

Water



Turbidity

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



TURBIDITY

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

September 1980

**U. S. Environmental Protection Agency
Office of Water Regulations and Standards
Washington, D. C. 20460**

**NATIONAL SUMMARY
OF
STATE WATER QUALITY STANDARDS**

TURBIDITY

SEPTEMBER, 1980

**PREPARED FOR
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
CRITERIA AND STANDARDS DIVISION**

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Contract Number 68-01-6058 ✓

Project Number WA-80-A058

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.

Water quality criteria (numerical or narrative specifications) for physical, chemical, temperature, and biological constituents are stated in the July 1976 U. S. Environmental Protection Agency publication Quality Criteria for Water (QCW), available from the Government Printing Office, Washington, D. C. The 1976 QCW, commonly referred to as the "Red Book," is the most current compilation of scientific information used by the Agency as a basis for assessing water quality. This publication is subject to periodic updating and revisions in light of new scientific and technical information.

Criteria for Turbidity in State water quality standards are the subject of this digest. The term turbidity is usually used in conjunction with the term "suspended and settleable solids" which is descriptive of the organic and inorganic particulate matter in water. Both are important parameters in municipal and industrial water supply and treatment technology. Besides producing undesirable recreational waters, other effects resulting from turbid waters or water having high suspended solids concentrations include reducing available food for fish, impeding fish migration and other natural fish movements, preventing the development of fish eggs and insect larvae, and decreasing the fishes resistance to disease. The 1976 Quality Criteria for Water recommends the following criterion which will prevent the deterioration of water quality and aquatic life.

Freshwater fish and other aquatic life:

Settleable and suspended solids should not reduce the depth of the compensation point for photosynthetic activity by more than 10 percent from the seasonally established norm for aquatic life.

Since water quality standards experience revisions and upgrading from time to time, following procedures set forth in the Clean Water Act, individual entries in this digest may be superseded. As these revisions are accomplished and allowing for the States to revise their standards accordingly, this digest will be updated and

reissued. Because this publication is not intended for use other than as a general information resource, to obtain the latest information and for special purposes and applications, the reader needs to refer to the current approved water quality standards. These can be obtained from the State water pollution control agencies or the EPA or Regional Offices.

Individual State-adopted criteria follow:

REFERENCES

- A California Water Quality Standards by River Basins, c.a. 1975
For more detailed information on selected basins, sub-basins and stretches of streams and coastal areas refer to California State Water Quality Standards.
- B Delaware Water Quality Standards, March 25, 1979
- C Idaho Water Quality Standards, c.a. September, 1979
- D Missouri Water Quality Standards, c.a. February, 1978
- E American Samoa Water Quality Standards,
Revised July, 1973
- F Territory of Guam Water Quality Standards, Sept. 1975
- G Trust Territory of the Pacific Islands Water Quality
Standards, October 21, 1973
- H Virgin Islands Water Quality Standards, Aug. 1973

ENVIRONMENT REPORTER, The Bureau of National Affairs, Inc.
Washington, D. C. 20037

- 1 Pages 701:0501-0509, February 16, 1979
- 2 Pages 706:1004-1008, July 20, 1979
- 3 Pages 711:0542-0544, August 5, 1977
- 4 Pages 716:0603, March 26, 1976
- 5 Pages 726:1005, 1011-1013, March 7, 1980
Basic Water Quality Standards adopted May 22, 1979,
have not yet been submitted to EPA for formal approval.
- 6 Pages 731:1002-1009, September 8, 1978
- 7 Pages 746:1008-1014, October 19, 1979
- 8 Pages 751:0504-0505, January 25, 1980
- 9 Pages 765:0512-0515, January 30, 1976
- 10 Page 761:0503-0504, 1973

