A&Wc acute standard: $e^{(0.8190 [\ln(Hardness)] + 3.688)}$

A&Wc chronic standard: $e^{(0.8190 [\ln(Hardness)] + 1.561)}$

A&Ww acute standard: $e^{(0.8190 [\ln(Hardness)] + 3.688)}$

A&Ww chronic standard: $e^{(0.8190 [\ln(Hardness)] + 1.561)}$

A&Wedw acute standard: $e^{(0.8190 [\ln(Hardness)] + 4.9361)}$

A&Wedw chronic standard: $e^{(0.8190 [\ln(Hardness)] + 1.561)}$

A&We acute standard: $e^{(0.8190 [\ln(Hardness)] + 3.688)}$

A&We chronic standard: $e^{(0.8190 [\ln(Hardness)] + 1.561)}$

(See Footnote 4)

f - Copper - A&Wc acute standard: $e^{(0.9422\,[\ln(Hardness)]\,-\,1.464)}$

A&Wc chronic standard: $e^{(0.8545\,[\ln(Hardness)]\,-\,1.465)}$

A&Ww acute standard: $e^{(0.9422\,[\ln(Hardness)]\,-\,1.464)}$

A&Ww chronic standard: $e^{(0.8545\,[\ln(Hardness)]\,-\,1.465)}$

A&Wedw acute standard: $e^{(0.9422\,[\ln(Hardness)]\,-\,1.464)}$

A&Wedw chronic standard: $e^{(0.8545\,[\ln(Hardness)]\,-\,1.465)}$

A&We acute standard: $e^{(0.9422\,[\ln(Hardness)]\,-\,1.1514)}$

A&We chronic standard: $e^{(0.8545\,[\ln(Hardness)]\,-\,1.1448)}$

(See Footnote 4)

g - Lead - A&Wc acute standard: $e^{(1.2730\,[\ln(Hardness)]\,-\,1.460)}$

A&Wc chronic standard: $e^{(1.2730\,[\ln(Hardness)]\,-\,4.705)}$

A&Ww acute standard: $e^{(1.2730\,[\ln(Hardness)]\,-\,1.460)}$

A&Ww chronic standard: $e^{(1.2730\,[\ln(Hardness)]\,-\,4.705)}$

A&Wedw acute standard: $e^{(1.2730\,[\ln(Hardness)]\,-\,1.460)}$

A&Wedw chronic standard: $e^{(1.2730\,[\ln(Hardness)]\,-\,4.705)}$

A&We acute standard: $e^{(1.2730\,[\ln(Hardness)]\,-\,0.7131)}$

A&We chronic standard: $e^{(1.2730\,[\ln(Hardness)]\,-\,3.9518)}$

(See Footnote 4)

h - Nickel - A&Wc acute standard: $e^{(0.8460\,[\ln(Hardness)]\,+\,3.3611)}$

A&Wc chronic standard: $e^{(0.8460\,[\ln(Hardness)]\,+\,1.1644)}$

A&Ww acute standard: $e^{(0.8460\,[\ln(Hardness)]\,+\,3.3611)}$

A&Ww chronic standard: $e^{(0.8460\,[\ln(Hardness)]\,+\,1.1644)}$

A&Wedw acute standard: $e^{(0.8460\,[\ln(Hardness)]\,+\,3.3611)}$

A&Wedw chronic standard: $e^{(0.8460\,[\ln(Hardness)]\,+\,1.1644)}$

A&We acute standard: $e^{(0.8460\,[\ln(Hardness)]\,+\,4.4389)}$

A&We chronic standard: $e^{(0.8460\,[\ln(Hardness)]\,+\,2.2417)}$

(See Footnote 4)

i - Pentachlorophenol - A&Wc acute standard: $e^{(1.005\ (pH)\ -\ 4.830)}$

A&Wc chronic standard: $e^{(1.005\ (pH)\ -\ 5.290)}$

A&Ww acute standard: $e^{(1.005\ (pH)\ -\ 4.830)}$

A&Ww chronic standard: $e^{(1.005\ (pH)\ -\ 5.290)}$

A&Wedw acute standard: $e^{(1.005\ (pH)\ -\ 4.830)}$

A&Wedw chronic standard: $e^{(1.005\ (pH)\ -\ 5.290)}$

A&We acute standard: $e^{(1.005\ (pH)\ -\ 3.4306)}$

A&We chronic standard: $e^{(1.005\ (pH)\ -\ 3.9006)}$

(See Footnote 5)

