APPENDIX D

BIOCONCENTRATION FACTORS (*BCF*s) FOR WILDLIFE MEASUREMENT RECEPTORS

Screening Level Ecological Risk Assessment Protocol

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APPENDIX D

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APPENDIX D

WILDLIFE MEASUREMENT RECEPTOR *BCF*s

Appendix D provides recommended guidance for determining values for compound-specific, media to receptor, bioconcentration factors (*BCF*s) for wildlife measurement receptors. Wildlife measurement receptor *BCF*s should be based on values reported in the scientific literature, or estimated using physical and chemical properties of the compound. Guidance on use of *BCF* values in the screening level ecological risk assessment is provided in Chapter 5.

Section D-1.0 provides the general guidance recommended to select or estimate compound *BCF* values for wildlife measurement receptors. Sections D-1.0 through D-1.3 further discuss determination of *BCF*s for specific media and receptors. References cited in Sections D-1.1 through D-1.3 are located following Section D-1.3.

For the compounds commonly identified in risk assessments for combustion facilities (identified in Chapter 2) and the mammal and bird example measurement receptors listed in Chapter 4, *BCF* values have been determined following the guidance in Sections D-1.0 through D-1.3. *BCF* values for these limited number of compounds and pathways are included in this appendix (see Tables D-1 through D-3) to facilitate the completion of screening ecological risk assessments. However, it is expected that *BCF* values for additional compounds and receptors may be required for evaluation on a site specific basis. In such cases, *BCF* values for these additional compounds could be determined following the same guidance (Sections D-1.0 through D-1.3) used in determination of the *BCF* values reported in this appendix. For the calculation of *BCF* values for measurement receptors not represented in Sections D-1.1 through D1-3 (e.g., amphibians and reptiles), an approach consistent to that presented in this appendix could be utilized by applying data applicable to those measurement receptors being evaluated.

For additional discussion on some of the references and equations cited in Sections D-1.0 through D-1.3, the reader is recommended to review the Human Health Risk Assessment Protocol (HHRAP) (U.S. EPA 1998) (see Appendix A-3), and the source documents cited in the reference section of this appendix.

D-1.0 GENERAL GUIDANCE

This section describes general procedures for developing compound-specific *BCF*s from biotransfer factors (*Ba*) for assessing exposure of measurement receptors. A biotransfer factor is the ratio of the compound concentration in fresh (wet) weight animal tissue to the daily intake of compound by the animal through ingestion of food items and media (soil, sediment, surface water). Therefore, as discussed in Chapter 5, biotransfer factors and receptor-specific ingestion rates can be used to calculate food item- and media-to-animal *BCF*s. This approach provides an estimate of biotransfer of compounds from applicable food items and media to measurement receptors ingesting these items.

Biotransfer factors could also be used directly in equations to calculate dose to measurement receptors. However, in order to promote consistency in evaluating exposure across all trophic levels within complex food webs, *BCF*s calculated from *Ba* values are recommended in this guidance for evaluating measurement receptors. The use of *Ba* values to determine *BCF* values, and the use of *BCF* values in general, for the estimation of compound concentrations in measurement receptors may introduce

uncertainty. Major factors that influence the uptake of a compound by an animal, and therefore uncertainty, include bioavailability, metabolic rate, type of digestive system, and feeding behavior. Uncertainties also should be considered regarding the development of biotransfer values in comparison to how they are being applied for estimating exposure. For example, biotransfer values may be used to estimate contaminant uptake to species from items ingested that differ from the species and intakes used to empirically develop the values. Also, biotransfer data reported in literature may be specific to tissue or organ analysis versus whole body. As a result, *BCF*s may be under- or over-estimated to an unknown degree.

BCFs for Measurement Receptors Ingesting Food Items *BCF* values for measurement receptors ingesting food items (plants or prey) can be calculated using the compound specific *Ba* value applicable to the animal (e.g., mammal, bird, etc.) and the measurement receptor-specific ingestion rate as follows:

$$BCF_{F\text{-}A} = Ba_A \cdot IR_F \qquad \text{Equation D-1-1}$$

where

$BCF_{F\text{-}A}$ = Bioconcentration factor for food item (plant or prey)-to-animal (measurement receptor) [(mg COPC/kg FW tissue)/(mg COPC/kg FW food item)]

Ba_A = COPC-specific biotransfer factor applicable for the animal (day/kg FW tissue)

IR_F = Measurement receptor food item ingestion rate (kg FW/day)

As an example of applying the above equation, *BCF* values for plants-to-wildlife measurement receptors listed in Chapter 4 are provided in Table D-1 at the end of this appendix. Measurement-receptor specific ingestion rates used to calculate *BCF*s are presented in Table 5-1. *Ba* values applicable to the mammal and bird measurement receptors in Table D-1 are discussed in Sections D-1.1 and D-1.2, respectively.