11 Page 766:0504-0509, October 5, 1979
12 Pages 771:0502-0504, September 29, 1978
13 Pages 776:0504-0506, April 10, 1979
14 Pages 781:0501-0502, May 18, 1979
15 Pages 786:0501-0502, August 29, 1975
16 Page 791:0583, May 26, 1978
17 Pages 796:0103-0108, February 16, 1979
18 Pages 801:1001-1002, Sept. 29, 1978
19 Page 806:1003, March 30, 1979
20 Page 811:1043, 1974
21 Pages 816:0602-0607, 0642-0648, 1974
22 Pages 821:0502-0505, June 30, 1978
23 Pages 831:0501-0510, February 21, 1975
24 Page 836:0502, June 30, 1978
25 Pages 841:0507-0537, December 7, 1979
26 Pages 846:0501-0508, November 17, 1978
27 Pages 851:1001-1023, December 15, 1978
28 Pages 856:1001-1002, July 18, 1978
29 Pages 861:1002-1007, August 11, 1979
30 Pages 866:1004-1009, December 28, 1979
31 Pages 871:0501-0506, November 25, 1977
32 Pages 876:1001-1043, May 26, 1978
33 Pages 881:1001-1007, September 21, 1979
34 Pages 886:0513-0524, August 29, 1975
35 Pages 891:1001-1129, November 16, 1979

- 36 Pages 901:0501-0505, November 3, 1978
- 37 Pages 906:0501-0506, October 13, 1978
- 38 Pages 911:0501-0507, June 22, 1979
- 39 Pages 916:0541-0544, April 14, 1978
- 40 Pages 921:1001-1003, August 13, 1976
- 41 Pages 926:0541-0563, January 26, 1979
- 42 Pages 931:0501-0508, May 26, 1978
- 43 Pages 936:1001-1003, June 27, 1975 ,
- 44 Pages 941:1001-1005, May 26, 1978
- 45 Pages 946:0501-0520, July 14, 1978
- 46 Pages 951:1002-1003, April 28, 1978
- 47 Pages 956:1001-1007, January 11, 1980
- 48 Page 741:1002, November 23, 1979
- 49 Pages 896:0301-0310, March 31, 1978

TURBIDITY

<u>State</u>	<u>Criteria Value</u>	<u>Designated Stream Use</u>
Alabama ¹	There shall be no turbidity of other than natural origin that will cause substantial visible contrast with the natural appearance of waters or interfere with any beneficial uses which they serve. Furthermore, in no case shall turbidity exceed 50 Jackson units above background. Background will be interpreted as the natural condition of the receiving waters without the influence of manmade or man-induced causes. Turbidity levels caused by natural runoff will be included in establishing background levels.	All
Alaska ²	<p>5 NTU above natural (50NTU or less); no more than 10% above natural (over 50NTU); not to exceed 25 NTU.</p> <p>25 NTU above natural; 5 NTU over natural (lake waters)</p> <p>5 NTU above natural (50 NTU or less); no more than 10% above natural (over 50 NTU); not to exceed 15 NTU; not to exceed 5 NTU over natural (lake waters)</p>	<p>Water supply; drinking, culinary, food processing</p> <p>Water supply, aquaculture, fish, shellfish, aquatic life, wildlife.</p> <p>Recreation</p>
Arizona ³	<p>Turbidity of the water will be maintained at the lowest practicable values possible, but in no case shall:</p> <p>a. Turbidity in the surface waters due to the discharge of wastes exceed 50 Jackson units in warm water fishery streams or 10 Jackson units in coldwater fishery streams.</p> <p>b. Discharge to warm water fishery lakes cause turbidities to exceed 25 Jackson units, and discharge to cold water fishery lake cause turbidities to exceed 10 Jackson units.</p> <p>These standards are applicable to turbidity caused by activities including, but not limited to, construction, mining, logging and related land uses.</p>	

