ACT 307 TYPE B CLEANUP CRITERIA FOR GROUNDWATER AND SOIL

Feb-94

(REVISION 3)

Type B criteria were calculated using currently available toxicological data and the algorithms set forth in the Act 307 Rules. These criteria may change as new toxicity data become available. They are not necessarily final cleanup standards. Please read the attached introduction for details. Carcinogenic chemicals are shown in italics. All values are expressed in units of parts per billion (ppb); ug/l in water and ug/kg in soil. Scientific notation is represented by E+ or E- a value, for example 2 x 10 is reported as 2E+6. Please refer to Operational Memorandum #6 for additional information concerning method detection limits.

	GROUNDWATER (ug/l;ppb)				SOIL (ug/kg;ppb)			
Chemical	Health-Based Drinking Water Value [R 709(2)(a)(b)]	Aesthetic Drinking Water Value [R 709(2)(c)(d)]	GSI Value {A} [R 713]	Target Method Detection Limit in Water {B}	20X Drinking Water Value [R 711(2)]	20X GSI Value	Direct Contact Value [R 711(5)]	Target Method Detection Limit in Soil {B}
Acenaphthene	1,200	NA	{D}	5	24,000	{D}	4.5E+7	330
Acenaphthylene	25	NA	{D}	5	500	{D}	9.3E+5	330
Acetaldehyde	910	NA	{D}	200	18,000	{D}	1.0E+7	500
Acetic acid	4,000	NA	{D}	18,000	80,000	{D}	4.4E+7	9.0E+5
Acetone	700	NA	500	50	14,000	10,000	7.8E+6	100
Acetonitrile	130	NA	810	10	2,600	16,000	1.5E+6	100
Acrolein	110	NA	2.5	5	2,200	50	1.2E+6	10
Acrylamide	0.0077	NA	9.1	0.5	0.15	180	280	5
Acrylic acid	580	NA	{D}	NA	12,000	{D}	6.4E+6	NA
Acrylonitrile	0.063	NA	2.2	1	1.3	44	700	10
Alachlor	0.42	NA	{D}	1	8.4	{D}	16,000	20
Aldrin	0.0021	NA	0.0014 {Q}	0.01	{G}	{G}	76	1.7
Aluminum	ID	50 {H}	{D}	20	1,000 {C}	{C,D}	ID	500
Aniline	6.3	NA	4	20	130	80	2.3E+5	1,700
Anthracene	7,000	NA	1.1E+5 {Q}	5	1.4E+5	2.2E+6	2.6E+8	330
Antimony	2.4 {C}	NA	4,300 {C,Q}	5	48 {C}	86,000	91,000	500
Arsenic	0.02 {C}	NA	11 {C,Q}	1	0.4 {C}	220 {C}	720 {C}	100
Atrazine	0.16	NA	{D}	1	3.2	{D}	5,800	50
Azobenzene	0.32	NA	{D}	NA	6.4	{D}	12,000	NA
Barium	2,400 {C}	NA	630 {C}	200	48,000 {C}	12,600	1.8E+7	1,000
Benzene	1.2	NA	60	1	24	1,200	13,000	10
Benzidine	0.00015	NA	0.0054 {Q}	50	0.003	0.11	5.6	5,000
Benzo(a)anthracene	0.0049	NA	0.31 {Q}	5	{G}	{G}	180	330
Benzo(b)fluoranthene	0.0049	NA	0.31 {Q}	5	{G}	{G}	180	330
Benzo(k)fluoranthene	0.0049	NA	0.31 {Q}	5	{G}	{G}	180	330
Benzo(g,h,i)perylene	25	NA	{D}	5	{G}	{G}	9.3E+5	330
Benzo(a)pyrene	0.0049	NA	0.31 {Q}	5	{G}	{G}	180	330
Benzoic acid	31,000	NA	{D}	50	6.2E+5	{D}	1E+9 {P}	3,300
Benzyl alcohol	9,800	NA	22	50	2E+5	440	1.1E+8	1,300
Benzyl chloride	0.21	NA	{D}	0.5	4.2	{D}	2,300	200
Bis(2-chloroethoxy)ethane	ID	NA	{D}	5	ID	{D}	ID	330
bis(2-Chloroethyl)ether	0.032	NA	4.2	5	0.64	84	350	330
bis(2-Ethylhexyl)phthalate	2.5	NA	59 {Q}	5	{G}	{G}	92,000	330
Boron	420 {C}	NA	{D}	10	8,400 {C}	{D}	1.6E+7	2,000
Bromobenzene	ID	NA	{D}	1	ID	{D}	ID	10
Bromodichloromethane	0.56	NA	24	1	11	480	6,200	10
Bromoform	4.6	NA	65	1	92	1,300	50,000	10
Bromomethane	9.8	NA	11	1	200	220	1.1E+5	10
n-Butanol	910	NA	{D}	40	18,000	{D}	1.0E+7	230
2-Butanone {MEK}	320	NA	4,100	50	6,400	82,000	3.6E+6	100

