

Appendix C: Reference Standards and Data for Water

Table C.1. Reference standards for radionuclides in water (pCi/L)

Parameter ^a	National primary drinking water standard ^b	4% of DCG ^c	DCG ^d
²⁴¹ Am		1.2	30
²¹⁴ Bi		24,000	600,000
¹⁰⁹ Cd		400	10,000
¹⁴³ Ce		1,200	30,000
⁶⁰ Co		200	5,000
⁵¹ Cr		40,000	1,000,000
¹³⁷ Cs		120	3,000
¹⁵⁵ Eu		4,000	100,000
Gross alpha ^e	15		
Gross beta (mrem/year)	4 ^f		
³ H	20,000 ^g	80,000	2,000,000
¹³¹ I		120	3,000
⁴⁰ K		280	7,000
²³⁷ Np		1.2	30
^{234m} Pa		2,800	70,000
²³⁸ Pu		1.6	40
^{239/240} Pu		1.2	30
²²⁶ Ra	5 ^h	4	100
²²⁸ Ra	5 ^h	4	100
¹⁰⁶ Ru		240	6,000
⁹⁰ Sr	8 ^g	40	1,000
⁹⁹ Tc		4,000	100,000
²²⁸ Th		16	400
²³⁰ Th		12	300
²³² Th		2	50
²³⁴ Th		400	10,000
Thorium, natural		2	50
²³⁴ U		20	500
²³⁵ U		24	600
²³⁶ U		20	500
²³⁸ U		24	600
Uranium, natural		24	600
Uranium, total ⁱ	30 µg/L ^j	20	500

^aOnly the radionuclides included in the Oak Ridge Reservation monitoring programs are listed.

^b40 CFR Part 141 National Primary Drinking Water Regulations Subparts B and G.

^cFour percent of the derived concentration guide represents the DOE criterion of 4 mrem effective dose equivalent from ingestion of drinking water.

^dU.S. DOE Order 5400.5 Chapter III, "Derived Concentration Guides for Air and Water."

^eExcludes radon and uranium.

^fPer the discussion in 40 CFR 141.26(b), compliance with the 4 mrem/year standard can be assumed if the average annual gross beta particle activity is less than 50 pCi/L and if the average annual concentrations of ³H and ⁹⁰Sr are less than 20,000 pCi/L and 8 pCi/L, respectively, provided that, if both radionuclides are present, the sum of their annual dose equivalents to bone marrow is less than 4 mrem/year. In the text of this document, 50 pCi/L is referred to as the "screening level."

^gThese values are not maximum contaminant levels (MCLs), but are concentrations that result in the effective dose equivalent of the MCL for gross beta emissions, which is 4 mrem/year.

^hApplies to combined ²²⁶Ra and ²²⁸Ra.

ⁱMinimum of uranium isotopes.

^jEffective December 8, 2003.

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Table C.2. Reference standards for chemicals and metals in water

Parameter	National drinking water standards		Tennessee water quality criteria ^c			
	Primary ^a	Secondary ^b	Domestic water supply	Fish and aquatic life CMC	Recreation	
					Organisms	Water and organisms ^d
Anions (mg/L)						
Chloride		250				
Fluoride	4	2				
Nitrate	10					
Nitrite	1					
Sulfate, as SO ₄		250				
Base/neutral/acid extractable organics (µg/L)						
1,2-Dichlorobenzene (<i>ortho</i>)	600		600		17,000	2,700
1,2-Diphenylhydrazine					5.4	0.4
1,2,4-Trichlorobenzene	70		70			
1,3-Dichlorobenzene (<i>meta</i>)					2,600	400
1,4-Dichlorobenzene (<i>para</i>)	75		75		2,600	400
2,4-Dichlorophenol					790	93
2,4-Dimethylphenol					2,300	540
2,4-Dinitrophenol					14,000	70
2,4-Dinitrotoluene					91	1.1
2,4,6-Trichlorophenol					65	21
2-Chlorophenol					400	120
2-Chloronaphthalene					4,300	1,700
2-Methyl-4,6-Dinitrophenol					765	13.4
3,3-Dichlorobenzidine					0.77	0.4
3,4-Benzo(b)fluoranthene					0.49	0.044
Benzo(k)fluoranthene					0.49	0.044
Acenaphthylene					2,700	1,200
Anthracene					110,000	9,600
Benzidine					0.0054	0.0012
Benzo(a)anthracene					0.49	0.044
Benzo(a)pyrene	0.2		0.2		0.49	0.044
bis-(2-chloroethyl)ether					14	0.31
bis-(2-Chloro-isopropyl)ether					170,000	1,400
bis-(2-ethylhexyl)phthalate	6		6		59	18
Butylbenzyl phthalate					5,200	3,000
Chrysene					0.49	0.044
Di-n-butyl phthalate					12,000	2,700
Dibenz(a,h)anthracene					0.49	0.044
Diethyl phthalate					120,000	23,000
Dimethyl phthalate					2,900,000	313,000
Fluoranthene					370	300
Fluorene					14,000	1,300
Hexachlorobenzene	1		1		0.0077	0.0075
Hexachlorobutadiene					500	4.4
Hexachlorocyclopentadiene	50		50		17,000	240
Hexachloroethane					89	19
Ideno(1,2,3-cd)pyrene					0.49	0.044
Isophorone					26,000	360
N-Nitrosodimethylamine					81	0.0069
N-Nitrosodi-n-propylamine					1.4	0.005
N-Nitrosodiphenylamine					160	50

