

Appendix D: Reference Standards and Data for Water

Table D.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		20	500

^aOnly the radionuclides sought on the Oak Ridge Reservation are listed.

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

^cFour percent of the DCG 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 containment levels (MCLs), but are concentrations that result in the effective dose equivalent (EDE) of the MCL for gross beta emissions, which is 4 mrem/year.

^hApplies to combined ²²⁶Ra and ²²⁸Ra.

ⁱMinimum of uranium isotopes.

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Table D.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
<i>Anions (mg/L)</i>						
Chloride		250				
Fluoride	4	2				
Nitrate	10					
Nitrite	1					
Sulfate, as SO ₄		250				
<i>Base/neutral/acid extractable organics (µg/L)</i>						
1,2-Dichlorobenzene (<i>ortho</i>)	600		600		17,000	2,700
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-Dinitrophenol					14,000	70
2,4-Dinitrotoluene					91	1.1
2,4,6-Trichlorophenol					65	21
2-Methyl-4,6-Dinitrophenol					765	13.4
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
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-ethylhexyl)phthalate	6	6			59	18
Di-n-butyl phthalate					12,000	2,700
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
Hexachlorocyclopentadiene	50		50		17,000	240
Hexachloroethane					89	19
Nitrobenzene					1,900	17
Pentachlorophenol (pH 7.8)	1		1	20	82	2.8
Pyrene					11,000	960
<i>Field measurements</i>						
Chlorine, mg/L				19		
Dissolved oxygen, mg/L				5		
Temperature, °C			30.5		30.5	30.5
Turbidity, JTU ^e	1					
pH, standard units		(6.5, 8.5)	(6.0, 9.0)	(6.5, 8.5)	(6.0, 9.0)	(6.0,9.0)

Table D.2 (continued)

Parameter	National drinking water standards		Tennessee water quality criteria ^c			
	Primary ^a	Secondary ^b	Domestic water supply	Fish and aquatic life	Recreation	
					Organisms	Water and organisms ^d
<i>Metals (mg/L)</i>						
Aluminum		0.05-0.2				
Antimony	0.006		0.006		4.30	0.014
Arsenic	0.05		0.05	360 (III)	0.0014	0.00018
Barium	2		2			
Beryllium	0.004		0.004			
Cadmium	0.005		0.005	0.0039 ^f		
Chromium, total	0.1		0.1			
Chromium (hexavalent)				0.016		
Copper	1.3 ^g	1		0.0177 ^f		
Iron		0.3				
Lead	0.015 ^g		0.005	0.0817 ^f		
Manganese		0.05				
Mercury	0.002		0.002	1.69	0.00005	0.000051
Nickel			0.1	1.418 ^f	4.6	0.61
Selenium	0.05		0.050	0.02		
Silver		0.1		0.0041 ^f		
Thallium	0.002		0.002		0.0063	0.0017
Zinc		5		0.117 ^f		
<i>Others</i>						
Asbestos (fibers/L)	7,000,000					
Coliform bacteria ^h						
Color (color units)		15				
Cyanide (mg/L)	0.2		0.2	0.022	220	0.7
Odor (T.O.N.)		3				
Total dissolved solids (mg/L)		500	500			
<i>Pesticides/herbicides/PCBs (µg/L)</i>						
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
4,4'-DDD					0.0084	0.0083
Alachlor	2		2			
Aldrin				3	0.0014	0.0013
Atrazine	3		3			
Carbofuran	40		40			
Chlordane	2		2	2.4	0.0059	0.0057
Dalapon	200		200			

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Table D.2 (continued)

Parameter	National drinking water standards		Tennessee water quality criteria ^c			
	Primary ^a	Secondary ^b	Domestic water supply	Fish and aquatic life	Recreation	
					Organisms	Water and organisms ^d
1,2-Dibromo-3-chloropropane	0.2		0.2			
Di(ethylhexyl)adipate	400		400			
Di(ethylhexyl)phthalate ⁱ						
Dinoseb	7		7			
Diquat	20		20			
a-Endosulfan				0.22	159	74
b-Endosulfan				0.22	159	74
Endothall	100		100			
Endrin	2		2	0.18	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	0.63	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
<i>Volatile organics (µg/L)</i>						
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 ^j						
cis-1,2-Dichloroethene	70		70			
trans-1,2-Dichloroethene	100		100			700
1,2-Dichloropropane	5		5		39	0.52
cis-1,3-Dichloropropene					1,700	10
trans-1,3-Dichloropropene					1,700	10