Chemical	GROUNDWATER (ug/l;ppb)				SOIL (ug/kg;ppb)			
	Health-Based Drinking Water Value [R 709(2)(a)(b)]	Aesthetic Drinking Water Value [R 709(2)(c)(d)]	GSI Value {A} [R 713]	Target Method Detection Limit in Water {B}	20X Drinking Water Value [R 711(2)]	20X GSI Value	Direct Contact Value [R 711(5)]	Target Method Detection Limit in Soil {B}
2-Butoxyethanol	ID	NA	{D}	NA	ID	{D}	ID	NA
n-Butyl acetate	530	NA	40	10	11,000	800	5.9E+6	20
t-Butyl alcohol	550	NA	{D}	NA	11,000	{D}	6.1E+6	NA
Butyl benzyl phthalate	1,100	NA	{D}	5	22,000	{D}	4.1E+7	330
Cadmium	3.5 {C}	NA	0.64 {C,E}	0.2	70 {C}	{D}	1.3E+5	50
Camphene	ID	NA	{D}	NA	ID	{D}	ID	NA
Caprolactam	5,800	NA	{D}	NA	1.2E+5	{D}	2.2E+8	NA
Carbon disulfide	770	NA	{D}	50	15,000	{D}	8.6E+6	100
Carbon tetrachloride	0.27	NA	21	1	5.4	420	3,000	10
Chlordane	0.027	NA	0.00053	0.02	{G}	{G}	1,000	3.3
Chloride	ID	250,000	{D}	10,000	5E+5 {I}	{D}	ID	2.0E+5
Chlorobenzene	130	NA	71	1	2,600	1,400	1.5E+6	10
Chloroethane	9.1	NA	{D}	1	180	{D}	1E+5	10
2-Chloroethyl vinyl ether	ID	NA	{D}	10	ID	{D}	ID	100
Chloroform	5.6	NA	43	1	110	860	62,000	10
Chloromethane	2.7	NA	{D}	1	54	{D}	30,000	10
2-Chlorophenol	43	NA	9.8	5	860	200	4.8E+5	330
o-Chlorotoluene	140	NA	{D}	1	2,800	{D}	1.6E+6	10
Chlorpyrifos	21	NA	{D}	1.5	420	{D}	7.8E+5	25
Chromium III {J}	37,000 {C}	NA	77 {C}	50	7.4E+5	1,500 {C}	3.9E+8	2,500
Chromium VI {J}	120 {C}	NA	7.3 {C}	1	2,400 {C}	150 {C}	1.2E+6	200
Chrysene	0.0049	NA	0.31 {Q}	5	{G}	{G}	180	330
Copper	1,300 {C}	1,000	18 {C,E}	25	20,000 {C}	370 {C}	9.8E+6	1,000
Cyanazine	9.8	NA	{D}	10	200	{D}	3.6E+5	500
Cyanide (Free)	150	NA	5.5	20	3,000 {C}	110 {C}	5.7E+6	500
Cyclohexanone	32,000	NA	{D}	NA	6.4E+5	{D}	3.5E+8	NA
Dacthal	5,300	NA	{D}	1	1.1E+5	{D}	2E+8	20
4-4'-DDD	0.15	NA	0.0084 {Q}	0.02	{G}	{G}	5,400	3.3
4-4'-DDE	0.1	NA	0.0059 {Q}	0.02	{G}	{G}	3,800	3.3
4-4'-DDT	0.1	NA	0.00023	0.02	{G}	{G}	3,800	3.3
Di-n-butyl phthalate	840	NA	{D}	5	17,000	{D}	3.1E+7	330
Di-n-octyl phthalate	130	NA	{D}	5	2,600	{D}	4.7E+6	330
Diacetone alcohol	ID	NA	{D}	NA	ID	{D}	ID	NA
Diazinon	0.63	NA	{D}	0.5	13	{D}	23,000	10
Dibenzo(a,h)anthracene	0.0049	NA	0.31 {Q}	5	{G}	{G}	180	330
Dibenzofuran	ID	NA	{D}	5	ID	{D}	ID	330
Dibromochloromethane	0.42	NA	29	1	8.4	580	4,700	10
Dibromomethane	77	NA	{D}	5	1,500	{D}	8.6E+5	10
1,2-Dichlorobenzene	600	NA	7	1	12,000	140	6.7E+6	10
1,3-Dichlorobenzene	600	NA	180	1	12,000	3,600	6.7E+6	10
1,4-Dichlorobenzene	1.5	NA	15	1	30	300	16,000	10
3,3'-Dichlorobenzidine	0.077	NA	0.063	20	1.5	1.3	2,800	2,000
Dichlorodifluoromethane	1,600	NA	{D}	1	32,000	{D}	1.8E+7	10
1,1-Dichloroethane	840	NA	{D}	1	17,000	{D}	9.3E+6	10
1,2-Dichloroethane	0.38	NA	560	1	7.6	11,000	4,300	10
1,1-Dichloroethylene	7	NA	32 {Q}	1	140	640	78,000	10
cis-1,2-Dichloroethylene	77	NA	{D}	1	1,500	{D}	8.6E+5	10
trans-1,2-Dichloroethylene	120	NA	300	1	2,400	6,000	1.3E+6	10
2,4-Dichlorophenol	21	NA	34	5	420	680	7.8E+5	330
2,4-Dichlorophenoxyacetic acid	70	NA	47	10	1,400	940	2.6E+6	200

