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The following table presents the human health benchmarks that were identified for potential constituents in biosolids[1].

Human health benchmarks for potential constituents in biosolids.

Constituent Name	CASRN	analyte group	RfD (mg/kg-d)	RfD Ref	RfC (mg/m^3)	RfC Ref	CSFo (per mg/kg-d)	CSFo Ref	URF (per $\mu g/m^3$)	URF Ref	CSFi (per mg/kg-d)	CSFi Ref	TEF	TEF Ref	base	Notes
Acenaphthene	83-32-9	PAH	6.0E-02	I												
Acetaldehyde	75-07-0	odor			9.0E-03	I			2.2E-06	I	7.7E-03	calc				
Acetophenone	98-86-2	pharm	1.0E-01	I												
Aldrin	309-00-2	pest	3.0E-05	I			1.7E+01	I	4.9E-03	I	1.7E+01	calc				
Aluminum	7429-90-5	metal	2.0E+00	A												intermediate MRL
Ammonia	7664-41-7	odor	9.7E-01	H	1.0E-01	I										RfD= 34 mg/L
Anthracene	120-12-7	PAH	3.0E-01	I												
Antimony	7440-36-0	metal	4.0E-04	I												
Antimony trioxide	1309-64-4	metal	4.0E-04	H	2.0E-04	I										
Arochlor 1016	12674-11-2	PCB	7.0E-05	I												
Arochlor 1254	11097-69-1	PCB	2.0E-05	I												
Arsenic, inorganic[1]	7440-38-2	metal	3.0E-04	I	3.0E-05	C00	1.5E+00	I	4.3E-03	I	1.5E+01	calc				
Barium	7440-39-3	metal	7.0E-02	I	5.0E-04	H										
Benz(a)anthracene	56-55-3	PAH											0.1	E93	BAP	
Benzenethiol (thiophenol)	108-98-5	odor	1.0E-05	H												
Benzo(a)pyrene	50-32-8	PAH					7.3E+00	I					1	E93	BAP	
Benzo(b)fluoranthene	205-99-2	PAH											0.1	E93	BAP	
Benzo(j)fluoranthene	205-82-3	PAH					1.2E+00	C99b	1.1E-04	C99b	3.9E-01	C99b				
Benzo(k)fluoranthene	207-08-9	PAH											0.01	E93	BAP	

1- Metal already regulated under Part 503.

Constituent Name	CASRN	analyte group	RfD (mg/kg-d)	RfD Ref	RfC (mg/m^3)	RfC Ref	CSFo (per mg/kg-d)	CSFo Ref	URF (per $\mu g/m^3$)	URF Ref	CSFi (per mg/kg-d)	CSFi Ref	TEF	TEF Ref	base	Notes
Beryllium	7440-41-7	metal	2.0E-03	I	2.0E-05	I			2.4E-03	I	8.4E+00	calc				
Bidrin	141-66-2	pest	1.0E-04	I												
Biphenyl, 1,1-	92-52-4	PBB	5.0E-02	I												
Bis(2-ethylhexyl)phthalate (DEHP; also di-)	117-81-7	other	2.0E-02	I	1.0E-02	C99a	1.4E-02	I	2.4E-06	C99b	8.4E-03	C99b				
Bisphenol A	80-05-7	other	5.0E-02	I												
Boron	7440-42-8	metal	9.0E-02	I	2.0E-02	H										
Butanol, n- (n-butyl alcohol)	71-36-3	odor	1.0E-01	I												
Cadmium[1]	7440-43-9	metal	5.0E-04 or 1.0E-03	I	2.0E-05	C00			1.8E-03	I	6.3E+00	calc				RfD for water=5E-4 & RfD for food = 1E-3 mkd
Captan	133-06-2	pest	1.3E-01	I			3.5E-03	H								
Carbaryl	63-25-2	other	1.0E-01	I												
Chlordane	57-74-9	pest	5.0E-04	I	7.0E-04	I	3.5E-01	I	1.0E-04	I	3.5E-01	calc				
Chlorfenvinphos	470-90-6	pest	7.0E-04	A												
Chlorine	7782-50-5	odor	1.0E-01	I	2.0E-04	C00										
Chlorobenzilate	510-15-6	pest	2.0E-02	I			2.7E-01	H	7.8E-05	H	2.7E-01	H				
Chloronaphthalene, beta-	91-58-7	chlorona p	8.0E-02	I												
Chlorpyrifos	2921-88-2	pest	3.0E-03	I												
Chromium (III), insoluble salts[1]	16065-83-1	metal	1.5E+00	I												
Chromium (VI)[1]	18540-29-9	metal	3.0E-03	I	8E-6 or 1E-4	I	4.2E-01	C99b	1.2E-02	I	4.2E+01	calc				
Chromium (VI) - chromic acid mists & dissolved Cr aerosols[1]	18540-29-9	metal			8.0E-06	I										
Chromium (VI) - Cr particulates[1]	18540-29-9	metal			1.0E-04	I										
Chrysene	218-01-9	PAH											0.001	E93	BAP	
Cobalt (and cmpds)	7440-48-4	metal	2.0E-02	SF	2.0E-05	SF			2.8E-03	SF	9.8E+00	calc				