<u>State</u>	<u>Criteria Value</u>	<u>Designated Stream Use</u>
Arkansas ⁴	There shall be no distinctly visible increase in turbidity of receiving waters attributable to municipal, industrial, agricultural, or other waste discharges. Specifically, in no case shall any such waste discharge cause (1) the turbidity of warm water streams to exceed 50 Jackson units, or of trout or smallmouth bass streams to exceed 10 Jackson units; or (2) the turbidity of warm water lakes to exceed 25 Jackson units, or of cold water or oligotrophic lakes to exceed 10 Jackson units.	All
California ^A	<p>Waters shall be free of changes in turbidity that cause nuisance or adversely affect beneficial uses.</p> <p>Increase in turbidity attributable to controllable water quality factors shall not exceed the following limits:</p> <ol style="list-style-type: none"> 1. Where natural turbidity is between 0 and 50 JTU, increases shall not exceed 20 percent. 2. Where natural turbidity is between 50 and 100 JTU, increases shall not exceed 10 JTU. 3. Where natural turbidity is greater than 100 JTU, increases shall not exceed 10 percent. <p>Allowable zones of dilution within which higher concentrations will be tolerated will be defined for each discharge in discharge permits.</p> <p>Limiting Concentrations</p> <p>75 JTU Monthly (30 day average)</p> <p>100 JTU Weekly (7 day average)</p> <p>225 JTU Maximum at any time</p>	All
Colorado ⁵	1.0 TU(E)	Domestic water supply (Class I)
		Ocean Waters

<u>State</u>	<u>Criteria Value</u>	<u>Designated Stream Use</u>
Connecticut ⁶	<p>None other than of natural origin except as may result from normal agricultural, road maintenance, construction activity or dredge material disposal provided all reasonable controls are used.</p> <p>Turbidity shall not exceed 25 JTU, Bc 10 JTU, and Cc 10 JTU(See note 15)</p> <p>A secchi disc shall be visible at a minimum depth of 1 meter, Bb-criteria may be exceeded (See Note 14)</p> <p>Note 14. - The use of subscript b in Class Sb is intended to identify "those areas where natural conditions or conditions which cannot be expected to be appreciably altered by the control of discharges may preclude bathing. It may also be used in Classes Bb and SBb to designate areas in the immediate vicinity of treated sewage outfalls where bathing is not advisable.</p> <p>Note 15. - The use of subscript c in Classes Bc, Cc, SBc and SCc is to identify areas suitable for coldwater fisheries, especially fish passage.</p>	<p>Drinking water supply, swimming</p> <p>Recreational, agricultural, industrial, fish and wildlife</p>
Delaware ^B	Not to exceed background by 10 units or a maximum of 25 units, whichever is less, except following precipitation.	All
Florida ⁷	Shall not exceed fifty (50) Jackson Units above natural background as related to a standard candle turbidimeter.	All
Georgia ⁸	Not Specified	
Hawaii ⁹	Secchi disc or secchi disc equivalent as "extinction coefficient" determinations shall not be altered from natural conditions more than 5%.	Classes AA, A, B, 1 and 2
Idaho ¹⁰	The Wastewater must not increase the turbidity of the receiving water outside the mixing zone by:	

<u>State</u>	<u>Criteria Value</u>	<u>Designated Stream Use</u>
Idaho (con't)	<p>1. More than five (5) NTU (Nephelometric Turbidity Units) over background turbidity, when background turbidity is fifty (50) NTU or less; or</p> <p>2. More than ten percent (10%) increase in turbidity when background turbidity is more than fifty (50) NTU, not to exceed a maximum increase of twenty-five (25) NTU.</p>	
Illinois ¹¹	Not Specified	
Indiana ¹²	<p>No turbidity of other than natural origin that will cause a substantial visible contrast with the natural appearance of the water.</p> <p>No activity causing turbidity of other than natural origin, that will cause substantial visible contrast with the natural appearance of the water shall be permitted.</p> <p>No material from other than natural causes shall be added which will cause the turbidity of the water to exceed 10 Jackson turbidity units (JTU).</p> <p>No material from other than natural causes shall be added which will cause the turbidity of the water to exceed 25 Jackson Turbidity Units.</p>	<p>Inner Harbor, Gary Harbor Burns Harbor, Lake Michigan</p> <p>Wolf Lake and Wolf Lake Channel</p> <p>Natural Spawning and Rearing or Imprinting Areas of Salmonid Fishes</p> <p>Migration Route of Sal- monid Fishes</p>
Iowa ¹³	The turbidity of the receiving stream shall not be increased by more than 25 Nephelometric turbidity units by any point source discharge.	All
Kansas ¹⁴	There shall be no turbidity increase in waters of the state, of other than natural origin, that will cause substantial visible contrast with the natural appearance of the water or be detrimental to the designated use.	
Kentucky ¹⁵	Not Specified	All
Louisiana ¹⁶	There shall be no substantial increase in turbidity from ambient conditions due to waste discharges.	All