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1,2-Dichloropropane	0.52	NA	64	1	10	1,300	5,800	10
1,3-Dichloropropene {K}	0.2	NA	3	1	4	60	2,200	10
Dichlorovos	0.12	NA	{D}	0.1	2.4	{D}	4,400	50
Dicyclohexyl phthalate	ID	NA	{D}	5	ID	{D}	ID	330
Dieldrin	0.0022	NA	3.2E-5	0.02	{G}	{G}	80	3.3
Diethyl ether	3,500	NA	{D}	50	70,000	{D}	3.9E+7	100
Diethyl phthalate	5,200	NA	1.2E+5 {Q}	5	1E+5	2.4E+6	1.9E+8	330
Diethylene glycol monobutyl ether	84	NA	{D}	NA	1,700	{D}	3.1E+6	NA
Diisopropylamine	5.4	NA	{D}	NA	110	{D}	60,000	NA
N,N-Dimethylacetamide	180	NA	{D}	NA	3,600	{D}	1.9E+6	NA
N,N-Dimethylaniline	15	NA	{D}	NA	300	{D}	1.7E+5	NA
Dimethylformamide	670	NA	3,800	NA	13,000	76,000	7.5E+6	NA
2,4-Dimethylphenol	350	NA	31	5	7,000	620	1.3E+7	330
2,6-Dimethylphenol	4.2	NA	{D}	5	84	{D}	1.6E+5	330
3,4-Dimethylphenol	9.8	NA	{D}	5	200	{D}	3.6E+5	330
Dimethyl phthalate	70,000	NA	2.9E+6 {Q}	5	1.4E+6	5.8E+7	1E+9 {P}	330
Dimethylsulfoxide	2.1E+5	NA	{D}	NA	4.2E+6	6644	1.0E+9	NA
2,4-Dinitrotoluene	0.052	NA	91 {Q}	5	1	1,800	1,900	330
Dinoseb	7	NA	0.5 {F}	1	140	10	2.6E+5	20
1,4-Dioxane	3.2	NA	2,000	1	64	40,000	35,000	10
Endosulfan {L}	1.6	NA	0.056 {Q}	0.01	{G}	{G}	60,000	3.3
Endrin	1.2	NA	0.0023	0.02	{G}	{G}	44,000	3.3
Epichlorohydrin	3.5	NA	{D}	5	70	{D}	39,000	10
Ethanol	2.2E+6	NA	41,000	1,000	4.3E+7	8.2E+5	1.0E+9	1,000
Ethyl acetate	6,300	NA	1,000	NA	1.3E+5	20,000	7E+7	NA
Ethylbenzene	680	74	31	1	1,500	620	7.5E+6	10
Ethylene dibromide	0.00042	NA	1.1	1	0.0084	22	4.7	10
Ethylene glycol	14,000	NA	68,000	50	2.8E+5	1.4E+6	5.2E+8	200
Ethylene glycol acetate	ID	NA	{D}	NA	ID	{D}	ID	NA
1-Ethyl-2-methylbenzene	ID	NA	{D}	NA	ID	{D}	ID	NA
Fluoranthene	840	NA	370 {Q}	5	17,000	7,400	3.1E+7	330
Fluorene	840	NA	14,000 {Q}	5	17,000	2.8E+5	3.1E+7	330
Fluorine (soluble fluoride)	2,100 {C}	2,000	1,900	NA	42,000 {C}	38,000 {C}	1.6E+7	NA
Formaldehyde	1,300	NA	170	100	26,000	3,400	1.4E+7	500
Formic acid	9,800	NA	{D}	18,000	2.OE+5	{D}	1.1E+8	9.0E+5
1-Formylpiperidine	77	NA	{D}	NA	1,500	{D}	8.6E+5	NA
Gentian violet	0.35	NA	{D}	NA	7	{D}	13,000	NA
Heptachlor	0.0077	NA	0.0016	0.01	{G}	{G}	280	1.7
Heptachlor epoxide	0.0038	NA	0.0011 {Q}	0.01	{G}	{G}	140	1.7
n-Heptane	31,000	NA	{D}	NA	6.2E+5	{D}	3.4E+8	NA
Hexabromobenzene	20	NA	{D}	0.1	400	{D}	7.3E+5	50
Hexachlorobenzene (C-66)	0.022	NA	0.0018	{R}	0.44	0.036	800	{R}
Hexachlorobutadiene (C-46)	0.46	NA	500 {Q}	{R}	9.2	10,000	17,000	{R}
alpha-Hexachlorocyclohexane	0.0056	NA	0.13 {Q}	0.01	0.11	2.6	210	1.7
beta-Hexachlorocyclohexane	0.02	NA	0.46 {Q}	0.01	0.4	9.2	720	1.7
Hexachlorocyclopentadiene (C-56)	50	NA	0.54	{R}	1,000	11	1.8E+6	{R}
Hexachloroethane	2.5	NA	13	{R}	50	260	28,000	{R}
n-Hexane	2,900	NA	{D}	NA	58,000	{D}	3.2E+7	NA
2-Hexanone	980	NA	{D}	50	20,000	{D}	1.1E+7	100
Indeno(1,2,3-cd)pyrene	0.0049	NA	0.31 {Q}	5	{G}	{G}	180	330

