APPENDIX C

BASELINE ECOLOGICAL RISK ASSESSMENT CALCULATIONS UPDATED WITH RECENT NOV-DEC 2015 SAMPLE DATA

Table 1:   Species factors for Ecological Risk Assessment.

Parameter	Description	Units	American Robin	Source	Spotted Sandpiper	Source	American Woodcock	Source
BW	Body weight of receptor	Kg	0.0773	USEPA 1993 (Section 2-197); [source: Clench and Leberman (1978)]; Sample and Suter 1994 (p. 21; Table 4.9 [source: Dunning 1984])	0.0425	USEPA 1993 (Section 2-149) [source: Maxson & Oring 1980][a]	0.169	USEPA 1993 (Section 2-140) [source: Nelson & Martin, 1953][b]
Food IR	Ingestion rate of food	Kg /KgBW/ d	0.129	Nagy 2001	0.044	Nagy 2001	0.118	Nagy 2001
Soil / Sediment Ingestion	Ingestion Proportion of soil or sediment	Fraction of Total Diet	0.02	Sample and Suter 1994 (p. 22; Table 4.9); Based on Beyer et al. 1994	0.17	Beyer et al. 1994	0.104	Beyer et al. 1994
Fd (plants)	Fraction of diet consisting of plants		0.41	USEPA 1993 (Section 2-198; based on Wheelwright 1986)	0		0	
Fd (inverts)	Fraction of diet consisting of soil invertebrates		0.59	USEPA 1993 (Section 2-198; based on Wheelwright 1986)	0		1	USEPA 1993 (Section 2-141) [source: Stribling & Doerr, 1985]
Fd (mammals)	Fraction of diet consisting of mammals		0		0		0	
Fd (benthic inverts)	Fraction of diet consisting of benthic invertebrates		0		1	USEPA 1993 (Section 2-152) [source: Maxson & Oring 1980]	0	
Fd (fish)	Fraction of diet consisting of fish		0		0		0	
Fd (birds)	Fraction of diet consisting of birds		0		0		0	

[a]Spotted Sandpiper body weight : Mean body weight of adult male (37.9 g) and female (47.1 g)

[b]Woodcock body weight: mean body weight of adult male (176 g) and adult female (218 g)

Table 2: Species factors for Ecological Risk Assessment.

Parameter	Description	Units	Mallard Duck	Source	Least Shrew	Source	Red Fox	Source
BW	Body weight of receptor	Kg	1.134	USEPA 1993 (Section 2-43) [source: Nelson & Martin, 1953][a]	0.017	USEPA 1993 (Section 2-213) [source: Guilday, 1957][b]	4.53	USEPA 1993 (Section 2-224) [source: Storm et al., 1976][c]
Food IR	Ingestion rate of food	Kg /KgBW/d	0.068	Nagy 2001	0.096	Nagy 2001	0.16	USEPA 1993 (Section 2-224) [source: Sargeant, 1978]
Soil / Sediment Ingestion	Ingestion Proportion of soil or sediment	Fraction of Total Diet	0.033	Beyer et al. 1994	0.13	Sample and Suter 1994 (Section 4.1; p. 11)	0.028	Beyer et al. 1994
Fd (plants)	Fraction of diet consisting of plants		0.5	USEPA 1993 (Section 2-45) [source: Dillon, 1959; Swanson et al., 1985][d]	0		0.07	USEPA 1993 (Section 2-225) [source: Knable, 1974; Hockman and Chapman, 1983]
Fd (inverts)	Fraction of diet consisting of soil invertebrates		0		1	USEPA 1993 (Section 2-214) [source: Whitaker & Ferraro, 1963]; (Whitaker & Ruckdeschel 2006)	0.03	USEPA 1993 (Section 2-225) [source: Knable, 1974; Hockman and Chapman, 1983]
Fd (mammals)	Fraction of diet consisting of mammals		0		0		0.9	USEPA 1993 (Section 2-225) [source: Knable, 1974; Hockman and Chapman, 1983]
Fd (benthic inverts)	Fraction of diet consisting of benthic invertebrates		0.5	USEPA 1993 (Section 2-45) [source: Dillon, 1959; Swanson et al., 1985]	0		0	
Fd (fish)	Fraction of diet consisting of fish		0		0		0	
Fd (birds)	Fraction of diet consisting of birds		0		0		0	

[a]Mallard body weight: mean body weight of adult male (1,225 g) and adult female (1,043 g)

[b]Least shrew body weight: arithmetic mean of average reported body weights of adult male and female during fall and summer

[c]Red fox body weight: arithmetic mean of adult male and female during spring and fall (Storm et al., 1976)

[d]Mallard diet: Dillon (1959) reports 93% of mallard diet consists of plants; Swanson et al. (1985) reports dietary consumption of invertebrates ranges from (67.8 % to 89.4% [wet volume % esophagus contents]); a conservative dietary estimate of 0.5 (50%) plants and 0.5 (50%) invertebrates was used.

Table 3:   Species factors for Ecological Risk Assessment.

Parameter	Description	Units	Swamp Rabbit	Source	Snowy Egret	Source
BW	Body weight of receptor	Kg	2.118	Bond et al., 2006[a]	0.37	Parsons et al., 2000
Food IR	Ingestion rate of food	Kg /KgBW/d	0.112	Sample and Suter 1994 (Section 4.5; page 16)	0.115	Nagy 2001
Soil / Sediment Ingestion	Ingestion Proportion of soil or sediment	Fraction of Total Diet	0.063	Sample and Suter 1994 (Section 4.5; p. 17)	0.005	Sample and Suter 1994 (Section 4.13; p. 27)
Fd (plants)	Fraction of diet consisting of plants		1	USEPA 1993 (Section 2-356) [source: Spencer & Chapman, 1986]	0	
Fd (inverts)	Fraction of diet consisting of soil invertebrates		0		0	
Fd (mammals)	Fraction of diet consisting of mammals		0		0	
Fd (benthic inverts)	Fraction of diet consisting of benthic invertebrates		0		0.1	Smith 1997
Fd (fish)	Fraction of diet consisting of fish		0		0.9	Smith 1997
Fd (birds)	Fraction of diet consisting of birds		0		0	

[a]Swamp rabbit body weight: arithmetic mean of adult male and female (Bond et al., 2006)

[b]Snowy egret diet (based on % biomass stomach contents): fish (91.4%), crayfish (6-7%); frogs (1%); invertebrates (1%; [insects, grass shrimp])

Table 4:   Species factors for Ecological Risk Assessment.