Constituent Name	CASRN	analyte group	RfD (mg/kg-d)	RfD Ref	RfC (mg/m^3)	RfC Ref	CSFo (per mg/kg-d)	CSFo Ref	URF (per $\mu g/m^3$)	URF Ref	CSFi (per mg/kg-d)	CSFi Ref	TEF	TEF Ref	base	Notes
Copper[1]	7440-50-8	metal	*MCL only	H												
Cresol, m- (3-methylphenol)	108-39-4	odor	5.0E-02	I												
Cresol, p- (4-methylphenol)	106-44-5	other	5.0E-03	H												
DDD (p,p'-dichlorodiphenyldichloroethane)	72-54-8	pest					2.4E-01	I								
DDE (p,p'-dichlorodiphenyldichloroethylene)	72-55-9	pest					3.4E-01	I								
DDT (p,p'-dichlorodiphenyltrichloroethane)	50-29-3	pest	5.0E-04	I			3.4E-01	I	9.7E-05	I	3.4E-01	calc				
Decabromodiphenyl ether	1163-19-5	PBDE	1.0E-02	I												
Demeton	8065-48-3	pest	4.0E-05	I												
Di(2-ethylhexyl)adipate	103-23-1	other	6.0E-01	I			1.2E-03	I								
Diallate	2303-16-4	pest					6.1E-02	H								
Diazinon	333-41-5	pest	9.0E-04	H	9.0E-03	A										intermediate MRL
Dibenz[a,h]acridine	226-36-8	PAH					1.2E+00	C99b	1.1E-04	C99b	3.9E-01	C99b				
Dibenz[a,j]acridine	224-42-0	PAH					1.2E+00	C99b	1.1E-04	C99b	3.9E-01	C99b				
Dibenzo(a,h)anthracene	53-70-3	PAH											1	E93	BAP	
Dibenzo[a,e]pyrene	192-65-4	PAH					1.2E+01	C99b	1.1E-03	C99b	3.9E+00	C99b				
Dibenzo[a,h]pyrene	189-64-0	PAH					1.2E+02	C99b	1.1E-02	C99b	3.9E+01	C99b				
Dibenzo[a,i]pyrene	189-55-9	PAH					1.2E+02	C99b	1.1E-02	C99b	3.9E+01	C99b				
Dibenzo[a,l]pyrene	191-30-0	PAH					1.2E+02	C99b	1.1E-02	C99b	3.9E+01	C99b				
Dibenzo[c,g]carbazole, 7H-	194-59-2	PAH					1.2E+01	C99b	1.1E-03	C99b	3.9E+00	C99b				
Dichlorobenzene, 1,4-	106-46-7	odor	4.0E-01	A	8.0E-01	I	2.4E-02	H	1.1E-05	C99b	4.0E-02	C99b				intermediate MRL
Dichlorophenoxyacetic acid, 2,4- (2,4-D)	94-75-7	pest	1.0E-02	I												
Dichlorvos	62-73-7	pest	5.0E-04	I	5.0E-04	I	2.9E-01	I								
Dieldrin	60-57-1	pest	5.0E-05	I			1.6E+01	I	4.6E-03	I	1.6E+01	calc				