BCFs for Measurement Receptors Ingesting Media *BCF* values for measurement receptors in trophic levels 2, 3, and 4 ingesting media (i.e., soil, surface water, and sediment) can be calculated using the compound specific *Ba* value applicable to the animal (e.g., mammal, bird, etc.) and the measurement receptor-specific ingestion rate as follows:

$$BCF_{M\text{-}A} = Ba_A \cdot IR_M \qquad \text{Equation D-1-2}$$

where

$BCF_{M\text{-}A}$ = Bioconcentration factor for media-to-animal (measurement receptor) [(mg COPC/kg FW tissue)/(mg COPC/kg WW or DW media)]

Ba_A = COPC-specific biotransfer factor applicable for the animal (day/kg FW tissue)

IR_M = Measurement receptor media ingestion rate (WW or DW kg/day)

Equation D-1-2 assumes that Ba_A provides a reasonable estimate of the uptake of a compound from incidental ingestion of abiotic media during foraging.

As an example of applying the above equation, *BCF* values for various wildlife measurement receptors listed in Chapter 4 are provided in Table D-2 (water) and Table D-3 (soil and sediment). Measurement-receptor specific ingestion rates used to calculate *BCF*s are presented in Table 5-1. *Ba* values applicable to the mammal and bird measurement receptors for which values were calculated are discussed in Sections D-1.1 and D-1.2, respectively.

BCFs for Dioxins and Furans As discussed in Chapter 2, the *BCF* values for PCDDs and PCDFs are calculated using bioaccumulation equivalency factors (*BEF*s). Consistent with U.S. EPA (1995b), *BEF*s are expressed relative to the *BCF* for 2,3,7,8-TCDD as follows:

$$BCF_j = BCF_{2,3,7,8-TCDD} \cdot BEF_j \qquad \text{Equation D-1-3}$$

where

BCF_j	=	Food item-to-animal or media-to-animal *BCF* for *j*th PCDD or PCDF congener for food item-to-animal pathway [(mg COPC/kg FW tissue)/(mg COPC/kg FW plant)]or media-to-animal pathway [(mg COPC/kg FW tissue)/(mg COPC/kg WW media)]
$BCF_{2,3,7,8-TCDD}$	=	Food item-to-animal or media-to-animal *BCF* for 2,3,7,8-TCDD
$BEFj$	=	Bioaccumulation equivalency factor for *j*th PCDD or PCDF congener (unitless)

The use of *BEF*s for dioxin and furan congeners is further discussed in Chapter 2.

D-1.1 BIOTRANSFER FACTORS FOR MAMMALS (Ba_{mammal})

As discussed in Section D-1.0, calculation of *BCF* values to be used in pathways for mammals ingesting food items and media requires the determination of COPC-specific biotransfer factors for mammal measurement receptors (Ba_{mammal}). This section discusses selection of the Ba_{mammal} values used to calculate the COPC and measurement receptor specific BCF values presented in Tables D-1 through D-3.

Organics For organics (except PCDDs and PCDFs), the following correlation equation from Travis and Arms (1988) was used to derrive Ba_{mammal} values on a FW basis:

$$\log Ba_{mammal} = -7.6 + \log K_{ow} \qquad \text{Equation D-1-4}$$

where

Ba_{mammal}	=	Biotransfer factor for mammals (day/kg FW tissue)
K_{ow}	=	Octanol-water partition coefficient (unitless)

To calculate the values presented in Tables D-1 through D-3, COPC-specific K_{ow} values were obtained from Appendix A-2.

Biotransfer factors obtained from Travis and Arms (1988) were derived from correlation equations developed from data on experiments conducted with beef cattle ingesting food items and media containing compound classes such as DDT, pesticides, PCDDs, PCDFs, and PCBs. As further literature is developed for other species and compounds, the Travis and Arms (1988) correlation equation should be compared for applicability to species and compound, and best fit correlation for estimation of uptake.

PCDDs and PCDFs Ba_{mammal} values for PCDD and PCDFs were derrived from *Ba* values for cattle as presented in:

- U.S. EPA 1995a. "Further Studies for Modeling the Indirect Exposure Impacts from Combustor Emissions." Memorandum from Matthew Lorber, Exposure Assessment Group, and Glenn Rice, Environmental Criteria and Assessment Office, Washington, D.C. January 20.

U.S. EPA (1995a) determined *Ba* values for cattle from McLachlan, Thoma, Reissinger, and Hutzinger (1990). These empirically determined *Ba* values were recommended by U.S. EPA (1995a) over the Travis and Arms (1988) correlation equation for dioxins and furans.

Inorganics For metals (except cadmium, mercury, selenium, and zinc), *Ba* values on a fresh weight basis were obtained from Baes, Sharp, Sjoreen, and Shor (1984). For cadmium, selenium, and zinc, U.S. EPA (1995a) indicated that *Ba* values were derived by dividing uptake slopes [(g compound/kg DW tissue)/(g compound/kg DW feed)], obtained from U.S. EPA (1992), by a daily consumption rate of 20 kilograms DW per day by cows.