Table D.2 (continued)

Parameter	National drinking water standards		Tennessee water quality criteria ^c			
	Primary ^a	Secondary ^b	Domestic water	Fish and aquatic life	Recreation	
					Organisms	Water and organisms ^d
Acrolein					780	320
Acrylonitrile					6.6	0.59
Benzene	5		5		710	12
Bromodichloromethane	100 ^k				220	2.7
Bromoform	100 ^k				3,600	43
Carbon tetrachloride	5		5		44	2.5
Chlorobenzene	100				21,000	680
Chloroform	100 ^k				4,700	57
Dibromochloromethane	100 ^k				340	4.1
Ethylbenzene	700		700		29,000	3,100
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					
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.

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

^g“Action level” for initiation of corrosion control studies and treatment techniques, applicable to community water systems and non-transient, non-community water systems.

^hStandard no longer numeric, but based on presence or absence in sample.

ⁱSee bis(2-ethylhexyl)phthalate.

^jSee *cis*-Dichloroethene and *trans*-Dichloroethene.

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

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Table D.3. 2000 surface water analyses at EMP surface water locations^a

Parameter	N det/ N total	Concentration				
		Max ^b	Min ^b	Avg ^c	Standard error ^d	TWQC ^e
<i>First Creek prior to confluence with Northwest Tributary (1STCK)</i>						
<i>Field measurements</i>						
Dissolved oxygen (ppm)	2/2	11	8.3	9.4	1.1	<i>f</i>
pH (SU)	2/2	8.0	7.8	7.9	0.10	<i>f</i>
Temperature (°C)	2/2	18	15	16	1.5	<i>f</i>
<i>Radionuclides (pCi/L)^g</i>						
Gross alpha	2/2	15*	1.0*	8.0	7.0	<i>f</i>
Gross beta	2/2	260*	14*	140	120	<i>f</i>
³ H	1/2	310*	-12	150	160	80,000
Total rad Sr	2/2	120*	6.4*	63	57	40
Total uranium	1/1	4.1*	4.1*	4.1	<i>f</i>	20
^{233/234} U	1/1	3.7*	3.7*	3.7	<i>f</i>	<i>f</i>
²³⁸ U	1/1	0.32*	0.32*	0.32	<i>f</i>	24
<i>Bear Creek downstream from all possible DOE inputs (BCK 0.6)</i>						
<i>Field measurements</i>						
Dissolved oxygen (ppm)	2/2	10	8.8	9.5	0.70	<i>f</i>
pH (SU)	2/2	8.2	7.7	8.0	0.25	<i>f</i>
Temperature (°C)	2/2	19	10	14	4.3	<i>f</i>
<i>Radionuclides (pCi/L)^g</i>						
Gross alpha	2/2	11*	8.7*	9.9*	1.2	<i>f</i>
Gross beta	2/2	9.5*	7.6*	8.6*	0.95	<i>f</i>
Total uranium	1/1	7.5*	7.5*	7.5	<i>f</i>	20
²³⁴ U	2/2	2.8*	2.4*	2.6*	0.20	20
²³⁵ U	1/2	0.16*	0.043	0.10	0.059	24
²³⁸ U	2/2	5.3*	4.7*	5.0*	0.30	24
<i>Clinch River downstream from all DOE inputs (CRK 16)</i>						
<i>Field measurements</i>						
Dissolved oxygen (ppm)	12/12	12	5.1	8.2	0.51	<i>f</i>
pH (SU)	12/12	8.5	7.5	8.0	0.086	<i>f</i>
Temperature (°C)	12/12	27	5.0	16	1.9	<i>f</i>
<i>Metals (mg/L)</i>						
Aluminum, total	10/12	1.1	<0.20	~0.43	0.068	<i>f</i>
Barium, total	12/12	0.046	0.033	0.039	0.0013	<i>f</i>
Calcium, total	12/12	39	29	34	0.99	<i>f</i>
Iron, total	12/12	1.1	0.13	0.40	0.072	<i>f</i>
Magnesium, total	12/12	12	7.9	9.8	0.35	<i>f</i>
Manganese, total	12/12	0.099	0.041	0.064	0.0057	<i>f</i>
Potassium, total	4/12	2.4	<2.0	~2.1	0.045	<i>f</i>
Sodium, total	12/12	7.9	4.6	6.3	0.35	<i>f</i>