Constituent Name	CASRN	analyte group	RfD (mg/kg-d)	RfD Ref	RfC (mg/m^3)	RfC Ref	CSFo (per mg/kg-d)	CSFo Ref	URF (per µg/m^3)	URF Ref	CSFi (per mg/kg-d)	CSFi Ref	TEF	TEF Ref	base	Notes
Diethyl phthalate	84-66-2	other	8.0E-01	I												
Diethylstilbestrol	56-53-1	DES					4.7E+03	H								
Dimethoate	60-51-5	pest	2.0E-04	I												
Dinitropyrene, 1,6-	42397-64-8	PAH					1.2E+02	C99b	1.1E-02	C99b	3.9E+01	C99b				
Dinitropyrene, 1,8-	42397-65-9	PAH					1.2E+01	C99b	1.1E-03	C99b	3.9E+00	C99b				
Dinoseb	88-85-7	pest	1.0E-03	I												
Disulfoton	298-04-4	pest	4.0E-05	I	2.0E-04	A										intermediate MRL
Endosulfan	115-29-7	pest	6.0E-03	I												
Endrin	72-20-8	pest	3.0E-04	I												
Ethion	563-12-2	pest	5.0E-04	I												
Ethyl p-nitrophenyl phenylphosphorothioacetate	2104-64-5	pest	1.0E-05	I												
Fluoranthene	206-44-0	PAH	4.0E-02	I												
Fluorene	86-73-7	PAH	4.0E-02	I												
Heptachlor	76-44-8	pest	5.0E-04	I			4.5E+00	I	1.3E-03	I	4.6E+00	calc				
Heptachlor epoxide	1024-57-3	pest	1.3E-05	I			9.1E+00	I	2.6E-03	I	9.1E+00	calc				
Heptachlorobiphenyl, 2,2',3,3',4,4',5- (PCB 170)	35065-30-6	PCB											0.0001	E98, W94	tcdd	
Heptachlorobiphenyl, 2,2',3,4,4',5,5'- (PCB 180)	35065-29-3	PCB											0.00001	E98, W94	tcdd	
Heptachlorobiphenyl, 2,3,3',4,4',5,5'- (PCB 189)	39635-31-9	PCB											0.0001	W	tcdd	
Heptachlorodibenzofuran, 1,2,3,4,6,7,8-	67562-39-4	CDF											0.01	W	tcdd	
Heptachlorodibenzofuran, 1,2,3,4,7,8,9-	55673-89-7	CDF											0.01	W	tcdd	
Heptachlorodibenzo-p-dioxin, 1,2,3,4,6,7,8-	35822-46-9	CDD											0.01	W	tcdd	
Hexachlorobiphenyl, 2,3,3',4,4',5- (PCB 156)	38380-08-4	PCB											0.0005	W	tcdd	

Constituent Name	CASRN	analyte group	RfD (mg/kg-d)	RfD Ref	RfC (mg/m^3)	RfC Ref	CSFo (per mg/kg-d)	CSFo Ref	URF (per µg/m^3)	URF Ref	CSFi (per mg/kg-d)	CSFi Ref	TEF	TEF Ref	base	Notes
Hexachlorobiphenyl, 2,3,3',4,4',5'- (PCB 157)	69782-90-7	PCB											0.0005	W	tcdd	
Hexachlorobiphenyl, 2,3',4,4',5,5'- (PCB 167)	52663-72-6	PCB											0.00001	W	tcdd	
Hexachlorobiphenyl, 3,3',4,4',5,5'- (PCB 169)	32774-16-6	PCB											0.01	W	tcdd	
Hexachlorocyclohexane, alpha-	319-84-6	pest	8.0E-03	A			6.3E+00	I	1.8E-03	I	6.3E+00	calc				
Hexachlorocyclohexane, beta-	319-85-7	pest	6.0E-04	A			1.8E+00	I	5.3E-04	I	1.9E+00	calc				
Hexachlorocyclohexane, gamma- (lindane)	58-89-9	pest	3.0E-04	I			1.3E+00	H	3.1E-04	C99b	1.1E+00	C99b				
Hexachlorodibenzofuran, 1,2,3,4,7,8-	70648-26-9	CDF											0.1	W	tcdd	
Hexachlorodibenzofuran, 1,2,3,6,7,8-	57117-44-9	CDF											0.1	W	tcdd	
Hexachlorodibenzofuran, 1,2,3,7,8,9-	72918-21-9	CDF											0.1	W	tcdd	
Hexachlorodibenzofuran, 2,3,4,6,7,8-	60851-34-5	CDF											0.1	W	tcdd	
Hexachlorodibenzo-p-dioxin, 1,2,3,4,7,8-	39227-28-6	CDD											0.1	W	tcdd	
Hexachlorodibenzo-p-dioxin, 1,2,3,6,7,8-	57653-85-7	CDD											0.1	W	tcdd	
Hexachlorodibenzo-p-dioxin, 1,2,3,7,8,9-	19408-74-3	CDD											0.1	W	tcdd	
Hydrogen sulfide	7783-06-4	odor	3.0E-03	I	1.0E-03	I										
Ideno[1,2,3-cd]pyrene	193-39-5	PAH											0.1	E93	BAP	
Iodine	7553-56-2	metal	1.0E-02	A												
Lead and cmpds (inorganic)[1]	7439-92-1	metal					8.5E-03	C99b	1.2E-05	C99b	4.2E-02	C99b				
Malathion	121-75-5	pest	2.0E-02	I												
Manganese	7439-96-5	metal	1.4E-01	I	5.0E-05	I										
Mercuric chloride	7487-94-7	metal	3.0E-04	H	9.0E-05	C00										
Mercury (elemental)[1]	7439-97-6	metal			3.0E-04	I										