Parameter	Description	Units	American Mink	Source	Great Blue Heron	Source
BW	Body weight of receptor	Kg	1.0	Sample and Suter 1994 (p. 18; Table 4.6 [source: Newell et al. 1987])	2.229	USEPA 1993 (Section 2-8) [source: Quinney 1982]
Food IR	Ingestion rate of food	Kg /KgBW/d	0.137	Sample and Suter 1994 (p. 18; Table 4.6 [source: Bleavins and Aulerich 1981])	0.103	Nagy 2001
Soil / Sediment Ingestion	Ingestion Proportion of soil or sediment	Fraction of Total Diet	0.005	Sample and Suter 1994 (p. 18; Table 4.6)	0.005	Sample and Suter 1994 (Section 4.13; p. 27)
Fd (plants)	Fraction of diet consisting of plants				0	
Fd (inverts)	Fraction of diet consisting of soil invertebrates				0	
Fd (mammals)	Fraction of diet consisting of mammals				0	
Fd (benthic inverts)	Fraction of diet consisting of benthic invertebrates		0.1	USEPA 1993 (Section 2-253) [source: Alexander 1977]	0.1	USEPA 1993 (Section 2-9) [source: Alexander 1977]
Fd (fish)	Fraction of diet consisting of fish		0.9	USEPA 1993 (Section 2-253) [source: Alexander 1977]	0.9	USEPA 1993 (Section 2-9) [source: Alexander 1977]
Fd (birds)	Fraction of diet consisting of birds				0	

Table 5:   Exposure Modifying Factors (EMFs) for receptors in Ecological Risk Assessment.

Parameter	Description	American Robin	American Woodcock	Spotted Sandpiper	Mallard Duck	Snowy Egret	Great Blue Heron	Least Shrew	Red Fox	Swamp Rabbit	American Mink	Un its	Citations
Home Range	Home Range of receptor	1.04	11	8	405	490[a]	560	0.49	3030	3.6	2.2	acres	USEPA 1993; See species descriptions; [a]Custer and Osborn 1978
Home Range Factor (area use factor)	Fraction of home range that may be contaminated	1	1	1	0.832	0.687	0.601	1	0.1112	1	1		Calculated based on an estimated size of potentially affected site of 337 acres
Time (temporal) Factor	Fraction of time spent in presumed contaminated area	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3		

Table 6:   Toxicity Reference Values (TRVs) for Baseline Ecological Risk Assessment.

Element or Constituent	TRV (mg/kg/d)			
	Avian (Robin, Woodcock, Mallard, Egret, Sandpiper)		Mammal (Shrew, Fox, and Rabbit)	
	Value	Source	Value	Source
Arsenic	2.24	US EPA 2005	1.04	US EPA 2005
Barium	20.8[a]	Sample et al., 1996	51.8	US EPA 2005
Cadmium	1.47	US EPA 2005	0.77	US EPA 2005
Chromium (Cr III)	2.66	US EPA 2008	2.4	US EPA 2008
Lead	1.63	US EPA 2005	4.7	US EPA 2005
Mercury	3.25[b]	US EPA 1999; Table E-8	1.01[c]	US EPA 1999; Table E-7
Selenium	0.5	US EPA 1999 Table E-8	0.076	US EPA 1999; Table E-7
Zinc	66.1	US EPA 2007	75.4	US EPA 2007

[a]Only a single paper (Johnson et al., 1960) with data on the toxicity of barium hydroxide to one avian species (chicken) was identified by USEPA (2005); therefore, an avian TRV could not be derived and an Eco-SSL could not be calculated for avian wildlife (calculation requires a minimum of three results for two test species). Johnson et al. (1960) reports a subchronic NOAEL of 208.26 mg/kg/d. The NOAEL was multiplied by an uncertainty factor of 0.1 to derive a very conservative TRV of 20.8 mg/kg/d.

[b]Mercuric chloride; Acute (5 day) LOAEL (mortality) for quail of 325 mg/kg/d; uncertainty factor of 0.01 applied to estimate from an acute to chronic endpoint (produces a very conservative TRV estimate).

[c]Mercuric chloride; Chronic (6 month) NOAEL (reproduction) for mink of 1.01 mg/kg/d

Table 7:   Bioconcentration Factors (BCFs) for food items.

COPEC	Soil – Plant BCF	Citation	Soil-Earthworm BCF	Citation	Soil-Mammal BCF	Citation
Arsenic	0.0375	Bechtel-Jacobs 1998; Table 6	0.224	Sample et al. 1998a; Table 11	0.0025	Sample et al. 1998b; Table 7
Barium	0.156	Bechtel-Jacobs 1998; Table D-1	0.0910	Sample et al. 1998a; Table C.1	0.0566	Sample et al. 1998b; Table 7
Cadmium	0.586	Bechtel-Jacobs 1998; Table 6	7.708	Sample et al. 1998a; Table 11	0.333	Sample et al. 1998b; Table 7
Chromium	0.041	Bechtel-Jacobs 1998; Table D-1	0.306	Sample et al. 1998a; Table 11	0.0846	Sample et al. 1998b; Table 7
Lead	0.0389	Bechtel-Jacobs 1998; Table 6	0.266	Sample et al. 1998a; Table 11	0.1054	Sample et al. 1998b; Table 7
Mercury	0.652	Bechtel-Jacobs 1998; Table 6	1.693	Sample et al. 1998a; Table 11	0.0534	Sample et al. 1998b; Table 7
Selenium	0.672	Bechtel-Jacobs 1998; Table 6	0.985	Sample et al. 1998a; Table 11	0.1619	Sample et al. 1998b; Table 7
Zinc	0.366	Bechtel-Jacobs 1998; Table 6	3.201	Sample et al. 1998a; Table 11	0.7717	Sample et al. 1998b; Table 7

Table 8:   Bioconcentration Factors (BCFs) for food items.

COPEC	Soil /Sediment – Benthic Invertebrate BCF	Citation	Sediment - Fish BCF	Citation
Arsenic	0.127	Bechtel Jacobs 1998b; Table 2	0.00065	Davis et al. 1996; p. 420
Barium	0.01	Menzie et al 2008; Zimmerman 2010	0.01	Menzie et al 2008; Zimmerman 2010
Cadmium	0.614	Bechtel Jacobs 1998b; Table 2	0.42	Chen and Chen 1992; Table 2
Chromium	0.108	Bechtel Jacobs 1998b; Table 2	<0.00011	Davis et al. 1996; p. 420
Lead	0.066	Bechtel Jacobs 1998b; Table 2	0.0000018	Davis et al. 1996; p. 420
Mercury	1.081	Bechtel Jacobs 1998b; Table 2	0.1	Zilloux et al. 1993; Knox et al. 2006; Gladden et al. 2008; Julian 2012
Selenium	0.9	USEPA 1999; Appendix C; Table C-6	1	Cleveland et al., 1993; Chapman et al., 2009
Zinc	2.33	Bechtel Jacobs 1998b; Table 2	0.138	Chen and Chen 1992; Table 2

Table 9:   Soil Bioavailability Estimates for the EWL Property.