Table D.3 (continued)

Parameter	N det/ N total	Concentration				
		Max ^b	Min ^b	Avg ^c	Standard error ^d	TWQC ^e
<i>Radionuclides (pCi/L)^g</i>						
⁷ Be	1/12	16*	-11	-0.39	2.2	40,000
⁶⁰ Co	3/12	2.2*	-0.27	1.1*	0.21	200
¹³⁷ Cs	1/12	2.7*	-0.98	0.77*	0.30	120
Gross alpha	4/12	9.3*	-0.31	1.3	0.79	<i>f</i>
Gross beta	9/12	5.2*	0.47	2.9*	0.41	<i>f</i>
⁴⁰ K	1/12	35*	-57	-12	9.4	280
Total uranium	1/1	9.4*	9.4*	9.4	<i>f</i>	20
²³⁴ U	2/2	8.9*	0.46*	4.7	4.2	20
²³⁵ U	1/2	0.22*	0.026	0.12	0.097	24
²³⁸ U	2/2	0.55*	0.23*	0.39	0.16	24
<i>Water supply intake for the ETP Site (CRK 23)</i>						
<i>Field measurements</i>						
Dissolved oxygen (ppm)	12/12	13	4.1	8.6	0.61	<i>f</i>
pH (SU)	12/12	8.6	7.1	8.0	0.11	<i>f</i>
Temperature (°C)	12/12	25	5.8	16	1.7	<i>f</i>
<i>Radionuclides (pCi/L)^g</i>						
⁷ Be	1/12	12*	-13	2.0	2.4	40,000
⁶⁰ Co	1/12	1.7*	-1.3	0.37	0.29	200
¹³⁷ Cs	3/12	2.8*	0.089	1.2*	0.26	120
Gross alpha	8/12	1.9*	0.36	0.75*	0.14	<i>f</i>
Gross beta	11/12	10*	0.93	4.3*	0.82	<i>f</i>
³ H	7/12	2,500*	2.0	710*	240	80,000
⁴⁰ K	1/12	190*	-73	12	19	280
Total rad Sr	7/12	4.2*	0.060	2.1*	0.41	40
<i>Clinch River downstream from ORNL (CRK 32)</i>						
<i>Field measurements</i>						
Dissolved oxygen (ppm)	12/12	13	2.2	7.7	0.72	<i>f</i>
pH (SU)	12/12	8.6	7.1	8.0	0.11	<i>f</i>
Temperature (°C)	12/12	24	6.2	16	1.6	<i>f</i>
<i>Radionuclides (pCi/L)^g</i>						
⁶⁰ Co	1/12	3.4*	-0.85	0.67*	0.34	200
¹³⁷ Cs	2/12	3.8*	-3.1	0.55	0.47	120
Gross alpha	6/12	1.4*	-0.10	0.54*	0.13	<i>f</i>
Gross beta	12/12	54*	2.5*	9.1*	4.2	<i>f</i>
³ H	11/12	16,000*	92	2,000	1,300	80,000
⁴⁰ K	2/12	130*	-43	0.025	14	280
Total rad Sr	5/12	24*	-0.23	3.8*	2.0	40

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Table D.3 (continued)