Table C.2. (continued)

Parameter	National drinking water standards		Tennessee water quality criteria ^c			
	Primary ^a	Secondary ^b	Domestic water supply	Fish and aquatic life CMC	Recreation	
					Organisms	Water and organisms ^d
Nitrobenzene					1,900	17
Pentachlorophenol (pH 7.8)	1		1	20	82	2.8
Phenol					4,600,000	21,000
Pyrene					11,000	960
Field measurements						
Chlorine, (TRC), µg/L				19		
Dissolved oxygen, mg/L				5		
Temperature, °C			30.5	30.5	30.5	30.5
Turbidity, JTU ^e	1					
pH, standard units		(6.5, 8.5)	(6.0, 9.0)	(6.5, 9.0)	(6.0, 9.0)	(6.0, 9.0)
Metals (mg/L)						
Aluminum		0.05-0.2				
Antimony	0.006		0.006		4.30	0.014
Arsenic	0.01 ^f		0.050	0.360 (III)	0.050	0.050
Barium	2		2			
Beryllium	0.004		0.004			
Cadmium	0.005		0.005	0.0039 ^g		
Chromium, total	0.1		0.1			
Chromium (hexavalent)				0.016		
Copper	1.3 ^h	1		0.0177 ^g		
Iron		0.3				
Lead	0.015 ^h		0.005	0.0817 ^g		
Manganese		0.05				
Mercury	0.002		0.002	0.00169	0.000051	0.00005
Nickel			0.1	1.418 ^g	4.6	0.61
Selenium	0.05		0.050	0.02		
Silver		0.1		0.0041 ^g		
Thallium	0.002		0.002		0.0063	0.0017
Zinc		5		0.117 ^g		
Others						
Asbestos (fibers/L)	7,000,000					
Chlorine (TRC)				0.019		
Coliform bacteria (no./100 mL, geometric mean)			1,000	1,000	200	200
Coliform bacteria (no./100 mL, individual sample)			5,000	5,000	1,000	1,000
Color (color units)		15				
Cyanide (mg/L)	0.2		0.2	0.022	220	0.7
E. coli (no./100 mL, geometric mean)					126	126
Odor (threshold odor number)		3				
Total dissolved solids (mg/L)		500	500			
Pesticides/herbicides/PCBs (µg/L)						
2,3,7,8-TCDD (Dioxin)	0.00003		0.00003		0.000001	0.000001
2,4-D	70		70			
2,4,5-TP (Silvex)	50		50			
4,4'-DDT				1.1	0.0059	0.0059
4,4'-DDE					0.0059	0.0059

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Table C.2 (continued)