COPEC	Soil Bioavailability Factor	Citation
Arsenic	0.01	US EPA 2005; Watts et al. 2008
Barium	0.01	Menzie et al. 2008; Zimmerman 2010
Cadmium	0.036	Prokop et al. 2003
Chromium	0.015	Han et al. 2004; Whitmer et al. 1991; Fargasova 2012
Lead	0.01	Hettiarachchi and Pierzynski 2004; Luo et al. 2014
Mercury	0.01 - 0.03	Anjum et al., 2012
Selenium	0.01	Nakamora et al., 2014
Zinc	0.01 - 0.1	US EPA 2005; Wang et al. 2005

Calculations used for calculating potential risk (HQs) for COPECs in the BERA for the EWL property based on soil/sediment 95% UCLs (Using 0-1 ft Depth)

COPEC	95% UCL [COPEC]
As	6.59
Ba	2076
Cd	0.69
Cr	16.96
Pb	39.25
Hg	1.19
Se	1.69
Zn	321.1

American Robin

Assumptions	Parameter	Symbol
Body weight (kg)	0.081	BW
Soil ingestion proportion	0.02	P_s
Food ingestion Rate (kg/kgBW/d)	0.159	FIR
Proportion of diet, plants	0.41	Pp
Proportion of diet, inverts	0.59	Pi
Proportion of diet, fish	-	Pf
Proportion of diet, birds	-	Pb
Area use factor	1	AUF
Time (temporal) factor	0.3	TF

COPEC	95% UCL [COPEC]	TRV	Soil bio-factor	BCF plants	BCF earthworm	BCF fish	BCF birds	HQ
As	6.59	2.24	0.01	0.0375	0.224			0.02073
Ba	2076	20.8	0.01	0.156	0.091			0.56106
Cd	0.69	1.47	0.036	0.586	7.708			0.10722
Cr	16.96	2.66	0.015	0.041	0.306			0.06011
Pb	39.25	1.63	0.01	0.0389	0.266			0.19881
Hg	1.19	3.25	0.03	0.652	1.693			0.02213
Se	1.688	0.5	0.01	0.672	0.985			0.13799
Zn	321.1	66.1	0.1	0.366	3.201			0.47285

The "Absorbed Fraction (AF)" header spans the columns: Soil bio-factor, BCF plants, BCF earthworm, BCF fish, BCF birds.

Notes:

$$\frac{[Soil_a \ x \ P_s \ x \ FIR \ x \ AF_{as}] + [\ \sum_i^N B_i \ \ x \ P_i \ x \ FIR \ x \ AF_{ai}] \ x \ AUF}{TRV} = HQ$$

Where:

HQ a	= Hazard Quotient for analyte a (COPEC a) (unitless)
Soil a	= Concentration of analyte a (COPEC a) in soil (mg/kg dry weight; 95% UCL)
N	= Number of different biota types in diet (food types)
B i	= Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
P i	= Proportion of biota type (i) in diet
FIR	= Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
AF ai	= Absorbed fraction of analyte a (COPEC a) from biota type (i)
AF as	= Absorbed fraction of analyte a (COPEC a) from soil (s)
TRV a	= The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
Ps	= Soil ingestion as a proportion of diet
AUF	= Area use factor ([home range factor] and [temporal factor, TF])

Spotted Sandpiper

Assumptions	Parameter	Symbol
Body weight (kg)	0.0425	BW
Soil ingestion proportion	0.17	P_s
Food ingestion Rate (kg/kgBW/d)	0.044	FIR
Proportion of diet, plants		Pp
Proportion of diet, inverts	1	Pi
Proportion of diet, fish		Pf
Proportion of diet, birds		Pb
Area use factor	1	AUF
Time (temporal) factor	0.3	TF

COPEC	95% UCL [COPEC]	TRV	Soil bio-factor	BCF plants	BCF benthic inverts	BCF fish	BCF birds	HQ
					Absorbed Fraction (AF)			
As	6.59	2.24	0.01		0.127			0.00500
Ba	2076	20.8	0.01		0.01			0.01541
Cd	0.69	1.47	0.036		0.614			0.00384
Cr	16.96	2.66	0.015		0.108			0.00930
Pb	39.25	1.63	0.01		0.066			0.02152
Hg	1.19	3.25	0.03		1.081			0.00525
Se	1.688	0.5	0.01		0.9			0.04018
Zn	321.1	66.1	0.1		2.33			0.15050

Notes:

$$\frac{[Soil_a \; x \; P_s \; x \; FIR \; x \; AF_{as}] + [\; \sum_i^N B_i \; \; x \; P_i \; x \; FIR \; x \; AF_{ai}\;] \; x \; AUF}{TRV} = HQ$$

Where:

HQ a	=	Hazard Quotient for analyte a (COPEC a) (unitless)
Soil a	=	Concentration of analyte a (COPEC a) in soil (mg/kg dry weight; 95% UCL)
N	=	Number of different biota types in diet (food types)
B i	=	Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
P i	=	Proportion of biota type (i) in diet
FIR	=	Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
AF ai	=	Absorbed fraction of analyte a (COPEC a) from biota type (i)
AF as	=	Absorbed fraction of analyte a (COPEC a) from soil (s)
TRV a	=	The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
Ps	=	Soil ingestion as a proportion of diet
AUF	=	Area use factor ([home range factor] and [temporal factor, TF])

Snowy Egret

Assumptions	Parameter	Symbol
Body weight (kg)	0.37	BW
Soil ingestion proportion	0.005	P_s
Food ingestion Rate (kg/kgBW/d)	0.115	FIR
Proportion of diet, plants		Pp
Proportion of diet, inverts	0.1	Pi
Proportion of diet, fish	0.9	Pf
Proportion of diet, birds		Pb
Area use factor	0.687	AUF
Time (temporal) factor	0.3	TF

COPEC	95% UCL [COPEC]	TRV	Soil bio-factor	BCF plants	BCF benthic inverts	BCF fish	BCF birds	HQ
					Absorbed Fraction (AF)			
As	6.59	2.24	0.01		0.127	0.00065		0.00094327
Ba	2076	20.8	0.01		0.01	0.01		0.02422981
Cd	0.69	1.47	0.036		0.614	0.42		0.00489813
Cr	16.96	2.66	0.015		0.108	0.00011		0.00170204
Pb	39.25	1.63	0.01		0.066	0.0000018		0.00390618
Hg	1.19	3.25	0.03		1.081	0.1		0.00172551
Se	1.688	0.5	0.01		0.9	1		0.07923551
Zn	321.1	66.1	0.1		2.33	0.138		0.04140624

Notes:

$$\frac{[Soil_a \; x \; P_s \; x \; FIR \; x \; AF_{as}] + [\sum_i^N B_i \; x \; P_i \; x \; FIR \; x \; AF_{ai}] \; x \; AUF}{TRV} = HQ$$

Where:

HQ a	=	Hazard Quotient for analyte a (COPEC a) (unitless)
Soil a	=	Concentration of analyte a (COPEC a) in soil (mg/kg dry weight; 95% UCL)
N	=	Number of different biota types in diet (food types)
B i	=	Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
P i	=	Proportion of biota type (i) in diet
FIR	=	Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
AF ai	=	Absorbed fraction of analyte a (COPEC a) from biota type (i)
AF as	=	Absorbed fraction of analyte a (COPEC a) from soil (s)
TRV a	=	The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
Ps	=	Soil ingestion as a proportion of diet
AUF	=	Area use factor ([home range factor] and [temporal factor, TF])

American Woodcock

Assumptions	Parameter	Symbol
Body weight (kg)	0.169	BW
Soil ingestion proportion	0.104	P_s
Food ingestion Rate (kg/kgBW/d)	0.118	FIR
Proportion of diet, plants		Pp
Proportion of diet, inverts	1	Pi
Proportion of diet, fish		Pf
Proportion of diet, birds		Pb
Area use factor	1	AUF
Time (temporal) factor	0.3	TF