Chemical	GROUNDWATER (ug/l;ppb)				SOIL (ug/kg;ppb)			
	Health-Based Drinking Water Value [R 709(2)(a)(b)]	Aesthetic Drinking Water Value [R 709(2)(c)(d)]	GSI Value {A} [R 713]	Target Method Detection Limit in Water {B}	20X Drinking Water Value [R 711(2)]	20X GSI Value	Direct Contact Value [R 711(5)]	Target Method Detection Limit in Soil {B}
Iron	ID	300 {C}	{D}	100	6,000 {C}	{D}	ID	2,000
Isobutyl alcohol	2,200	NA	{D}	1,000	44,000	{D}	2.5E+7	1,000
Isophorone	38	NA	860	5	760	17,000	4.3E+5	330
Isopropyl alcohol	450	NA	21,000	400	9,000	4.2E+5	5E+6	400
Lead	4 {C,O}	NA	6.6 {C,E,Q}	3	80 {C}	130 {C}	4E+5	1,000
Lindane	0.027	NA	0.08 {Q}	0.01	0.54	1.6	1,000	1.7
Manganese	170 {C}	50 {C}	{D}	20	1,000 {C}	{D}	1.2E+6	2,000
Mercury (Inorganic)	2.1 {C}	NA	0.0013 {C}	0.2	42 {C}	0.026 {C}	78,000	100
Methanol	3,500	NA	41,000	800	70,000	8.2E+5	3.9E+7	800
Methoxychlor	35	NA	{D}	0.5	700	{D}	1.3E+6	50
2-Methoxyethanol	28	NA	{D}	NA	560	{D}	3.1E+5	NA
2-Methyl-4-chlorophenoxyacetic acid	7	NA	{D}	0.5	140	{D}	2.6E+5	20
2-Methyl-4,6-dinitrophenol	2.4	NA	0.59	20	48	12	91,000	1,700
4-Methyl-2-pentanone {MIBK}	350	NA	{D}	50	7,000	{D}	3.9E+6	100
Methyl-tert-butyl ether (MTBE)	230	NA	380	50	4,600	7,600	2.6E+6	100
Methylcyclopentane	ID	NA	{D}	NA	ID	{D}	ID	NA
4,4'-Methylene-bis-2-chloroaniline {M}	0.035	NA	{D}	1	{G}	{G}	1,300	50
Methylene chloride	4.6	NA	59	1	92	1,200	51,000	10
N-Methyl morpholine	19	NA	1,100	NA	380	22,000	2.1E+5	NA
2-Methylnaphthalene	ID	NA	{D}	5	ID	{D}	ID	330
2-Methylphenol	350	NA	38	5	7,000	760	3.9E+6	330