j - Silver - A&Wc acute standard: $e^{(1.72\ [\ln(Hardness)]\ -\ 6.52)}$

A&Ww acute standard: $e^{(1.72\ [\ln(Hardness)]\ -\ 6.52)}$

A&Wedw acute standard: $e^{(1.72\ [\ln(Hardness)]\ -\ 6.52)}$

A&We acute standard: $e^{(1.72\ [\ln(Hardness)]\ -\ 6.52)}$

(See Footnote 4)

k - Zinc - A&Wc acute standard: $e^{(0.8473\ [\ln(Hardness)]\ +\ 0.860)}$

A&Wc chronic standard: $e^{(0.8473\ [\ln(Hardness)]\ +\ 0.761)}$

A&Ww acute standard: $e^{(0.8473\ [\ln(Hardness)]\ +\ 0.860)}$

A&Ww chronic standard: $e^{(0.8473\ [\ln(Hardness)]\ +\ 0.761)}$

A&Wedw acute standard: $e^{(0.8473\ [\ln(Hardness)]\ +\ 0.860)}$

A&Wedw chronic standard: $e^{(0.8473\ [\ln(Hardness)]\ +\ 0.761)}$

A&We acute standard: $e^{(0.8473\ [\ln(Hardness)]\ +\ 3.1342)}$

A&We chronic standard: $e^{(0.8473\ [\ln(Hardness)]\ +\ 3.0484)}$

(See Footnote 4)

l - The standard to protect this use is 0.003 µg/L aldrin/dieldrin.
m - 2,4,5-Trichlorophenoxyacetic acid

1 - The numeric standards to protect this use shall not be exceeded.
2 - Determination of compliance with acute standards shall be as prescribed in Section 3.101.0.
3 - Determination of compliance with chronic standards shall be as prescribed in Section 3.101.0.
4 - Hardness is determined pursuant to the methods specified for the definition of hardness Section 101. Hardness is determined from a series of samples taken at a location representative of the hardness where the sample for the metal is taken. The hardness value selected should represent fairly critical conditions; e.g., be exceeded 90% of the time at the sampling site. Hardness, expressed as mg/L $CaCO_3$, is then inserted into the equation where it says "Hardness". The minimum hardness allowed for use in the equation is 25 mg/L and the maximum is 400 mg/L.
5 - The pH at the time and location that the sample for pentachlorophenol was taken is inserted into the equation where it says "pH".
NNS - No numeric standard.
D - Dissolved
T - Total recoverable
TTHM - Indicates that the chemical is a trihalomethane. See trihalomethanes for DWS standard.

A&Wc - ACUTE

Total Ammonia mg-N/liter (or mg NH3-N/liter)