<u>State</u>	<u>Criteria Value</u>	<u>Designated Stream Use</u>
Maine ¹⁷	There shall be no discharge of any matter or substances which would impart turbidity other than that which naturally occurs.	All
Maryland ¹⁸	a. Turbidity may not exceed levels detrimental to aquatic life; and b. Within limits of Best Practicable Control Technology Currently Available, turbidity may not exceed for extended periods of time those levels normally prevailing during periods of base flow in the surface waters; and c. Turbidity in the receiving water resulting from any discharge may not exceed 50 JTU (Jackson Turbidity Units) as a monthly average, nor exceed 150 JTU at any time.	All
Massachusetts ¹⁹	None other than of natural origin Shall not be in concentrations that would exceed the recommended limits on the most sensitive receiving water use.	Public water supply All
Michigan ²⁰	All waters of the State shall contain no unnatural turbidity, color, oil films, floating solids, foams, settleable solids, or deposits in quantities which are or may become injurious to any designated use.	All
Minnesota ²¹	5 25	Domestic consumption Classes A and B, industrial consumption class A Domestic consumption class C; Fisheries and recreation classes B and C
Mississippi ²²	Not Specified	All
Missouri ^D	Not Specified There shall be no turbidity that will cause substantial visible contrast with natural appearance of the stream or lake or interfere with its beneficial uses.	All All

<u>State</u>	<u>Criteria Value</u>	<u>Designated Stream Use</u>
Montana ²³	<p>The maximum allowable increase above naturally occurring turbidity is 10 Jackson Candle Units, except as is permitted in the general water criteria.</p> <p>(see B-D2)</p> <p>The maximum allowable increase above naturally occurring turbidity is 5 Jackson Candle Units.</p> <p>(see B-D2)</p> <p>Naturally occurring turbidity, naturally occurring water temperatures and naturally occurring concentrations of sediments, settleable solids or residues are not to be increased in quantity or amounts which adversely affect the use indicated.</p> <p>No wastes are to be discharged and no activities conducted which, either alone or in combination with other wastes or activities, will cause turbidities to exceed those allowed by specific water quality criteria; provided, short-term activities necessary to accomodate essential dredging, channel or bank alterations, stream diversions or other construction where turbidities in excess of the criteria are unavoidable, may be authorized by the department under conditions as it may prescribe.</p>	<p>B-D2 Classification</p> <p>B-D3 Classification</p> <p>C-D1 Classification</p> <p>C-D2 Classification</p> <p>E-F Classification</p>
Nebraska ²⁴	<p>Turbidity caused by wastewater shall not impart more than a 10 percent increase in turbidity, as measured in Jackson Turbidity Units, to the receiving water.</p>	<p>All</p>
Nevada ²⁵	<p>No turbidity which will adversely affect the beneficial uses of the water, i.e. not to exceed 10 NTU for cold water fishery (Salmonids), and 50 NTU for warm water fishery (other than Salmonids).</p> <p>Turbidity shall not exceed that characteristic of natural conditions by more than 10 Jackson Units.</p> <p>See Nevada State Water Quality Criteria Compilation 1979, for specific stretches of stream.</p>	<p>Variable</p> <p>Variable</p>