3-Methylphenol	350	NA	{D}	5	7,000	{D}	1.3E+7	330
4-Methylphenol	35	NA	24	5	700	480	1.3E+6	330
Metolachlor	1,600	NA	{D}	0.1	32,000	{D}	6E+7	20
Naphthalene	250	NA	29	5	5,000	580	9.3E+6	330
Nickel	530 {C}	NA	57 {C,E}	50	11,000 {C}	1,100 {C}	2E+7	1,000
Nitrate	10,000	NA	{D}	NA	2.0E+5	{D}	6.4E+7	NA
Nitrite	1,000	NA	{D}	NA	20,000	{D}	2.6E+7	NA
Nitrobenzene	3.2	NA	1,900 {Q}	5	64	38,000	36,000	330
n-Nitroso-di-n-Propylamine	0.0049	NA	{D}	5	0.098	{D}	54	330
N-Nitrosodiphenylamine	7	NA	160 {Q}	5	140	3,200	78,000	330
Pendimethalin	840	NA	{D}	0.1	17,000	{D}	3.1E+7	20
Pentachlorobenzene	5.8	NA	{D}	0.5	120	{D}	2.2E+5	50
Pentachlorophenol	0.29	NA	0.8 {F}	1	5.8	16	11,000	1,700
2-Pentene	ID	NA	{D}	NA	ID	{D}	ID	NA
Phenanthrene	25	NA	{D}	5	500	{D}	9.3E+5	330
Phenol	4,200	NA	1,100	5	84,000	22,000	4.7E+7	330
Piperidine	3.1	NA	{D}	NA	62	{D}	34,000	NA
Polybrominated biphenyls	0.0038	NA	{D}	0.01	0.076	{D}	140	50
Polychlorinated biphenyls {N}	0.018	NA	2E-5	0.2	{G}	{G}	1,000	330
Prometon	150	NA	{D}	0.5	3,000	{D}	5.7E+6	20
Propachlor	91	NA	{D}	0.2	1,800	{D}	3.4E+6	20
Propazine	190	NA	{D}	0.5	3,800	{D}	7E+6	20
Propionic acid	12,000	NA	{D}	18,000	2.4E+5	{D}	1.3E+8	9.0E+5
Propyl alcohol	1,300	NA	8.2E+5	NA	26,000	1.6E+7	1.5E+7	NA
Propylene glycol	1.4E+5	NA	1.9E+5	50	2.8E+6	3.8E+6	1E+9 {P}	200
Pyrene	520	NA	11,000	5	10,000	2.2E+5	1.9E+7	330
Pyridine	7	NA	20	10	140	400	78,000	330
Selenium	35 {C}	NA	5 {C,Q}	5	700 {C}	100 {C}	1.3E+6	500
Silver	33 {C}	100	0.1 {C}	0.5	660 {C}	2 {C}	1.2E+6	500