pH	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	25	30 and above	pH
	Temperature in Degrees Celsius																							
6.5	29	28	28	27	27	27	27	26	26	26	25	25	25	25	25	24	24	24	24	24	24	16.6	11.8	6.5
6.6	28	27	27	27	26	26	26	25	25	25	25	24	24	24	24	24	24	23	23	23	23	16.2	11.4	6.6
6.7	27	27	26	26	26	25	25	25	24	24	24	24	23	23	23	23	23	23	23	22	22	15.6	11.1	6.7
6.8	26	25	25	25	24	24	24	24	23	23	23	23	23	22	22	22	22	22	22	22	21	15.0	10.6	6.8
6.9	25	24	24	24	23	23	23	22	22	22	22	22	21	21	21	21	21	21	21	21	20	14.3	10.1	6.9
7.0	23	23	22	22	22	22	21	21	21	21	20	20	20	20.0	19.9	19.7	19.6	19.5	19.4	19.3	19.2	13.4	9.5	7.0
7.1	22	21	21	21	20	20	19.9	19.6	19.5	19.3	19.1	18.9	18.8	18.6	18.5	18.4	18.3	18.2	18.1	18.0	17.9	12.5	8.9	7.1
7.2	19.8	19.6	19.2	19.0	18.8	18.5	18.4	18.1	17.9	17.8	17.6	17.5	17.3	17.2	17.0	16.9	16.8	16.7	16.7	16.6	16.5	11.6	8.2	7.2
7.3	18.0	17.8	17.5	17.3	17.1	16.9	16.7	16.5	16.3	16.2	16.0	15.9	15.8	15.6	15.5	15.4	15.3	15.2	15.2	15.1	15.0	10.6	7.5	7.3
7.4	16.2	16.0	15.7	15.5	15.3	15.1	15.0	14.8	14.6	14.5	14.4	14.3	14.1	14.0	13.9	13.8	13.8	13.7	13.6	13.6	13.5	9.5	6.7	7.4
7.5	14.3	14.1	13.9	13.7	13.6	13.4	13.3	13.1	13.0	12.8	12.7	12.6	12.5	12.4	12.4	12.3	12.2	12.1	12.1	12.1	12.0	8.4	6.0	7.5
7.6	12.5	12.3	12.2	12.0	11.9	11.7	11.6	11.5	11.4	11.2	11.2	11.1	11.0	10.9	10.8	10.8	10.7	10.6	10.6	10.5	10.5	7.4	5.3	7.6
7.7	10.8	10.7	10.5	10.4	10.3	10.1	10.0	9.9	9.8	9.7	9.6	9.6	9.5	9.5	9.3	9.3	9.2	9.2	9.2	9.1	9.1	6.4	4.6	7.7
7.8	9.2	9.1	9.0	8.9	8.8	8.7	8.6	8.5	8.4	8.3	8.2	8.2	8.1	8.1	8.0	8.0	7.9	7.9	7.9	7.8	7.8	5.5	4.0	7.8
7.9	7.8	7.7	7.6	7.5	7.4	7.3	7.2	7.2	7.1	7.0	7.0	6.9	6.9	6.8	6.8	6.7	6.7	6.7	6.7	6.6	6.6	4.7	3.4	7.9
8.0	6.5	6.4	6.4	6.3	6.2	6.1	6.1	6.0	5.9	5.9	5.8	5.8	5.8	5.7	5.7	5.7	5.6	5.6	5.6	5.6	5.6	4.0	2.9	8.0
8.1	5.2	5.1	5.1	5.0	4.9	4.9	4.8	4.8	4.8	4.7	4.7	4.6	4.6	4.6	4.6	4.5	4.5	4.9	4.5	4.5	4.5	3.2	2.3	8.1
8.2	4.2	4.1	4.0	4.0	4.0	3.9	3.9	3.8	3.8	3.8	3.7	3.7	3.7	3.7	3.6	3.6	3.6	3.6	3.6	3.6	3.6	2.6	1.89	8.2
8.3	3.3	3.3	3.2	3.2	3.1	3.1	3.1	3.1	3.0	3.0	3.0	3.0	3.0	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.1	1.55	8.3
8.4	2.6	2.6	2.6	2.5	2.5	2.5	2.5	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.3	2.3	2.3	2.4	2.4	1.71	1.27	8.4
8.5	2.1	2.1	2.1	2.0	2.0	2.0	1.98	1.96	1.95	1.94	1.93	1.92	1.91	1.90	1.90	1.90	1.90	1.90	1.90	1.91	1.92	1.41	1.05	8.5
8.6	1.68	1.66	1.65	1.63	1.61	1.60	1.59	1.58	1.57	1.56	1.55	1.55	1.54	1.54	1.54	1.54	1.54	1.55	1.55	1.56	1.57	1.16	0.88	8.6
8.7	1.35	1.33	1.32	1.31	1.30	1.29	1.28	1.27	1.26	1.26	1.25	1.25	1.25	1.25	1.25	1.25	1.26	1.26	1.27	1.28	1.29	0.96	0.74	8.7
8.8	1.08	1.07	1.06	1.05	1.04	1.04	1.03	1.03	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.03	1.03	1.04	1.05	1.06	1.07	0.81	0.63	8.8
8.9	0.87	0.86	0.86	0.85	0.84	0.84	0.84	0.83	0.83	0.83	0.83	0.83	0.84	0.84	0.84	0.85	0.85	0.86	0.87	0.88	0.89	0.69	0.55	8.9
9.0	0.70	0.70	0.69	0.69	0.69	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.69	0.69	0.70	0.70	0.71	0.72	0.73	0.74	0.75	0.59	0.48	9.0

NOTES:

1. pH and temperature are field measurements taken at the same time and location as the water samples destined for the laboratory analysis of ammonia.
2. If field measured pH and/or temperature values fall between the A&Wc Acute Total Ammonia tabular values, round field measured values according to standard rounding procedures to nearest tabular value to determine ammonia standard.