COPEC	95% UCL [COPEC]	TRV	Soil bio-factor	BCF plants	BCF earthworm	BCF fish	BCF birds	HQ
					Absorbed Fraction (AF)			
As	6.59	2.24	0.01		0.224			0.023437
Ba	2076	20.8	0.01		0.091			0.325195
Cd	0.69	1.47	0.036		7.708			0.12814
Cr	16.96	2.66	0.015		0.306			0.069419
Pb	39.25	1.63	0.01		0.266			0.22763
Hg	1.19	3.25	0.03		1.693			0.02198
Se	1.688	0.5	0.01		0.985			0.11784
Zn	321.1	66.1	0.1		3.201			0.55225

Notes:

$$\frac{[Soil_a \, x \, P_s \, x \, FIR \, x \, AF_{as}] + [\sum_i^N B_i \; x \, P_i \, x \, FIR \, x \, AF_{ai}] \; x \, AUF}{TRV} = HQ$$

Where:

HQ a	= Hazard Quotient for analyte a (COPEC a) (unitless)
Soil a	= Concentration of analyte a (COPEC a) in soil (mg/kg dry weight; 95% UCL)
N	= Number of different biota types in diet (food types)
B i	= Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
P i	= Proportion of biota type (i) in diet
FIR	= Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
AF ai	= Absorbed fraction of analyte a (COPEC a) from biota type (i)
AF as	= Absorbed fraction of analyte a (COPEC a) from soil (s)
TRV a	= The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
Ps	= Soil ingestion as a proportion of diet
AUF	= Area use factor ([home range factor] and [temporal factor, TF])

Mallard Duck

Assumptions	Parameter	Symbol
Body weight (kg)	1.134	BW
Soil ingestion proportion	0.033	P_s
Food ingestion Rate (kg/kgBW/d)	0.068	FIR
Proportion of diet, plants	0.5	Pp
Proportion of diet, inverts	0.5	Pi
Proportion of diet, fish		Pf
Proportion of diet, birds		Pb
Area use factor	0.832	AUF
Time (temporal) factor	0.3	TF

COPEC	95% UCL [COPEC]	TRV	Soil bio-factor	BCF plants	BCF benthic inverts	BCF fish	BCF birds	HQ
					Absorbed Fraction (AF)			
As	6.59	2.24	0.01	0.0375	0.127			0.00412
Ba	2076	20.8	0.01	0.156	0.01			0.14116
Cd	0.69	1.47	0.036	0.586	0.614			0.00479
Cr	16.96	2.66	0.015	0.041	0.108			0.00812
Pb	39.25	1.63	0.01	0.0389	0.066			0.02157
Hg	1.19	3.25	0.03	0.652	1.081			0.00539
Se	1.688	0.5	0.01	0.672	0.9			0.04506
Zn	321.1	66.1	0.1	0.366	2.33			0.11142

Notes:

$$\frac{[Soil_a \; x \; P_s \; x \; FIR \; x \; AF_{as}] + [\; \sum_i^N B_i \; x \; P_i \; x \; FIR \; x \; AF_{ai}] \; x \; AUF}{TRV} = HQ$$

Where:

HQ a	=	Hazard Quotient for analyte a (COPEC a) (unitless)
Soil a	=	Concentration of analyte a (COPEC a) in soil (mg/kg dry weight; 95% UCL)
N	=	Number of different biota types in diet (food types)
B i	=	Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
P i	=	Proportion of biota type (i) in diet
FIR	=	Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
AF ai	=	Absorbed fraction of analyte a (COPEC a) from biota type (i)
AF as	=	Absorbed fraction of analyte a (COPEC a) from soil (s)
TRV a	=	The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
Ps	=	Soil ingestion as a proportion of diet
AUF	=	Area use factor ([home range factor] and [temporal factor, TF])

Great Blue Heron

Assumptions	Parameter	Symbol
Body weight (kg)	2.229	BW
Soil ingestion proportion	0.005	P_s
Food ingestion Rate (kg/kgBW/d)	0.103	FIR
Proportion of diet, plants		Pp
Proportion of diet, benthic inverts	0.1	Pi
Proportion of diet, fish	0.9	Pf
Proportion of diet, birds		Pb
Area use factor	0.601	AUF
Time (temporal) factor	0.3	TF

COPEC	95% UCL [COPEC]	TRV	Soil bio-factor	BCF plants	BCF benthic inverts	BCF fish	BCF birds	HQ
					Absorbed Fraction (AF)			
As	6.59	2.24	0.01		0.127	0.00065		0.00074098
Ba	2076	20.8	0.01		0.01	0.01		0.01904920
Cd	0.69	1.47	0.036		0.614	0.42		0.00383893
Cr	16.96	2.66	0.015		0.108	0.00011		0.00133977
Pb	39.25	1.63	0.01		0.066	0.0000018		0.00307614
Hg	1.19	3.25	0.03		1.081	0.1		0.00135270
Se	1.688	0.5	0.01		0.9	1		0.06208579
Zn	321.1	66.1	0.1		2.33	0.138		0.03247446

Notes:

$$\frac{[Soil_a \ x \ P_s \ x \ FIR \ x \ AF_{as}] + [\ \sum_i^N B_i \ x \ P_i \ x \ FIR \ x \ AF_{ai}] \ x \ AUF}{TRV} = HQ$$

Where:

HQ a	=	Hazard Quotient for analyte a (COPEC a) (unitless)
Soil a	=	Concentration of analyte a (COPEC a) in soil (mg/kg dry weight; 95% UCL)
N	=	Number of different biota types in diet (food types)
B i	=	Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
P i	=	Proportion of biota type (i) in diet
FIR	=	Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
AF ai	=	Absorbed fraction of analyte a (COPEC a) from biota type (i)
AF as	=	Absorbed fraction of analyte a (COPEC a) from soil (s)
TRV a	=	The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
Ps	=	Soil ingestion as a proportion of diet
AUF	=	Area use factor ([home range factor] and [temporal factor, TF])

Least Shrew

Assumptions	Parameter	Symbol
Body weight (kg)	0.017	BW
Soil ingestion proportion	0.13	P_s
Food ingestion Rate (kg/kgBW/d)	0.096	FIR
Proportion of diet, plants		Pp
Proportion of diet, inverts	1	Pi
Proportion of diet, fish		Pf
Proportion of diet, birds		Pb
Area use factor	1	AUF
Time (temporal) factor	0.3	TF

			Absorbed Fraction (AF)					
COPEC	95% UCL [COPEC]	TRV	Soil bio-factor	BCF earthworm	BCF mammals	BCF fish	BCF birds	HQ
As	6.59	1.04	0.01	0.224				0.04112
Ba	2076	51.8	0.01	0.091				0.10653
Cd	0.69	0.77	0.036	7.708				0.19905
Cr	16.96	2.4	0.015	0.306				0.06267
Pb	39.25	4.7	0.01	0.266				0.06429
Hg	1.19	1.01	0.03	1.693				0.05758
Se	1.688	0.076	0.01	0.985				0.63090
Zn	321.1	75.4	0.1	3.201				0.39419