Constituent Name	CASRN	analyte group	RfD (mg/kg-d)	RfD Ref	RfC (mg/m^3)	RfC Ref	CSFo (per mg/kg-d)	CSFo Ref	URF (per $\mu g/m^3$)	URF Ref	CSFi (per mg/kg-d)	CSFi Ref	TEF	TEF Ref	base	Notes
Methoxychlor	72-43-5	pest	5.0E-03	I												
Methyl mercury	22967-92-6	metal	1.0E-04	I												
Methyl parathion	298-00-0	pest	2.5E-04	I												
Methylchrysene, 5-	3697-24-3	PAH					1.2E+01	C99b	1.1E-03	C99b	3.9E+00	C99b				
Mirex	2385-85-5	pest	2.0E-04	I												
Molybdenum[1]	7439-98-7	metal	5.0E-03	I												
Naled	300-76-5	pest	2.0E-03	I												
Naphthalene	91-20-3	PAH	2.0E-02	I	3.0E-03	I										
Nickel oxide[1]	1313-99-1	metal			1.0E-04	C00										
Nickel, soluble salts[1]	7440-02-0	metal	2.0E-02	I	5.0E-05	C00			2.6E-04	C99b	9.1E-01	C99b				
Nitrochrysene, 6-	7496-02-8	PAH					1.2E+02	C99b	1.1E-02	C99b	3.9E+01	C99b				
Nitrofluorene, 2-	607-57-8	PAH					1.2E-01	C99b	1.1E-05	C99b	3.9E-02	C99b				
Nitropyrene, 1-	5522-43-0	PAH					1.2E+00	C99b	1.1E-04	C99b	3.9E-01	C99b				
Nitropyrene, 4-	57835-92-4	PAH					1.2E+00	C99b	1.1E-04	C99b	3.9E-01	C99b				
Octabromodiphenyl ether	32536-52-0	PBDE	3.0E-03	I												
Octachlorodibenzofuran, 1,2,3,4,6,7,8,9-	39001-02-0	CDF											0.0001	W	tcdd	
Octachlorodibenzo-p-dioxin, 1,2,3,4,6,7,8,9-	3268-87-9	CDD											0.0001	W	tcdd	
Parathion	56-38-2	pest	6.0E-03	H												
Pentabromodiphenyl ether	32534-81-9	PBDE	2.0E-03	I												
Pentachlorobiphenyl, 2,3,3',4,4'- (PCB 105)	32598-14-4	PCB											0.0001	W	tcdd	
Pentachlorobiphenyl, 2,3,4,4',5- (PCB 114)	74472-37-0	PCB											0.0005	W	tcdd	
Pentachlorobiphenyl, 2,3',4,4',5- (PCB 118)	31508-00-6	PCB											0.0001	W	tcdd	

Constituent Name	CASRN	analyte group	RfD (mg/kg-d)	RfD Ref	RfC (mg/m^3)	RfC Ref	CSFo (per mg/kg-d)	CSFo Ref	URF (per µg/m^3)	URF Ref	CSFi (per mg/kg-d)	CSFi Ref	TEF	TEF Ref	base	Notes
Pentachlorobiphenyl, 2',3,4,4',5- (PCB 123)	65510-44-3	PCB											0.0001	W	tcdd	
Pentachlorobiphenyl, 3,3',4,4',5- (PCB 126)	57465-28-8	PCB											0.1	W	tcdd	
Pentachlorodibenzofuran, 1,2,3,7,8-	57117-41-6	CDF											0.05	W	tcdd	
Pentachlorodibenzofuran, 2,3,4,7,8-	57117-31-4	CDF											0.5	W	tcdd	
Pentachlorodibenzo-p-dioxin, 1,2,3,7,8-	40321-76-4	CDD											1	W	tcdd	
Pentachloronitrobenzene	82-68-8	pest	3.0E-03	I			2.6E-01	H								
Phenol	108-95-2	other	3.0E-01	I												
Phorate	298-02-2	pest	2.0E-04	H												
Phosmet	732-11-6	pest	2.0E-02	I												
Phthalic anhydride	85-44-9	other	2.0E+00	I	2.0E-02	C00										
Polybrominated biphenyls	67774-32-7	PBB	7.0E-06	H			8.9E+00	H								
Polychlorinated biphenyls	1336-36-3	PCB					2.0 (food), 0.4 (H2O)	I	0.0001 (evap congenr)	I	2.0 (dust, aerosol), 0.4 (evap c)	calc				
Pyrene	129-00-0	PAH	3.0E-02	I												
Pyridine	110-86-1	odor	1.0E-03	I												
Selenium[1]	7782-49-2	metal	5.0E-03	I	2.0E-02	C00										
Silver	7440-22-4	metal	5.0E-03	I												
Strontium	7440-24-6	metal	6.0E-01	I												
Sulfuric acid	7664-93-9	condition-ing			1.0E-03	C00										
TCDD, 2,3,7,8-	1746-01-6	CDD					1.5E+05	H	3.3E+01	H	1.5E+05	H	1	W	tcdd	
Terbufos	13071-79-9	pest	2.5E-05	H												
Tetrachlorobiphenyl, 3,3',4,4'- (PCB 77)	32598-13-3	PCB											0.0001	W	tcdd	
Tetrachlorobiphenyl, 3,4,4',5- (PCB 81)	70362-50-4	PCB											0.0001	W	tcdd	