A&Ww - ACUTE

Total Ammonia mg-N/liter (or mg NH3-N/liter)

Temperature in Degrees Celsius

pH	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	pH
6.5	29	28	28	27	27	27	27	26	26	26	25	25	25	25	25	6.5
6.6	28	27	27	27	26	26	26	25	25	25	25	25	24	24	24	6.6
6.7	27	27	26	26	26	25	25	25	24	24	24	24	23	23	23	6.7
6.8	26	25	25	25	24	24	24	24	23	23	23	23	23	22	22	6.8
6.9	25	24	24	24	23	23	23	22	22	22	22	22	21	21	21	6.9
7.0	23	23	22	22	22	22	21	21	21	21	20	20	20	20	20	7.0
7.1	22	21	21	21	20	20	20	20	19.5	19.3	19.1	18.9	18.8	18.6	18.5	7.1
7.2	20	20	19.2	19.0	18.8	18.5	18.4	18.1	17.9	17.8	17.6	17.5	17.3	17.2	17.0	7.2
7.3	18.0	17.8	17.5	17.3	17.1	16.9	16.7	16.5	16.3	16.2	16.0	15.9	15.8	15.6	15.5	7.3
7.4	16.2	16.0	15.7	15.5	15.3	15.1	15.0	14.8	14.7	14.5	14.4	14.3	14.1	14.0	13.9	7.4
7.5	14.3	14.1	13.9	13.7	13.6	13.4	13.3	13.1	13.0	12.8	12.7	12.6	12.5	12.4	12.4	7.5
7.6	12.5	12.3	12.2	12.0	11.9	11.7	11.6	11.5	11.4	11.3	11.2	11.1	11.0	10.9	10.8	7.6
7.7	10.8	10.7	10.5	10.4	10.3	10.1	10.0	9.9	9.8	9.7	9.6	9.6	9.5	9.5	9.3	7.7
7.8	9.2	9.1	9.0	8.9	8.8	8.7	8.6	8.5	8.4	8.3	8.2	8.2	8.1	8.1	8.0	7.8
7.9	7.8	7.7	7.6	7.5	7.4	7.3	7.2	7.2	7.1	7.0	7.0	6.9	6.9	6.8	6.8	7.9
8.0	6.5	6.4	6.4	6.3	6.2	6.1	6.1	6.0	5.9	5.9	5.8	5.8	5.8	5.7	5.7	8.0
8.1	5.2	5.1	5.1	5.0	4.9	4.9	4.8	4.8	4.8	4.7	4.7	4.6	4.6	4.6	4.6	8.1
8.2	4.2	4.1	4.0	4.0	4.0	3.9	3.9	3.8	3.8	3.8	3.7	3.7	3.7	3.7	3.6	8.2
8.3	3.3	3.3	3.2	3.2	3.1	3.1	3.1	3.1	3.0	3.0	3.0	3.0	3.0	2.9	2.9	8.3
8.4	2.6	2.6	2.6	2.5	2.5	2.5	2.5	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	8.4
8.5	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	1.95	1.94	1.93	1.92	1.91	1.90	1.90	8.5
8.6	1.68	1.66	1.65	1.63	1.61	1.60	1.59	1.58	1.57	1.56	1.55	1.55	1.54	1.54	1.54	8.6
8.7	1.35	1.33	1.32	1.31	1.30	1.29	1.28	1.27	1.26	1.26	1.25	1.25	1.25	1.25	1.25	8.7
8.8	1.08	1.07	1.06	1.05	1.04	1.04	1.03	1.03	1.02	1.02	1.02	1.02	1.02	1.02	1.02	8.8
8.9	0.87	0.86	0.86	0.85	0.84	0.84	0.84	0.83	0.83	0.83	0.83	0.83	0.84	0.84	0.84	8.9
9.0	0.70	0.70	0.69	0.69	0.69	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.69	0.69	0.70	9.0

NOTES:

1. pH and temperature are field measurements taken at the same time and location as the water samples destined for the laboratory analysis of ammonia.
2. If field measured pH and/or temperature values fall between the A&Ww Acute Total Ammonia tabular values, round field measured values according to standard scientific rounding procedures to nearest tabular value to determine the ammonia standard.