Notes:

$$\frac{[Soil_\alpha \; x \; P_s \; x \; FIR \; x \; AF_{as}] + [\; \sum_i^N B_i \; \; x \; P_i \; x \; FIR \; x \; AF_{\alpha i}] \; x \; AUF}{TRV} = HQ$$

Where:

HQ a	= Hazard Quotient for analyte a (COPEC a) (unitless)
Soil a	= Concentration of analyte a (COPEC a) in soil (mg/kg dry weight; 95% UCL)
N	= Number of different biota types in diet (food types)
B i	= Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
P i	= Proportion of biota type (i) in diet
FIR	= Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
AF ai	= Absorbed fraction of analyte a (COPEC a) from biota type (i)
AF as	= Absorbed fraction of analyte a (COPEC a) from soil (s)
TRV a	= The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
Ps	= Soil ingestion as a proportion of diet
AUF	= Area use factor ([home range factor] and [temporal factor, TF])

Swamp Rabbit

Assumptions	Parameter	Symbol
Body weight (kg)	2.118	BW
Soil ingestion proportion	0.063	P_s
Food ingestion Rate (kg/kgBW/d)	0.112	FIR
Proportion of diet, plants	1	Pp
Proportion of diet, inverts		Pi
Proportion of diet, fish		Pf
Proportion of diet, birds		Pb
Area use factor	1	AUF
Time (temporal) factor	0.3	TF

COPEC	95% UCL [COPEC]	TRV	Soil bio-factor	BCF plants	BCF mammals	BCF fish	BCF birds	HQ
					Absorbed Fraction (AF)			
As	6.59	1.04	0.01	0.0375				0.00812
Ba	2076	51.8	0.01	0.156				0.21092
Cd	0.69	0.77	0.036	0.586				0.017712
Cr	16.96	2.4	0.015	0.041				0.009959
Pb	39.25	4.7	0.01	0.0389				0.01109
Hg	1.19	1.01	0.03	0.652				0.02589
Se	1.688	0.076	0.01	0.672				0.50197
Zn	321.1	75.4	0.1	0.366				0.05327

Notes:

$$\frac{[Soil_\alpha \; x \; P_s \; x \; FIR \; x \; AF_{as}] + [\sum_i^N B_i \; x \; P_i \; x \; FIR \; x \; AF_{\alpha i}] \; x \; AUF}{TRV} = HQ$$

Where:

HQ a	= Hazard Quotient for analyte a (COPEC a) (unitless)
Soil a	= Concentration of analyte a (COPEC a) in soil (mg/kg dry weight; 95% UCL)
N	= Number of different biota types in diet (food types)
B i	= Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
P i	= Proportion of biota type (i) in diet
FIR	= Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
AF ai	= Absorbed fraction of analyte a (COPEC a) from biota type (i)
AF as	= Absorbed fraction of analyte a (COPEC a) from soil (s)
TRV a	= The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
Ps	= Soil ingestion as a proportion of diet
AUF	= Area use factor ([home range factor] and [temporal factor, TF])

Red Fox

Assumptions	Parameter	Symbol
Body weight (kg)	4.53	BW
Soil ingestion proportion	0.028	P_s
Food ingestion Rate (kg/kgBW/d)	0.16	FIR
Proportion of diet, plants	0.07	Pp
Proportion of diet, inverts	0.03	Pi
Proportion of diet, mammals	0.9	Pm
Proportion of diet, birds		Pb
Area use factor	0.1112	AUF
Time (temporal) factor	0.3	TF

COPEC	95% UCL [COPEC]	TRV	Soil bio-factor	BCF plants	BCF earthworm	BCF mammals	BCF birds	HQ
					Absorbed Fraction (AF)			
As	6.59	1.04	0.01	0.0375	0.224	0.0025		0.00040164
Ba	2076	51.8	0.01	0.156	0.091	0.0566		0.01387674
Cd	0.69	0.77	0.036	0.586	7.708	0.33		0.00272762
Cr	16.96	2.4	0.015	0.041	0.306	0.0846		0.00334228
Pb	39.25	4.7	0.01	0.0389	0.266	0.1054		0.00471791
Hg	1.19	1.01	0.03	0.652	1.693	0.0534		0.00091396
Se	1.688	0.076	0.01	0.672	0.985	0.1619		0.02638706
Zn	321.1	75.4	0.1	0.366	3.201	0.7717		0.01861608

Notes:

$$\frac{[Soil_a \ x \ P_s \ x \ FIR \ x \ AF_{as}] + [\sum_i^N B_i \ x \ P_i \ x \ FIR \ x \ AF_{ai}] \ x \ AUF}{TRV} = HQ$$

Where:

HQ a	=	Hazard Quotient for analyte a (COPEC a) (unitless)
Soil a	=	Concentration of analyte a (COPEC a) in soil (mg/kg dry weight; 95% UCL)
N	=	Number of different biota types in diet (food types)
B i	=	Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
P i	=	Proportion of biota type (i) in diet
FIR	=	Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
AF ai	=	Absorbed fraction of analyte a (COPEC a) from biota type (i)
AF as	=	Absorbed fraction of analyte a (COPEC a) from soil (s)
TRV a	=	The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
Ps	=	Soil ingestion as a proportion of diet
AUF	=	Area use factor ([home range factor] and [temporal factor, TF])

American Mink

Assumptions	Parameter	Symbol
Body weight (kg)	1.0	BW
Soil ingestion proportion	0.005	P_s
Food ingestion Rate (kg/kgBW/d)	0.137	FIR
Proportion of diet, plants		Pp
Proportion of diet, benthic inverts	0.1	Pi
Proportion of diet, fish	0.9	Pf
Proportion of diet, birds		Pb
Area use factor	1	AUF
Time (temporal) factor	0.3	TF

COPEC	95% UCL [COPEC]	TRV	Soil bio-factor	BCF plants	BCF benthic inverts	BCF fish	BCF birds	HQ
					Absorbed Fraction (AF)			
As	6.59	1.04	0.01		0.127	0.00065		0.00350324
Ba	2076	51.8	0.01		0.01	0.01		0.01674627
Cd	0.69	0.77	0.036		0.614	0.42		0.01620514
Cr	16.96	2.4	0.015		0.108	0.00011		0.00323812
Pb	39.25	4.7	0.01		0.066	0.0000018		0.00232307
Hg	1.19	1.01	0.03		1.081	0.1		0.00961716
Se	1.688	0.076	0.01		0.9	1		0.90387625
Zn	321.1	75.4	0.1		2.33	0.138		0.06281219

Notes:

$$\frac{[Soil_a \ x \ P_s \ x \ FIR \ x \ AF_{as}] + [\ \sum_i^N B_i \ \ x \ P_i \ x \ FIR \ x \ AF_{ai}] \ x \ AUF}{TRV} = HQ$$

Where:

HQ a	= Hazard Quotient for analyte a (COPEC a) (unitless)
Soil a	= Concentration of analyte a (COPEC a) in soil (mg/kg dry weight; 95% UCL)
N	= Number of different biota types in diet (food types)
B i	= Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
P i	= Proportion of biota type (i) in diet
FIR	= Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
AF ai	= Absorbed fraction of analyte a (COPEC a) from biota type (i)
AF as	= Absorbed fraction of analyte a (COPEC a) from soil (s)
TRV a	= The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
Ps	= Soil ingestion as a proportion of diet
AUF	= Area use factor ([home range factor] and [temporal factor, TF])