Parameter	N det/ N total	Concentration				
		Max ^b	Min ^b	Avg ^c	Standard error ^d	TWQC ^e
<i>Water supply intake for Knox County (CRK 58)</i>						
<i>Field measurements</i>						
Dissolved oxygen (ppm)	12/12	13	6.4	9.0	0.54	<i>f</i>
pH (SU)	12/12	8.6	7.5	8.1	0.11	<i>f</i>
Temperature (°C)	12/12	29	6.5	18	2.0	<i>f</i>
<i>Radionuclides (pCi/L)^g</i>						
⁶⁰ Co	1/12	2.8*	-3.1	-0.021	0.48	200
Gross alpha	3/12	1.2*	-0.15	0.42*	0.10	<i>f</i>
Gross beta	9/12	3.9*	0.89	2.3*	0.28	<i>f</i>
²³⁸ U	1/1	0.19*	0.19*	0.19	<i>f</i>	24
<i>Melton Hill Reservoir above city of Oak Ridge water intake (CRK 66)</i>						
<i>Field measurements</i>						
Dissolved oxygen (ppm)	12/12	11	6.5	9.4	0.42	<i>f</i>
pH (SU)	12/12	8.4	7.1	7.9	0.11	<i>f</i>
Temperature (°C)	12/12	29	5.6	18	2.0	<i>f</i>
<i>Radionuclides (pCi/L)^g</i>						
⁶⁰ Co	2/12	2.8*	-3.9	0.085	0.56	200
Gross alpha	6/12	1.3*	-0.28	0.50*	0.15	<i>f</i>
Gross beta	9/12	2.8*	0.75	1.9*	0.18	<i>f</i>
40K	1/12	230*	-38	18	20	280
<i>Clinch River (Solway Bridge) upstream from all DOE inputs (CRK 70)</i>						
<i>Field measurements</i>						
Dissolved oxygen (ppm)	12/12	10	6.6	8.6	0.34	<i>f</i>
pH (SU)	12/12	8.1	6.7	7.6	0.11	<i>f</i>
Temperature (°C)	12/12	29	7.9	18	1.8	<i>f</i>
<i>Metals (mg/L)</i>						
Aluminum, total	6/12	1.9	<0.20	~0.50	0.15	<i>f</i>
Barium, total	12/12	0.048	0.034	0.038	0.0013	<i>f</i>
Calcium, total	12/12	39	32	36	0.57	<i>f</i>
Iron, total	12/12	2.2	0.081	0.45	0.17	<i>f</i>
Magnesium, total	12/12	12	8.4	11	0.26	<i>f</i>
Manganese, total	12/12	0.17	0.030	0.062	0.011	<i>f</i>
Potassium, total	1/12	2.4	<2.0	~2.0	0.035	<i>f</i>
Sodium, total	12/12	8.0	5.3	7.1	0.20	<i>f</i>
Zinc, total	1/12	0.078	<0.050	~0.052	0.0023	<i>f</i>
<i>Radionuclides (pCi/L)^g</i>						
⁷ Be	1/12	17*	-6.5	1.5	2.3	40,000
¹³⁷ Cs	1/12	2.2*	-0.75	0.27	0.24	120
Gross alpha	3/12	7.3*	-0.15	0.95	0.59	<i>f</i>
Gross beta	9/12	4.6*	0.41	2.3*	0.34	<i>f</i>

Table D.3 (continued)

Parameter	N det/ N total	Concentration				
		Max ^b	Min ^b	Avg ^c	Standard error ^d	TWQC ^e
³ H	2/12	290*	-210	26	44	80,000
⁴⁰ K	5/12	230*	-43	40*	21	280
Total rad Sr	5/12	3.3*	-1.7	1.0*	0.48	40
²³⁸ U	1/1	0.17*	0.17*	0.17	<i>f</i>	24
<i>East Fork Poplar Creek prior to entering Poplar Creek (EFK 0.1)</i>						
<i>Field measurements</i>						
Dissolved oxygen (ppm)	2/2	7.6	6.2	6.9	0.70	<i>f</i>
pH (SU)	2/2	8.0	7.9	8.0	0.050	<i>f</i>
Temperature (°C)	2/2	18	13	16	2.5	<i>f</i>
<i>Radionuclides (pCi/L)^g</i>						
⁶⁰ Co	1/2	3.2*	1.0	2.1	1.1	200
¹³⁷ Cs	1/2	1.7*	-1.1	0.30	1.4	120
Gross alpha	2/2	4.5*	2.5*	3.5	0.98	<i>f</i>
Gross beta	2/2	4.5*	4.4*	4.5*	0.070	<i>f</i>
²³⁴ U	1/1	1.7*	1.7*	1.7	<i>f</i>	20
²³⁸ U	1/1	3.3*	3.3*	3.3	<i>f</i>	24
<i>East Fork Poplar Creek downstream from floodplain (EFK 5.4)</i>						
<i>Field measurements</i>						
Dissolved oxygen (ppm)	2/2	9.1	8.0	8.6	0.55	<i>f</i>
pH (SU)	2/2	7.9	7.6	7.8	0.15	<i>f</i>
Temperature (°C)	2/2	18	11	15	3.6	<i>f</i>
<i>Radionuclides (pCi/L)^g</i>						
Gross alpha	2/2	4.2*	2.5*	3.4	0.85	<i>f</i>
Gross beta	2/2	7.6*	4.2*	5.9	1.7	<i>f</i>
Total uranium	1/1	2.5*	2.5*	2.5	<i>f</i>	20
²³⁴ U	1/1	1.0*	1.0*	1.0	<i>f</i>	20
²³⁵ U	1/1	0.091*	0.091*	0.091	<i>f</i>	24
²³⁸ U	1/1	1.4*	1.4*	1.4	<i>f</i>	24
<i>Fifth Creek just upstream of White Oak Creek at ORNL (FIFTHCK 0.1)</i>						
<i>Field Measurements</i>						
Dissolved oxygen (ppm)	2/2	11	7.0	8.8	1.8	<i>f</i>
pH (SU)	2/2	7.9	7.9	7.9	0	<i>f</i>
Temperature (°C)	2/2	19	16	17	1.8	<i>f</i>
<i>Radionuclides (pCi/L)^g</i>						
⁶⁰ Co	1/2	2.4*	-22	-9.8	12	200
¹³⁷ Cs	1/2	7.4	2.2*	4.8	2.6	120
Gross alpha	1/2	1.7*	0.32	1.0	0.69	<i>f</i>
Gross beta	2/2	56*	20*	38	18	<i>f</i>
³ H	1/1	370*	370*	370	<i>f</i>	80,000
Total rad Sr	2/2	28*	11*	19	8.7	40