A&Ww - ACUTE

Total Ammonia mg-N/liter (or mg NH3-N/liter) (cont.)

pH	Temperature in Degrees Celsius 15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30 and above	pH
6.5	24	24	24	24	24	24	24	24	24	24	23	22	20	19.1	17.8	16.6	6.5
6.6	24	24	23	23	23	23	23	23	23	23	23	21	20	18.5	17.3	16.1	6.6
6.7	23	23	23	23	22	22	22	22	22	22	22	21	19.2	17.9	16.7	15.6	6.7
6.8	22	22	22	22	22	21	21	21	21	21	21	20	18.4	17.2	16.1	15.0	6.8
6.9	21	21	21	21	21	20	20	20	20	20	20	18.8	17.5	16.4	15.3	14.3	6.9
7.0	20	20	20	19.4	19.3	19.2	19.2	19.1	19.1	19.0	19.0	17.7	16.5	15.4	14.4	13.4	7.0
7.1	18.4	18.3	18.2	18.1	18.0	17.9	17.9	17.8	17.8	17.7	17.7	16.5	15.4	14.4	13.4	12.6	7.1
7.2	16.9	16.8	16.7	16.7	16.6	16.5	16.5	16.4	16.4	16.4	16.3	15.2	14.2	13.3	12.4	11.6	7.2
7.3	15.4	15.3	15.2	15.2	15.1	15.0	15.0	15.0	14.9	14.9	14.9	13.9	12.9	12.0	11.3	10.6	7.3
7.4	13.8	13.8	13.7	13.6	13.6	13.5	13.5	13.5	13.4	13.4	13.4	12.5	11.6	10.9	10.2	9.5	7.4
7.5	12.3	12.2	12.2	12.1	12.1	12.0	12.0	12.0	11.9	11.9	11.9	11.1	10.4	9.7	9.1	8.5	7.5
7.6	10.8	10.7	10.6	10.6	10.5	10.5	10.5	10.4	10.4	10.4	10.5	9.8	9.1	8.5	8.0	7.4	7.6
7.7	9.3	9.2	9.2	9.2	9.1	9.1	9.1	9.1	9.1	9.1	9.1	8.5	7.9	7.4	6.9	6.5	7.7
7.8	8.0	7.9	7.9	7.9	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.3	6.8	6.4	6.0	5.6	7.8
7.9	6.7	6.7	6.7	6.7	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.2	5.8	5.4	5.1	4.8	7.9
8.0	5.7	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.2	4.9	4.6	4.3	4.0	8.0
8.1	4.5	4.5	4.9	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.2	4.0	3.7	3.5	3.3	8.1
8.2	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.7	3.4	3.2	3.0	2.8	2.7	8.2
8.3	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	3.0	2.8	2.6	2.5	2.3	2.2	8.3
8.4	2.4	2.3	2.3	2.3	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.3	2.1	2.0	1.90	1.80	8.4
8.5	1.90	1.90	1.90	1.90	1.91	1.92	1.92	1.93	1.95	1.96	1.99	1.86	1.77	1.66	1.57	1.49	8.5
8.6	1.54	1.54	1.55	1.55	1.56	1.57	1.58	1.58	1.60	1.62	1.63	1.55	1.46	1.38	1.31	1.24	8.6
8.7	1.25	1.26	1.26	1.27	1.28	1.29	1.30	1.31	1.33	1.34	1.36	1.29	1.22	1.16	1.10	1.05	8.7
8.8	1.03	1.03	1.04	1.05	1.06	1.07	1.08	1.09	1.11	1.12	1.14	1.09	1.03	0.98	0.94	0.90	8.8
8.9	0.85	0.85	0.86	0.87	0.88	0.89	0.91	0.92	0.93	0.95	0.97	0.93	0.88	0.84	0.81	0.77	8.9
9.0	0.70	0.71	0.72	0.73	0.74	0.75	0.77	0.78	0.80	0.81	0.83	0.80	0.76	0.73	0.70	0.68	9.0

NOTES:

1. pH and temperature are field measurements taken at the same time and location as the water samples destined for the laboratory analysis of ammonia.
2. If field measured pH and/or temperature values fall between the A&Ww Acute Total Ammonia tabular values, round field measured values according to standard scientific rounding procedures to nearest tabular value to determine the ammonia standard.