Parameter	National drinking water standards		Tennessee water quality criteria ^c			
	Primary ^a	Secondary ^b	Domestic water supply	Fish and aquatic life CMC	Recreation	
					Organisms	Water and organisms ^d
4,4'-DDD					0.0084	0.0083
a-BHC					0.13	0.039
b-BHC					0.46	0.14
Alachlor	2		2			
Aldicarb	3					
Aldicarb sulfoxide	4					
Aldicarb sulfone	2					
Aldrin				3.0	0.0014	0.0013
Atrazine	3		3			
Carbofuran	40		40			
Chlordane	2		2	2.4	0.0059	0.0057
Dalapon	200		200			
1,2-Dibromo-3-chloropropane	0.2		0.2			
Di(ethylhexyl)adipate	400		400			
Dieldrin				2.5	0.0014	0.0014
Di(ethylhexyl)phthalate ⁱ						
Dinoseb	7		7			
Diquat	20		20			
a-Endosulfan				0.22	240	110
b-Endosulfan				0.22	240	110
Endosulfan sulfate					240	110
Endothall	100		100			
Endrin	2		2	0.18	0.81	0.76
Endrin aldehyde					0.81	0.76
Ethylene dibromide	0.05		0.05			
Glyphosate	700		700			
Heptachlor	0.4		0.4	0.52	0.0021	0.0021
Heptachlor epoxide	0.2		0.2	0.52	0.0011	0.001
g-BHC (Lindane)	0.2		0.2	2.0	0.63	0.19
Methoxychlor	40		40			
Oxamyl (Vydate)	200		200			
PCB-1242					0.00045	0.00044
PCB-1254					0.00045	0.00044
PCB-1221					0.00045	0.00044
PCB-1232					0.00045	0.00044
PCB-1248					0.00045	0.00044
PCB-1260					0.00045	0.00044
PCB-1016					0.00045	0.00044
PCB, total	0.5		0.5		0.00045	0.00044
Picloram	500		500			
Simazine	4		4			
Toxaphene	3		3	0.73	0.0075	0.0073
Volatile organics (µg/L)						
1,1,1-Trichloroethane	200		200			
1,1-Dichloroethene	7		7		32	0.57
1,1,2-Trichloroethane	5		5		420	6
1,1,2,2-Tetrachloroethane					110	1.7
1,2-Dichloroethane	5		5		990	3.8
1,2-Dichloroethene ^f						

Table C.2 (continued)

Parameter	National drinking water standards		Tennessee water quality criteria ^c			
	Primary ^d	Secondary ^b	Domestic water supply	Fish and aquatic life CMC	Recreation	
					Organisms	Water and organisms ^d
<i>cis</i> -1,2-Dichloroethene	70		70			
<i>trans</i> -1,2-Dichloroethene	100		100		140,000	700
1,2-Dichloropropane	5		5		39	0.52
<i>cis</i> -1,3-Dichloropropene					1,700	10
<i>trans</i> -1,3-Dichloropropene					1,700	10
Acrolein					780	320
Acrylonitrile					6.6	0.59
Benzene	5		5		710	12
Bromodichloromethane	100 ^k				460	5.6
Bromoform	100 ^k				3,600	43
Carbon tetrachloride	5		5		44	2.5
Chlorobenzene	100		100		21,000	680
Chloroform	100 ^k				4,700	57
Dibromochloromethane	100 ^k				340	4.1
Ethylbenzene	700		700		29,000	3,100
Methylbromide					4,000	48
Methylene chloride (Dichloromethane)	5		5		16,000	47
Styrene	100		100			
Tetrachloroethene	5		5		88.5	8
Toluene	1,000		1,000		200,000	6,800
Trichloroethene	5		5		810	27
Trihalomethanes, total	100 ^k					
Vinyl chloride	2		2		5,250	20
Xylene, total	10,000		10,000			

^a40 CFR Part 141—National Primary Drinking Water Regulations, Subparts B and G, as amended.

^b40 CFR Part 143—National Secondary Drinking Water Regulations, as amended.

^cRules of Tennessee Department of Environment and Conservation, Division of Water Pollution Control, Chapter 1200-4-3, General Water Quality Criteria, as amended. CMC = criterion maximum concentration.

^dThese criteria, for the protection of public health, pertain to the consumption of water and organisms. They are applied only to waters designated for *both* recreation and domestic water supply.

^eJackson turbidity unit (JTU) and nephelometric turbidity unit (NTU) are roughly equivalent in the range of 25 to 1000 JTU.

^fAs of January 23, 2006.

^gThe standard is a function of total hardness. The values in this table correspond to a total-hardness value of 100 mg/L.

^h“Action level” for initiation of corrosion control studies and treatment techniques, applicable to community water systems and nontransient, noncommunity water systems.

ⁱSee bis(2-ethylhexyl)phthalate.

^jSee *cis*-1,2-Dichloroethene and *trans*-1,2-Dichloroethene.

^kLimit for total trihalomethanes (bromodichloromethane + bromoform + chloroform + dibromochloromethane).