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Table D.3 (continued)

Parameter	N det/ N total	Concentration				
		Max ^b	Min ^b	Avg ^c	Standard error ^d	TWQC ^e
<i>Grassy Creek upstream of SEG and IT Corp. at CRK 23 (GCK 3.6)</i>						
<i>Field measurements</i>						
Dissolved oxygen (ppm)	2/2	9.8	5.9	7.9	2.0	<i>f</i>
pH (SU)	2/2	8.0	7.8	7.9	0.10	<i>f</i>
Temperature (°C)	2/2	16	14	15	0.80	<i>f</i>
<i>Metals (mg/L)</i>						
Aluminum, total	2/2	0.82	0.24	0.53	0.29	<i>f</i>
Barium, total	2/2	0.039	0.031	0.035	0.0043	<i>f</i>
Calcium, total	2/2	32	16	24	8.1	<i>f</i>
Iron, total	2/2	0.84	0.23	0.54	0.31	<i>f</i>
Magnesium, total	2/2	19	3.4	11	7.6	<i>f</i>
Manganese, total	2/2	0.068	0.028	0.048	0.020	<i>f</i>
Sodium, total	2/2	1.8	0.56	1.2	0.60	<i>f</i>
<i>Radionuclides (pCi/L)^g</i>						
Gross beta	1/2	2.0*	0.96	1.5	0.52	<i>f</i>
⁴⁰ K	1/2	260*	-32	110	150	280
<i>Ish Creek prior to entering CRK 30.8 (ICK 0.7)</i>						
<i>Field measurements</i>						
Dissolved oxygen (ppm)	2/2	10	7.5	8.8	1.3	<i>f</i>
pH (SU)	2/2	8.1	8.0	8.1	0.050	<i>f</i>
Temperature (°C)	2/2	16	10	13	2.9	<i>f</i>
<i>Radionuclides (pCi/L)^g</i>						
Gross alpha	1/2	0.44*	0.34	0.39*	0.050	<i>f</i>
⁴⁰ K	1/2	48*	-44	2.0	46	280
<i>McCoy Branch prior to entering CRK 60.3 (MCCBK 1.8)</i>						
<i>Field measurements</i>						
Dissolved oxygen (ppm)	2/2	8.9	4.5	6.7	2.2	<i>f</i>
pH (SU)	2/2	7.7	7.6	7.7	0.050	<i>f</i>
Temperature (°C)	2/2	16	11	14	2.5	<i>f</i>
<i>Radionuclides (pCi/L)^g</i>						
⁶⁰ Co	1/2	2.0*	-0.33	0.84	1.2	200
Gross alpha	1/2	0.74*	0.39	0.57	0.18	<i>f</i>
Gross beta	2/2	2.4*	2.3*	2.4*	0.050	<i>f</i>
<i>Melton Branch downstream from ORNL (MEK 0.2)</i>						
<i>Field measurements</i>						
Dissolved oxygen (ppm)	6/6	14	7.5	9.6	1.1	<i>f</i>
pH (SU)	6/6	8.1	7.0	7.7	0.18	<i>f</i>
Temperature (°C)	6/6	23	8.1	16	2.2	<i>f</i>
<i>Radionuclides (pCi/L)^g</i>						
⁷ Be	1/6	14*	-7.9	4.8	3.4	40,000
⁶⁰ Co	2/6	3.0*	0.086	1.2*	0.46	200
¹³⁷ Cs	1/6	1.8*	-0.88	0.39	0.36	120