<u>State</u>	<u>Criteria Value</u>	<u>Designated Stream Use</u>
New Hampshire ²⁶	10 STU	Cold water fisheries
	25 STU	Warm water fisheries
New Jersey ²⁷	20 JTU (30-day average) 110 JTU (maximum at anytime), unless exceeded due to natural conditions	All except preservation of natural state designations.
New Mexico ²⁸	Turbidity attributable to other than natural causes shall not reduce light transmission to the point that desirable aquatic life presently common in New Mexico waters is inhibited or that will cause substantial visible contrast with the natural appearance of the water. Turbidity attributable to natural causes or the reasonable operation of irrigation and flood control facilities is not subject to these standards.	All
New York ²⁹	No increase, except from natural sources, that will cause a substantial visible contrast to natural conditions. In cases of naturally turbid waters, the contrast will be due to increased turbidity.	All
North Carolina ³⁰	The turbidity in the receiving water due to a discharge shall not exceed 50 NTU in streams not designated as trout waters and 10 NTU in streams, lakes or reservoirs designated as trout waters; for lakes or reservoirs not designated as trout waters, the turbidity shall not exceed 25 NTU due to discharge.	All
North Dakota ³¹	Not Specified	All
Ohio ³²	Not Specified	All
Oklahoma ³³	Turbidity from other than natural sources shall be restricted to the following numerical limits: 1. Warm water streams - 50 Jackson units 2. Warm water lakes - 25 Jackson Units 3. Cold water streams - 10 Jackson Units (Those designated as small-mouth bass fisheries or trout fisheries)	All

<u>State</u>	<u>Criteria Value</u>	<u>Designated Stream Use</u>
Oklahoma (con't)	In waters where background turbidity exceeds these values, turbidity from point sources shall be restricted to not exceed the naturally occurring background. Further, the turbidity background levels should decrease as management of non-point sources reduces the current background turbidity levels.	
Oregon ³⁴	<p>No more than ten percent cumulative increase in natural stream turbidities shall be allowed, as measured from immediately upstream of the turbidity causing activity, except for:</p> <p>(a) specifically limited duration activities which may be specifically authorized by DEQ under terms of Sections 401 and 404 (1977 Amendments to the Clean Water Act); Division of State Land's Permits, and other conditions as it may prescribe and which are necessary to accommodate essential dredging, construction, or other legitimate uses or activities, and</p> <p>(b) specifically limited duration activities, not to exceed five days, which do not meet conditions under (a) above and which may be specifically authorized by DEQ and the Department of Fish and Wildlife under conditions they may prescribe to accommodate response to emergencies or to protect the public health and welfare where (1) turbidities in excess of this standard are unavoidable and (2) all practicable turbidity preventative techniques have been applied.</p>	All
Pennsylvania ³⁵	<p>(Tur₁) - not more than 30 NTU during the period 5/30 - 9/15, nor more than a monthly mean of 40 NTU or a maximum of 150 NTU during the remainder of the year.</p> <p>(Tur₂) - Maximum monthly mean 40 NTU, maximum value not more than 150 NTU</p> <p>(Tur₃) - Not more than 100 NTU</p>	All

<u>State</u>	<u>Criteria Value</u>	<u>Designated Stream Use</u>
Pennsylvania (con't)	(Tur ₄) - For the period 5/15 - 9/15 of any year, not more than 40 NTU; for the period 9/16 - 5/14 of any year, not more than 100 NTU	
	(Tur ₅) - Maximum monthly mean of 10 NTU, maximum 150 NTU	
	(Tur ₆) - Maximum monthly mean of 20 NTU, maximum of 150 NTU	
	(Tur ₇) - maximum monthly mean of 30 NTU, maximum of 150 NTU	
	Note: See Drainage Lists A through E of Pennsylvania Water Quality Standards for applicable uses and streams.	
Rhode Island ³⁶	5 Jackson Units	Water supply
	None other than of natural conditions	Water supply
	10 Jackson Units	Recreation, agricultural, industrial, fish and wild-life
	15 Jackson Units	Recreational boating
South Carolina ³⁷	Not Specified	All
South Dakota ³⁸	Not Specified	All
Tennessee ³⁹	Not Specified	All
Texas ⁴⁰	There shall be no substantial change in turbidity from ambient conditions due to waste discharges	All
Utah ⁴¹	10 NTU	Recreation, aquatic life and aesthetics
	15 NTU	Waterfowl
Vermont ⁴²	None other than of natural origin	Public water supply
	10 JTU	Water management types I, II, IV uses
	25 JTU	Water management types III, V uses
Virginia ⁴³	Not Specified	All