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Constituent Name	CASRN	analyte group	RfD (mg/kg-d)	RfD Ref	RfC (mg/m^3)	RfC Ref	CSFo (per mg/kg-d)	CSFo Ref	URF (per $\mu g/m^3$)	URF Ref	CSFi (per mg/kg-d)	CSFi Ref	TEF	TEF Ref	base	Notes
Tetrachlorodibenzofuran, 2,3,7,8-	51207-31-9	CDF											0.1	W	tcdd	
Tetrachloroethylene (perchloroethylene)	127-18-4	other	1.0E-02	I	3.0E-01	A	5.2E-02	HAD	5.8E-07	HAD	2.0E-03	HAD				RfC=0.04 ppm
Tetrachlorovinphos	961-11-5	pest	3.0E-02	I			2.4E-02	H								
Tetraethyldithiopyrophosphate	3689-24-5	pest	5.0E-04	I												
Thallium (I) chloride	7791-12-0	metal	8.0E-05	I												
Tin and compounds		metal	6.0E-01	H												
Titanium tetrachloride	7550-45-0	metal			1.0E-04	A										
Toxaphene	8001-35-2	pest					1.1E+00	I	3.2E-04	I	1.1E+00	calc				
Trichloro-2-hydroxydiphenyl ether, 2,2,4-	3380-34-5	other	4.0E+00	H												
Trichlorophenoxy) propionic acid, 2 (2,4,5-	93-72-1	pest	8.0E-03	I												
Trichlorophenoxyacetic acid, 2,4,5-	93-76-5	pest	1.0E-02	I												
Triethylamine	121-44-8	odor			7.0E-03	I										
Trifluranlin	1582-09-8	pest	7.5E-03	I			7.7E-03	I								
Trimethyl phosphate	512-56-1	pest					3.7E-02	H								
Uranium, insoluble forms		metal			8.0E-03	A										intermediate MRL
Uranium, soluble salts	7440-61-1	metal	3.0E-03	I	3.0E-04	A										
Vanadium	7440-62-2	metal	7.0E-03	H	7.0E-05	AC										
Warfarin	81-81-2	pharm	3.0E-04	I												
Zinc[1]	7440-66-6	metal	3.0E-01	I												

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Key to Table.

CASRN	=	Chemical Abstract Service registry number.
CSFi	=	Inhalation cancer slope factor.
CSFo	=	Oral cancer slope factor.
RfC	=	Reference concentration.
RfD	=	Reference dose.
TEF	=	Toxicity equivalency factor.
URF	=	Unit risk factor.

[a] Sources:

A	=	ATSDR MRLs (ATSDR, 2002)
C99a	=	CalEPA chronic RELs (CalEPA, 1999a)
C99b	=	CalEPA cancer potency factor (CalEPA, 1999b)
C00	=	CalEPA chronic RELs (CalEPA, 2000)
E93	=	EPA TEFs for PAHs (U.S. EPA, 1993)
E98	=	EPA TEFs for dioxins and furans (U.S. EPA, 1998)
I	=	IRIS (U.S. EPA, 2002)
H	=	HEAST (U.S. EPA, 1997)
SF	=	Superfund Risk Issue Papers
surr	=	surrogate
W	=	World Health Organization TEFs (Van den Berg et al., 1998).

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