Table D.3 (continued)

Parameter	N det/ N total	Concentration				
		Max ^b	Min ^b	Avg ^c	Standard error ^d	TWQC ^e
Gross alpha	4/6	2.4*	0.73	1.4*	0.26	<i>f</i>
Gross beta	6/6	1,500*	430*	730*	170	<i>f</i>
³ H	6/6	520,000*	180,000*	350,000*	56,000	80,000
Total rad Sr	6/6	630*	190*	330*	67	40
<i>Northwest Tributary prior to confluence with 1st Creek at ORNL (NWTK 0.1)</i>						
<i>Field measurements</i>						
Dissolved oxygen (ppm)	2/2	10	6.9	8.5	1.6	<i>f</i>
pH (SU)	2/2	7.9	7.7	7.8	0.10	<i>f</i>
Temperature (°C)	2/2	19	13	16	2.8	<i>f</i>
<i>Radionuclides (pCi/L)^g</i>						
⁶⁰ Co	1/2	26*	-1.4	12	14	200
Gross alpha	1/2	1.9*	0.34	1.1	0.78	<i>f</i>
Gross beta	2/2	99*	36*	68	32	<i>f</i>
³ H	1/2	180*	130	160	25	80,000
⁴⁰ K	1/2	210*	-430	-110	320	280
Total rad Sr	2/2	43*	16*	30	14	40
<i>Raccoon Creek sampling station prior to entering CRK 31 (RCK 2.0)</i>						
<i>Field measurements</i>						
Dissolved oxygen (ppm)	2/2	8.7	3.8	6.3	2.5	<i>f</i>
pH (SU)	2/2	7.6	7.0	7.3	0.30	<i>f</i>
Temperature (°C)	2/2	17	11	14	3.1	<i>f</i>
<i>Radionuclides (pCi/L)^g</i>						
⁷ Be	1/2	16*	8.4	12	3.8	40,000
Gross alpha	1/2	2.5*	0.12	1.3	1.2	<i>f</i>
Gross beta	2/2	37*	3.3*	20	17	<i>f</i>
³ H	1/2	300*	120	210	90	80,000
Total rad Sr	1/2	13*	0.40	6.7	6.3	40
<i>Walker Branch prior to entering CRK 53.4 (WBK 0.1)</i>						
<i>Field measurements</i>						
Dissolved oxygen (ppm)	2/2	10	6.3	8.2	1.9	<i>f</i>
pH (SU)	2/2	7.8	7.3	7.6	0.25	<i>f</i>
Temperature (°C)	2/2	16	12	14	2.1	<i>f</i>
<i>Radionuclides (pCi/L)^g</i>						
Gross beta	2/2	2.8*	1.7*	2.3	0.55	<i>f</i>
<i>White Oak Lake at White Oak Dam (WCK 1.0)</i>						
<i>Field Measurements</i>						
Dissolved oxygen (ppm)	12/12	11	2.5	6.4	0.80	<i>f</i>
pH (SU)	12/12	8.8	7.0	7.8	0.14	<i>f</i>
Temperature (°C)	12/12	25	1.6	16	2.2	<i>f</i>

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Table D.3 (continued)