<u>State</u>	<u>Criteria Value</u>	<u>Designated Stream Use</u>
Washington ⁴⁴	<p>Turbidity shall not exceed 5 NTU over background turbidity when the background turbidity is 50 NTU or less, or have more than a 10 percent increase in turbidity when the background turbidity is more than 50 NTU.</p> <p>Turbidity shall not exceed 10 NTU over background turbidity when the background turbidity is 50 NTU or less, or have more than a 20 percent increase in turbidity when the background turbidity is more than 50 NTU</p> <p>5 NTU over background turbidity</p>	<p>All uses for extraordinary (Class AA) and excellent (Class A) waters</p> <p>All uses for good (Class B) and fair (Class C) waters</p> <p>All uses for Lake class waters</p>
West Virginia ⁴⁵	Not Specified	All
Wisconsin ⁴⁶	Not Specified	All
Wyoming ⁴⁷	<p>a. In all Class I and II waters the discharge of substances attributable to or influenced by the activities of man shall not be present in quantities which would result in a turbidity increase of more than 10 NTU's.</p> <p>b. In all Class III waters the discharge of substances attributable to or influenced by the activities of man shall not be present in quantities which would result in a turbidity increase of more than 15 NTU's.</p> <p>c. Exceptions to parts a and b of this Section may be granted in the following instances:</p> <p>(1) Where the method of operation of a dam results in violation of the above standards and that method of operation has received specific approval to continue by the Environmental Quality Council in accordance with the following provisions.</p> <p>(a) The Environmental Quality Council has held a public hearing in the geographic area affected: and</p>	<p>Natural water uses and game fish support</p> <p>Non-game fish support</p>

<u>State</u>	<u>Criteria Value</u>	<u>Designated Stream Use</u>
Wyoming (con't)	<p>(b) The Environmental Quality Council finds that continuation of the method of dam operation and exception to the above standards is justifiable on the basis of social, economic, aesthetic, scenic, municipal, industrial, recreational, agricultural, ecological, botanical, historical, zoological, geological, cultural, archaeological, fish and wildlife or other values of present and future benefit to the people.</p> <p>d. The exception allowed under part c of this Section may be granted only if one or more of the following, can be demonstrated;</p> <p>(1) The standards are not attainable due to natural background;</p> <p>(2) The standards are not attainable due to irretrievable man-induced conditions;</p> <p>(3) Attainment of the standards would require application of effluent limitations more stringent than those required by Section 301(b)(2)(A) and (B) of the Federal Act; and, application of these more stringent effluent limitations would result in substantial and widespread adverse economic and social impact.</p> <p>e. Exceptions granted under parts c and d of this Section shall not be allowed for periods greater than three years. At the end of the exception period the entity which was granted the exception must begin compliance or request that the Environmental Quality Council hold another public hearing in the area affected and reevaluate the request for continuance of the exception in accordance with the criteria given in parts c and d of this Section. Exceptions granted under parts c and d of this Section shall not exempt any person from the penalty provisions of W.S. 35-11-901(b).</p>	

<u>State</u>	<u>Criteria Value</u>	<u>Designated Stream Use</u>
American Samoa ^E	10 JTU unless exceeded by natural conditions	Recreation, aquatic life
District of Columbia ⁴⁸	Color - 75 color units	Domestic water supply
Guam ^F	Turbidity at any point, as measured by Jackson Turbidity Units (JTU), shall not be increased from ambient conditions at any time.	AA, 2a-I, 2b-I
	Turbidity at any point, as measured by JTU, shall not be greater than 5 JTU at any time.	A
	Turbidity values (JTU) at any point shall not be increased from natural conditions more than 25% at any time.	2a-II, 2b-II, C
Puerto Rico ⁴⁹	Shall not be altered except for natural causes. A secchi disc shall be visible at a minimum depth of 1 meter.	Preservation of natural phenomena
	A secchi disc shall be visible at a minimum depth of 1 meter.	All uses for coastal class waters
	50 JTU except when due to natural phenomena	All uses for surface class waters
Trust Territories ^G	Visibility shall not be reduced by more than 10 percent of natural values as measured by Secchi disc.	Recreation
Virgin Islands ^H	A secchi disc shall be visible at a minimum depth of 1 meter.	All except preservation of natural phenomena