Calculations used for calculating potential risk (HQs) for COPECs in the BERA for the EWL property based on soil/sediment 95% UCLs (Using 0-3 ft depth)

COPEC	95% UCL [COPEC]
As	6.77
Ba	2043
Cd	0.681
Cr	16.96
Pb	38.76
Hg	1.19
Se	1.69
Zn	321.1

American Robin

Assumptions	Parameter	Symbol
Body weight (kg)	0.081	BW
Soil ingestion proportion	0.02	P_s
Food ingestion Rate (kg/kgBW/d)	0.159	FIR
Proportion of diet, plants	0.41	Pp
Proportion of diet, inverts	0.59	Pi
Proportion of diet, fish	-	Pf
Proportion of diet, birds	-	Pb
Area use factor	1	AUF
Time (temporal) factor	0.3	TF

COPEC	95% UCL [COPEC]	TRV	Soil bio-factor	BCF plants	BCF earthworm	BCF fish	BCF birds	HQ
					Absorbed Fraction (AF)			
As	6.772	2.24	0.01	0.0375	0.224			0.02130
Ba	2043	20.8	0.01	0.156	0.091			0.55214
Cd	0.681	1.47	0.036	0.586	7.708			0.10582
Cr	16.96	2.66	0.015	0.041	0.306			0.06011
Pb	38.76	1.63	0.01	0.0389	0.266			0.19633
Hg	1.19	3.25	0.03	0.652	1.693			0.02213
Se	1.688	0.5	0.01	0.672	0.985			0.13799
Zn	321.1	66.1	0.1	0.366	3.201			0.47285

Notes:

$$\frac{[Soil_a \ x \ P_s \ x \ FIR \ x \ AF_{as}] + [\ \sum_i^N B_i \ \ x \ P_i \ x \ FIR \ x \ AF_{ai}] \ x \ AUF}{TRV} = HQ$$

Where:

HQ a	= Hazard Quotient for analyte a (COPEC a) (unitless)
Soil a	= Concentration of analyte a (COPEC a) in soil (mg/kg dry weight; 95% UCL)
N	= Number of different biota types in diet (food types)
B i	= Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
P i	= Proportion of biota type (i) in diet
FIR	= Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
AF ai	= Absorbed fraction of analyte a (COPEC a) from biota type (i)
AF as	= Absorbed fraction of analyte a (COPEC a) from soil (s)
TRV a	= The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
Ps	= Soil ingestion as a proportion of diet
AUF	= Area use factor ([home range factor] and [temporal factor, TF])

Spotted Sandpiper

Assumptions	Parameter	Symbol
Body weight (kg)	0.0425	BW
Soil ingestion proportion	0.17	P_s
Food ingestion Rate (kg/kgBW/d)	0.044	FIR
Proportion of diet, plants		Pp
Proportion of diet, inverts	1	Pi
Proportion of diet, fish		Pf
Proportion of diet, birds		Pb
Area use factor	1	AUF
Time (temporal) factor	0.3	TF

COPEC	95% UCL [COPEC]	TRV	Soil bio-factor	BCF plants	BCF benthic inverts	BCF fish	BCF birds	HQ
					Absorbed Fraction (AF)			
As	6.772	2.24	0.01		0.127			0.00514
Ba	2043	20.8	0.01		0.01			0.01517
Cd	0.681	1.47	0.036		0.614			0.00379
Cr	16.96	2.66	0.015		0.108			0.00930
Pb	38.76	1.63	0.01		0.066			0.02125
Hg	1.19	3.25	0.03		1.081			0.00525
Se	1.688	0.5	0.01		0.9			0.04018
Zn	321.1	66.1	0.1		2.33			0.15050

Notes:

$$\frac{[Soil_a \; x \; P_s \; x \; FIR \; x \; AF_{as}] + [\; \sum_i^N B_i \; x \; P_i \; x \; FIR \; x \; AF_{ai}\;] \; x \; AUF}{TRV} = HQ$$

Where:

HQ a	=	Hazard Quotient for analyte a (COPEC a) (unitless)
Soil a	=	Concentration of analyte a (COPEC a) in soil (mg/kg dry weight; 95% UCL)
N	=	Number of different biota types in diet (food types)
B i	=	Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
P i	=	Proportion of biota type (i) in diet
FIR	=	Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
AF ai	=	Absorbed fraction of analyte a (COPEC a) from biota type (i)
AF as	=	Absorbed fraction of analyte a (COPEC a) from soil (s)
TRV a	=	The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
Ps	=	Soil ingestion as a proportion of diet
AUF	=	Area use factor ([home range factor] and [temporal factor, TF])

Snowy Egret

Assumptions	Parameter	Symbol
Body weight (kg)	0.37	BW
Soil ingestion proportion	0.005	P_s
Food ingestion Rate (kg/kgBW/d)	0.115	FIR
Proportion of diet, plants		Pp
Proportion of diet, inverts	0.1	Pi
Proportion of diet, fish	0.9	Pf
Proportion of diet, birds		Pb
Area use factor	0.687	AUF
Time (temporal) factor	0.3	TF

COPEC	95% UCL [COPEC]	TRV	Soil bio-factor	BCF plants	BCF benthic inverts	BCF fish	BCF birds	HQ
					Absorbed Fraction (AF)			
As	6.772	2.24	0.01		0.127	0.00065		0.00096932
Ba	2043	20.8	0.01		0.01	0.01		0.02384466
Cd	0.681	1.47	0.036		0.614	0.42		0.00483424
Cr	16.96	2.66	0.015		0.108	0.00011		0.00170204
Pb	38.76	1.63	0.01		0.066	0.0000018		0.00385741
Hg	1.19	3.25	0.03		1.081	0.1		0.00172551
Se	1.688	0.5	0.01		0.9	1		0.07923551
Zn	321.1	66.1	0.1		2.33	0.138		0.04140624

Notes:

$$\frac{[Soil_a \; x \; P_s \; x \; FIR \; x \; AF_{as}] + [\; \sum_i^N B_i \; x \; P_i \; x \; FIR \; x \; AF_{ai}] \; x \; AUF}{TRV} = HQ$$

Where:

HQ a	= Hazard Quotient for analyte a (COPEC a) (unitless)
Soil a	= Concentration of analyte a (COPEC a) in soil (mg/kg dry weight; 95% UCL)
N	= Number of different biota types in diet (food types)
B i	= Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
P i	= Proportion of biota type (i) in diet
FIR	= Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
AF ai	= Absorbed fraction of analyte a (COPEC a) from biota type (i)
AF as	= Absorbed fraction of analyte a (COPEC a) from soil (s)
TRV a	= The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
Ps	= Soil ingestion as a proportion of diet
AUF	= Area use factor ([home range factor] and [temporal factor, TF])

American Woodcock

Assumptions	Parameter	Symbol
Body weight (kg)	0.169	BW
Soil ingestion proportion	0.104	P_s
Food ingestion Rate (kg/kgBW/d)	0.118	FIR
Proportion of diet, plants		Pp
Proportion of diet, inverts	1	Pi
Proportion of diet, fish		Pf
Proportion of diet, birds		Pb
Area use factor	1	AUF
Time (temporal) factor	0.3	TF