Parameter	N det/ N total	Concentration				
		Max ^b	Min ^b	Avg ^c	Standard error ^d	TWQC ^e
<i>Metals (mg/L)</i>						
Aluminum, total	10/12	14	<0.20	~2.6	1.2	<i>f</i>
Barium, total	12/12	0.091	0.026	0.046	0.0047	<i>f</i>
Calcium, total	12/12	54	24	40	3.4	<i>f</i>
Iron, total	12/12	16	0.30	2.6	1.3	<i>f</i>
Magnesium, total	12/12	12	4.2	7.7	0.81	<i>f</i>
Manganese, total	12/12	0.40	0.071	0.16	0.029	<i>f</i>
Potassium, total	10/12	3.8	<2.0	~2.7	0.17	<i>f</i>
Sodium, total	12/12	23	3.0	12	2.2	<i>f</i>
Vanadium, total	1/12	0.031	<0.020	~0.021	0.00093	<i>f</i>
<i>Radionuclides (pCi/L)^g</i>						
⁷ Be	2/12	21*	-9.6	1.6	2.9	40,000
⁶⁰ Co	5/12	5.9*	0.17	1.9*	0.42	200
¹³⁷ Cs	12/12	60*	3.6*	19*	4.3	120
Gross alpha	12/12	15*	2.1*	6.9*	0.96	<i>f</i>
Gross beta	12/12	360*	180*	280*	17	<i>f</i>
³ H	12/12	120,000*	29,000*	72,000*	8,900	80,000
⁴⁰ K	2/12	120*	-38	14	12	280
Total rad Sr	12/12	160*	75*	120*	6.7	40
Total uranium	7/7	16*	0.52*	5.5*	2.0	20
^{233/234} U	6/6	15*	1.1*	6.0*	2.0	<i>f</i>
²³⁴ U	4/4	2.4*	0.37*	1.5*	0.43	20
²³⁵ U	3/10	0.31*	-0.029	0.085*	0.030	24
²³⁸ U	10/10	2.6*	0.15*	0.95*	0.22	24
<i>Volatile organics (µg/L)</i>						
Acetone	2/2	J4.0	J2.0	~3.0	1.0	<i>f</i>
<i>White Oak Creek downstream from ORNL (WCK 2.6)</i>						
<i>Field measurements</i>						
Dissolved oxygen (ppm)	6/6	13	7.5	9.6	0.71	<i>f</i>
pH (SU)	6/6	8.3	7.3	7.9	0.14	<i>f</i>
Temperature (°C)	6/6	23	11	17	1.9	<i>f</i>
<i>Radionuclides (pCi/L)^g</i>						
⁷ Be	1/6	14*	-9.0	2.2	4.0	40,000
⁶⁰ Co	3/6	2.9*	-0.42	1.4*	0.44	200
¹³⁷ Cs	6/6	45*	15*	33*	4.7	120
Gross alpha	6/6	16*	2.3*	6.2*	2.1	<i>f</i>
Gross beta	6/6	270*	150*	210*	18	<i>f</i>
³ H	6/6	97,000*	1,400*	39,000*	14,000	80,000
Total rad Sr	6/6	110*	70*	89*	7.0	40
Total uranium	3/3	4.5*	1.3*	2.8*	0.93	20
^{233/234} U	2/2	4.0*	1.1*	2.6	1.5	<i>f</i>
²³⁴ U	2/2	2.8*	1.4*	2.1	0.70	20
²³⁸ U	4/4	1.2*	0.21*	0.76*	0.24	24

Table D.3 (continued)

Parameter	N det/ N total	Concentration				
		Max ^b	Min ^b	Avg ^c	Standard error ^d	TWQC ^e
<i>White Oak Creek upstream from ORNL (WCK 6.8)</i>						
<i>Field measurements</i>						
Dissolved oxygen (ppm)	4/4	13	9.8	11	0.83	<i>f</i>
pH (SU)	4/4	7.4	7.2	7.3	0.048	<i>f</i>
Temperature (°C)	4/4	17	6.4	13	2.3	<i>f</i>
<i>Radionuclides (pCi/L)^g</i>						
Gross alpha	1/4	0.86*	0.098	0.38	0.18	<i>f</i>
Gross beta	2/4	2.4*	-0.39	1.3	0.65	<i>f</i>
³ H	2/4	180*	10	110*	42	80,000
Total rad Sr	2/4	3.5*	-0.17	1.5	0.93	40

^aAll values were included in the calculations. Only parameters that have one or more samples detected are listed in the table. The sampling and analysis plan contains a complete list of analyses performed.

^bPrefix “<” indicates the value for a parameter (excluding organics) was not quantifiable at the analytical detection limit and “J” indicates the value was estimated at or below the analytical detection limit by the laboratory.

^cA tilde (~) indicates that estimated values and/or detection limits were used in the calculation.

^dStandard error of the mean.

^eTennessee General Water Quality Criteria for Recreation and Domestic Use, as amended (CRK 16, CRK 23, CRK 32, CRK 58, CRK 66, CRK 70) or Tennessee General Water Quality Criteria for Freshwater Fish and Aquatic Life, as amended (BCK 0.6, EFK 0.1, EFK 5.4, MEK 0.2, WCK 1.0, WCK 2.6, WCK 6.8). 4% of DOE DCG used for radionuclides, where applicable.

^fNot applicable.

^gIndividual and average radionuclide concentrations significantly greater than zero (at the 95% confidence level) are identified by an *.