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Sodium	1.5E+5	NA	{D}	NA	3E+6 {C}	{D}	1E+9 {P}	NA
Styrene	1.2	NA	19	1	24	380	13,000	10
Sulfate	ID	2.5E+5	{D}	NA	5E+6	{D}	ID	NA
Tebuthiuron	490	NA	{D}	NA	9,800	{D}	1.8E+7	NA
1,2,4,5-Tetrachlorobenzene	2,400	NA	0.4	0.1	48,000	8	8.8E+7	20
2,3,7,8-Tetrachlorodibenzo-p-dioxin {S}	4.6E-7	NA	1.4E-8	1E-5	{G}	{G}	0.013	0.001
1,1,1,2-Tetrachloroethane	1.3	NA	{D}	1	26	{D}	15,000	10
1,1,2,2-Tetrachloroethane	0.18	NA	32	1	3.6	640	1,900	10
Tetrachloroethylene	0.7	NA	22	1	14	440	7,800	10
Tetrahydrofuran	230	NA	3,300	NA	4,600	66,000	2.6E+6	NA
Thallium	0.58 {C}	NA	6.3 {C,Q}	2	12 {C}	130 {C}	22,000	500
Toluene	1,500	790	110	1	16,000	2,200	1.7E+7	10
p-Toluidine	0.18	NA	{D}	NA	3.6	{D}	6,900	NA
Toxaphene	0.032	NA	0.0002 {Q}	1	0.64	0.004	350	170
Triallate	91	NA	{D}	1	1,800	{D}	3.4E+6	20
Tributylamine	9.8	NA	{D}	NA	200	{D}	1.1E+5	NA
1,2,4-Trichlorobenzene	110	NA	22	{R}	2,200	440	1.2E+6	{R}
1,1,1-Trichloroethane	200	NA	120	1	4,000	2,400	2.2E+6	10
1,1,2-Trichloroethane	0.63	NA	65	1	13	1,300	7,000	10
Trichloroethylene	2.2	NA	94	1	44	1,900	24,000	10
Trichlorofluoromethane	2,400	NA	{D}	1	48,000	{D}	2.7E+7	10
2,4,5-Trichlorophenol	700	NA	{D}	50	14,000	{D}	2.6E+7	1,700
2,4,6-Trichlorophenol	3.2	NA	1.5	5	64	30	1.2E+5	330
2(2,4,5-Trichlorophenoxy)propionic acid	52	NA	21	1	1,000	420	1.9E+6	50
1,2,3-Trichloropropane	40	NA	{D}	1	800	{D}	4.4E+5	10
1,1,2-Trichloro-1,2,2-trifluoroethane	1.9E+5	NA	{D}	NA	3.8E+6	{D}	1E+9 {P}	NA
Trifluralin	4.6	NA	{D}	1	92	{D}	1.7E+5	50
2,2,4-Trimethyl-2-pentene	ID	NA	{D}	NA	ID	{D}	ID	NA
1,3,5-Trimethylbenzene	ID	NA	{D}	1	ID	{D}	ID	10
tris(2,3-Dibromopropyl)phosphate	0.02	NA	{D}	NA	0.4	{D}	720	NA
Vanadium	61 {C}	NA	8 {C}	20	1,200 {C}	160 {C}	2.2E+6	1,000
Vinyl acetate	620	NA	NA	50	12,000	{D}	6.8E+6	100
Vinyl chloride	0.016	NA	3.1	1	0.32	62	180	10
Xylenes	13,000	280	59	3	5,600	1,200	1.4E+8	30
Zinc	2,300 {C}	5,000 {C}	81 {C,E}	20	46,000 {C}	1,600 {C}	8.6E+7	1,000