COPEC	95% UCL [COPEC]	TRV	Soil bio-factor	BCF plants	Absorbed Fraction (AF) BCF earthworm	BCF fish	BCF birds	HQ
As	6.772	2.24	0.01		0.224			0.024084
Ba	2043	20.8	0.01		0.091			0.320026
Cd	0.681	1.47	0.036		7.708			0.12647
Cr	16.96	2.66	0.015		0.306			0.069419
Pb	38.76	1.63	0.01		0.266			0.22479
Hg	1.19	3.25	0.03		1.693			0.02198
Se	1.688	0.5	0.01		0.985			0.11784
Zn	321.1	66.1	0.1		3.201			0.55225

Notes:

$$\frac{[Soil_\alpha \; x \; P_s \; x \; FIR \; x \; AF_{as}] + [\sum_i^N B_i \; x \; P_i \; x \; FIR \; x \; AF_{\alpha i}] \; x \; AUF}{TRV} = HQ$$

Where:

HQ a	=	Hazard Quotient for analyte a (COPEC a) (unitless)
Soil a	=	Concentration of analyte a (COPEC a) in soil (mg/kg dry weight; 95% UCL)
N	=	Number of different biota types in diet (food types)
B i	=	Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
P i	=	Proportion of biota type (i) in diet
FIR	=	Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
AF ai	=	Absorbed fraction of analyte a (COPEC a) from biota type (i)
AF as	=	Absorbed fraction of analyte a (COPEC a) from soil (s)
TRV a	=	The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
Ps	=	Soil ingestion as a proportion of diet
AUF	=	Area use factor ([home range factor] and [temporal factor, TF])

Mallard Duck

Assumptions	Parameter	Symbol
Body weight (kg)	1.134	BW
Soil ingestion proportion	0.033	P_s
Food ingestion Rate (kg/kgBW/d)	0.068	FIR
Proportion of diet, plants	0.5	Pp
Proportion of diet, inverts	0.5	Pi
Proportion of diet, fish		Pf
Proportion of diet, birds		Pb
Area use factor	0.832	AUF
Time (temporal) factor	0.3	TF

COPEC	95% UCL [COPEC]	TRV	Soil bio-factor	BCF plants	BCF benthic inverts	BCF fish	BCF birds	HQ
					Absorbed Fraction (AF)			
As	6.772	2.24	0.01	0.0375	0.127			0.00424
Ba	2043	20.8	0.01	0.156	0.01			0.13892
Cd	0.681	1.47	0.036	0.586	0.614			0.00473
Cr	16.96	2.66	0.015	0.041	0.108			0.00812
Pb	38.76	1.63	0.01	0.0389	0.066			0.02130
Hg	1.19	3.25	0.03	0.652	1.081			0.00539
Se	1.688	0.5	0.01	0.672	0.9			0.04506
Zn	321.1	66.1	0.1	0.366	2.33			0.11142

Notes:

$$\frac{[Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}] \times AUF}{TRV} = HQ$$

Where:

HQ a	=	Hazard Quotient for analyte a (COPEC a) (unitless)
Soil a	=	Concentration of analyte a (COPEC a) in soil (mg/kg dry weight; 95% UCL)
N	=	Number of different biota types in diet (food types)
B i	=	Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
P i	=	Proportion of biota type (i) in diet
FIR	=	Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
AF ai	=	Absorbed fraction of analyte a (COPEC a) from biota type (i)
AF as	=	Absorbed fraction of analyte a (COPEC a) from soil (s)
TRV a	=	The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
Ps	=	Soil ingestion as a proportion of diet
AUF	=	Area use factor ([home range factor] and [temporal factor, TF])

Great Blue Heron

Assumptions	Parameter	Symbol
Body weight (kg)	2.229	BW
Soil ingestion proportion	0.005	P_s
Food ingestion Rate (kg/kgBW/d)	0.103	FIR
Proportion of diet, plants		Pp
Proportion of diet, benthic inverts	0.1	Pi
Proportion of diet, fish	0.9	Pf
Proportion of diet, birds		Pb
Area use factor	0.601	AUF
Time (temporal) factor	0.3	TF

COPEC	95% UCL [COPEC]	TRV	Soil bio-factor	BCF plants	BCF benthic inverts	BCF fish	BCF birds	HQ
					Absorbed Fraction (AF)			
As	6.772	2.24	0.01		0.127	0.00065		0.00076144
Ba	2043	20.8	0.01		0.01	0.01		0.01874639
Cd	0.681	1.47	0.036		0.614	0.42		0.00378886
Cr	16.96	2.66	0.015		0.108	0.00011		0.00133977
Pb	38.76	1.63	0.01		0.066	0.0000018		0.00303774
Hg	1.19	3.25	0.03		1.081	0.1		0.00135270
Se	1.688	0.5	0.01		0.9	1		0.06208579
Zn	321.1	66.1	0.1		2.33	0.138		0.03247446

Notes:

$$\frac{[Soil_a \, x \, P_s \, x \, FIR \, x \, AF_{as}] + [\sum_i^N B_i \; x \, P_i \, x \, FIR \, x \, AF_{ai}] \, x \, AUF}{TRV} = HQ$$

Where:

HQ a	=	Hazard Quotient for analyte a (COPEC a) (unitless)
Soil a	=	Concentration of analyte a (COPEC a) in soil (mg/kg dry weight; 95% UCL)
N	=	Number of different biota types in diet (food types)
B i	=	Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
P i	=	Proportion of biota type (i) in diet
FIR	=	Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
AF ai	=	Absorbed fraction of analyte a (COPEC a) from biota type (i)
AF as	=	Absorbed fraction of analyte a (COPEC a) from soil (s)
TRV a	=	The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
Ps	=	Soil ingestion as a proportion of diet
AUF	=	Area use factor ([home range factor] and [temporal factor, TF])

Least Shrew

Assumptions	Parameter	Symbol
Body weight (kg)	0.017	BW
Soil ingestion proportion	0.13	P_s
Food ingestion Rate (kg/kgBW/d)	0.096	FIR
Proportion of diet, plants		Pp
Proportion of diet, inverts	1	Pi
Proportion of diet, fish		Pf
Proportion of diet, birds		Pb
Area use factor	1	AUF
Time (temporal) factor	0.3	TF

COPEC	95% UCL [COPEC]	TRV	Soil bio-factor	BCF earthworm	BCF mammals	BCF fish	BCF birds	HQ
				Absorbed Fraction (AF)				
As	6.772	1.04	0.01	0.224				0.04225
Ba	2043	51.8	0.01	0.091				0.10484
Cd	0.681	0.77	0.036	7.708				0.19645
Cr	16.96	2.4	0.015	0.306				0.06267
Pb	38.76	4.7	0.01	0.266				0.06349
Hg	1.19	1.01	0.03	1.693				0.05758
Se	1.688	0.076	0.01	0.985				0.63090
Zn	321.1	75.4	0.1	3.201				0.39419

Notes:

$$\frac{[Soil_\alpha \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{\alpha i}] \times AUF}{TRV} = HQ$$

Where:

HQ a	=	Hazard Quotient for analyte a (COPEC a) (unitless)
Soil a	=	Concentration of analyte a (COPEC a) in soil (mg/kg dry weight; 95% UCL)
N	=	Number of different biota types in diet (food types)
B i	=	Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
P i	=	Proportion of biota type (i) in diet
FIR	=	Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
AF ai	=	Absorbed fraction of analyte a (COPEC a) from biota type (i)
AF as	=	Absorbed fraction of analyte a (COPEC a) from soil (s)
TRV a	=	The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
Ps	=	Soil ingestion as a proportion of diet
AUF	=	Area use factor ([home range factor] and [temporal factor, TF])

Swamp Rabbit

Assumptions	Parameter	Symbol
Body weight (kg)	2.118	BW
Soil ingestion proportion	0.063	P_s
Food ingestion Rate (kg/kgBW/d)	0.112	FIR
Proportion of diet, plants	1	Pp
Proportion of diet, inverts		Pi
Proportion of diet, fish		Pf
Proportion of diet, birds		Pb
Area use factor	1	AUF
Time (temporal) factor	0.3	TF

COPEC	95% UCL [COPEC]	TRV	Soil bio-factor	BCF plants	BCF mammals	BCF fish	BCF birds	HQ
						Absorbed Fraction (AF)		
As	6.772	1.04	0.01	0.0375				0.00834
Ba	2043	51.8	0.01	0.156				0.20756
Cd	0.681	0.77	0.036	0.586				0.017481
Cr	16.96	2.4	0.015	0.041				0.009959
Pb	38.76	4.7	0.01	0.0389				0.01095
Hg	1.19	1.01	0.03	0.652				0.02589
Se	1.688	0.076	0.01	0.672				0.50197
Zn	321.1	75.4	0.1	0.366				0.05327

Notes:

$$\frac{[Soil_\alpha \ x \ P_s \ x \ FIR \ x \ AF_{\alpha s}] + [\ \sum_i^N B_i \ \ x \ P_i \ x \ FIR \ x \ AF_{\alpha i}] \ x \ AUF}{TRV} = HQ$$

Where:

HQ a	=	Hazard Quotient for analyte a (COPEC a) (unitless)
Soil a	=	Concentration of analyte a (COPEC a) in soil (mg/kg dry weight; 95% UCL)
N	=	Number of different biota types in diet (food types)
B i	=	Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
P i	=	Proportion of biota type (i) in diet
FIR	=	Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
AF ai	=	Absorbed fraction of analyte a (COPEC a) from biota type (i)
AF as	=	Absorbed fraction of analyte a (COPEC a) from soil (s)
TRV a	=	The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
Ps	=	Soil ingestion as a proportion of diet
AUF	=	Area use factor ([home range factor] and [temporal factor, TF])

Red Fox

Assumptions	Parameter	Symbol
Body weight (kg)	4.53	BW
Soil ingestion proportion	0.028	P_s
Food ingestion Rate (kg/kgBW/d)	0.16	FIR
Proportion of diet, plants	0.07	Pp
Proportion of diet, inverts	0.03	Pi
Proportion of diet, mammals	0.9	Pm
Proportion of diet, birds		Pb
Area use factor	0.1112	AUF
Time (temporal) factor	0.3	TF

COPEC	95% UCL [COPEC]	TRV	Soil bio-factor	BCF plants	BCF earthworm	BCF mammals	BCF birds	HQ
					Absorbed Fraction (AF)			
As	6.772	1.04	0.01	0.0375	0.224	0.0025		0.00041273
Ba	2043	51.8	0.01	0.156	0.091	0.0566		0.01365616
Cd	0.681	0.77	0.036	0.586	7.708	0.33		0.00269204
Cr	16.96	2.4	0.015	0.041	0.306	0.0846		0.00334228
Pb	38.76	4.7	0.01	0.0389	0.266	0.1054		0.00465901
Hg	1.19	1.01	0.03	0.652	1.693	0.0534		0.00091396
Se	1.688	0.076	0.01	0.672	0.985	0.1619		0.02638706
Zn	321.1	75.4	0.1	0.366	3.201	0.7717		0.01861608

Notes:

$$\frac{[Soil_\alpha \; x \; P_s \; x \; FIR \; x \; AF_{as}] + [\sum_i^N B_i \; x \; P_i \; x \; FIR \; x \; AF_{\alpha i}] \; x \; AUF}{TRV} = HQ$$

Where:

HQ a	=	Hazard Quotient for analyte a (COPEC a) (unitless)
Soil a	=	Concentration of analyte a (COPEC a) in soil (mg/kg dry weight; 95% UCL)
N	=	Number of different biota types in diet (food types)
B i	=	Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
P i	=	Proportion of biota type (i) in diet
FIR	=	Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
AF ai	=	Absorbed fraction of analyte a (COPEC a) from biota type (i)
AF as	=	Absorbed fraction of analyte a (COPEC a) from soil (s)
TRV a	=	The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
Ps	=	Soil ingestion as a proportion of diet
AUF	=	Area use factor ([home range factor] and [temporal factor, TF])

American Mink

Assumptions	Parameter	Symbol
Body weight (kg)	1.0	BW
Soil ingestion proportion	0.005	P_s
Food ingestion Rate (kg/kgBW/d)	0.137	FIR
Proportion of diet, plants		Pp
Proportion of diet, benthic inverts	0.1	Pi
Proportion of diet, fish	0.9	Pf
Proportion of diet, birds		Pb
Area use factor	1	AUF
Time (temporal) factor	0.3	TF

COPEC	95% UCL [COPEC]	TRV	Soil bio-factor	BCF plants	Absorbed Fraction (AF) BCF benthic inverts	BCF fish	BCF birds	HQ
As	6.772	1.04	0.01		0.127	0.00065		0.00359999
Ba	2043	51.8	0.01		0.01	0.01		0.01648007
Cd	0.681	0.77	0.036		0.614	0.42		0.01599377
Cr	16.96	2.4	0.015		0.108	0.00011		0.00323812
Pb	38.76	4.7	0.01		0.066	0.0000018		0.00229407
Hg	1.19	1.01	0.03		1.081	0.1		0.00961716
Se	1.688	0.076	0.01		0.9	1		0.90387625
Zn	321.1	75.4	0.1		2.33	0.138		0.06281219

Notes:

$$\frac{[Soil_a \ x \ P_s \ x \ FIR \ x \ AF_{as}] + [\sum_i^N B_i \ x \ P_i \ x \ FIR \ x \ AF_{ai}] \ x \ AUF}{TRV} = HQ$$

Where:

HQ a	=	Hazard Quotient for analyte a (COPEC a) (unitless)
Soil a	=	Concentration of analyte a (COPEC a) in soil (mg/kg dry weight; 95% UCL)
N	=	Number of different biota types in diet (food types)
B i	=	Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
P i	=	Proportion of biota type (i) in diet
FIR	=	Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
AF ai	=	Absorbed fraction of analyte a (COPEC a) from biota type (i)
AF as	=	Absorbed fraction of analyte a (COPEC a) from soil (s)
TRV a	=	The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
Ps	=	Soil ingestion as a proportion of diet
AUF	=	Area use factor ([home range factor] and [temporal factor, TF])