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Footnotes

{A} Groundwater surface water interface (GSI) values are based on Rule 57 of Act 245. The GSI values are presented only to establish groundwater criteria which are protective of surface water.

{B} Acceptable method detection limits for groundwater and soil samples, the latter expressed in ug/kg dry weight.

{C} Background, as defined in Rule 701(c), may be substituted as the cleanup criteria if higher than the Type B cleanup criterion.

{D} Chemical has either not been evaluated or an inadequate data base precludes the development of a GSI value. MDNR should be contacted to determine whether a chemical is being evaluated or has been evaluated since this list was prepared. If no value exists, the responsible party (RP) may develop a proposed GSI value for MDNR review and approval. Guidance can be obtained from MDNR. If a GSI value cannot be developed from data in the scientific literature, the RP can either perform a Type A cleanup or generate the minimum toxicity data required to develop the GSI value.

{E} GSI value is dependant on water hardness. Value presented was calculated assuming a hardness of 178 mg/l of $CaCO_3$. If site-specific water hardness is expected to be significantly different, contact an ERD toxicologist.

{F} GSI value is pH dependant. Value was calculated assuming a pH of 7.7. If site-specific pH is expected to be significantly different, contact an ERD toxicologist.

{G} Chemical, due to its physicochemical properties, is not expected to leach through soils to groundwater under most conditions. Therefore, the direct contact soil

criterion is considered to be protective of groundwater. However, the presence of organic solvents in the soil may increase the solubility of these chemicals, thereby increasing their potential to leach from soil to groundwater. Under these conditions site-specific leachate testing may be required.

(H) Professional judgement used to determine that 50 ppb of aluminum in drinking water is protective of human health.

{I} Criteria is based on agricultural impacts (phytotoxicity), not 20X groundwater criterion.

{J} Valence-specific chromium data (Cr III and Cr VI) must be compared to the same valence-specific cleanup criteria. If analytical data are provided for "total" chromium only, then values for chromium VI must be applied as the cleanup criteria. Chromium III cleanup criteria can only be used at sites where groundwater is prevented from being used as a public water supply, currently or in the future.

{K} Criteria for 1,3-dichloropropene can be applied to the cis- and trans-1,3-dichloropropene isomers. The toxicity data used for criteria development was generated using a mixture of both isomers (Telone II).

{L} Criteria for endosulfan can be applied to endosulfan I (alpha-endosulfan) and endosulfan II (beta-endosulfan).

{M} Also known as MBOCA.

{N} If more than one PCB Aroclor is present, the total PCB concentration must be compared to the PCB criteria.

{O} Higher level may be acceptable if soil concentration is less than 400 ppm and groundwater migrating off-site will not impact adjacent properties. Contact an ERD toxicologist for further explanation.

{P} Direct contact criterion is at saturation in soil. Criterion is actually greater than 100% in soil, hence it is reduced to 100%.

{Q} Basis for the GSI value is the National Toxics Rule (NTR). The NTR value was either more restrictive than the Rule 57 value or a Rule 57 value was not available.

{R} Two different analytical methods and target method detection limits are available for this chemical. Please refer to Operational Memorandum #6 for details.

{S} Use 2,3,7,8-TCDD "toxicity equivalence factors" (TEFs) for other chlorinated dibenzo-p-dioxins and chlorinated dibenzofurans. Contact an ERD toxicologist for details

ID = Inadequate data to develop criterion; NA = Not available.