For use in calculating *BCF* values presented in Tables D-1 through D-3 of this appendix, dry weight *Ba* values were converted to fresh weight basis by assuming a tissue moisture content (by mass) of 70 percent for cows. Moisture content information was obtained from the following:

- U.S. EPA. 1997a. *Exposure Factors Handbook*. "Food Ingestion Factors". Volume II. EPA/600/P-95/002Fb. August.

- Pennington, J.A.T. 1994. *Food Value of Portions Commonly Used*. Sixteenth Edition. J.B. Lippincott Company, Philadelphia.

Mercuric Compounds Based on assumptions made regarding speciation and fate and transport of mercury from stack emissions (as discussed in Chapter 2), elemental mercury is assumed not to deposit onto soils, water, or plants. Therefore, it is also not available in food items or media for ingestion and subsequent uptake by measurement receptors. As a result, no *BCF* values for elemental mercury are

presented in Tables D-1 through D-3 of this appendix. If site-specific field data suggest otherwise, *Ba* values for elemental mercury can be derived from uptake slope factors provided in U.S. EPA (1992) and U.S. EPA (1995a), using the same consumption rates as were discussed earlier for the metals like cadmium, selenium, and zinc.

Ba_{mammal} values for mercuric chloride and methyl mercury were derived from data in U.S. EPA (1997b). U.S. EPA (1997b) provides *Ba* values for mercury in cows, but does not specify the form of mercury. To obtain the *Ba* values for mercuric chloride and methyl mercury presented in Tables D-1 through D-3 of this guidance, consistent with U.S. EPA (1997b) total mercury was assumed to be composed of 87 percent divalent mercury (as mercuric chloride) and 13 percent methyl mercury in herbivore animal tissue. Also, assuming that the *Ba* value provided in U.S. EPA (1997b) is for the total mercury in the animal tissue, then biotransfer factors in U.S. EPA (1997b) can be determined for mercuric chloride and methyl mercury, as follows:

- The default *Ba* value of 0.02 day/kg DW for total mercury obtained from U.S. EPA (1997b) was converted to a fresh weight basis assuming a 70 percent moisture content in cow tissue (U.S. EPA 1997a; Pennington 1994). The fresh weight *Ba* value for total mercury was multiplied by 0.13 to obtain a Ba_{mammal} value for methyl mercury, and by 0.87 to obtain a Ba_{mammal} value for mercuric chloride.

D-1.2 BIOTRANSFER FACTORS FOR BIRDS (Ba_{bird})

As discussed in Section D-1.0, calculation of *BCF* values to be used in pathways for birds ingesting food items and media requires the determination of COPC-specific biotransfer factors for bird measurement receptors (Ba_{bird}). This section discusses selection of the Ba_{bird} values used to calculate the COPC and measurement receptor specific *BCF* values presented in Tables D-1 through D-3.

Organics Ba_{bird} values for organic compounds (except PCDDs and PCDFs) were derived from Ba_{mammal} values by assuming that the lipid content (by mass) of birds and mammals is 15 and 19 percent, respectively. Therefore, Ba_{bird} values presented in Tables D-1 through D-3 were determined by multiplying Ba_{mammal} values by the bird and mammal fat content ratio of 0.8 (15/19).

Notable uncertainties associated with this approach include (1) extent to which specific organic compounds bioconcentrate in fatty tissues, and (2) differences in lipid content, metabolism, and feeding characteristics between species.

PCDDs and PCDFs Ba_{bird} values presented in Tables D-1 through D-3 for PCDD and PCDF congeners were derrived from data provided in the following:

- Stephens, R.D., M. Petreas, and G.H. Hayward. 1995. "Biotransfer and Bioaccumulation of Dioxins and Furans from Soil: Chickens as a Model for Foraging Animals." *The Science of the Total Environment.* Volume 175. Pages 253-273.

Stephens, Petreas, and Hayward (1995) conducted experiments to determine the bioavailability and the rate of PCDDs and PCDFs uptake from soil by foraging chickens. Three groups of White Leghorn

chickens were studied—control group, low exposure group, and high exposure group. Eggs, tissues (liver, adipose, and thigh), feed, and feces were analyzed.

Congener specific Ba_{bird} values were derrived from the Stephens, Petreas, and Hayward (1995) study by dividing estimated whole body bioconcentration values for the high exposure group by a daily consumption rate of soil. If congener specific *BCF* values were not reported for the high exposure group, then estimated whole body values were determined using reported data for the low exposure group, if available. A default consumption rate of soil by chicken of 0.02 kg DW/day was determined as follows:

(1) Consumption rate of feed by chicken was obtained from U.S. EPA (1995a), which cites a value of 0.2 kg (DW) feed/day obtained from various literature sources.

(2) The fraction of feed that is soil (0.1) was obtained from Stephens, Petreas, and Hayward (1995).

(3) Feed consumption rate of 0.2 kg/day was multiplied by fraction of feed that is soil (0.1), to obtain the soil consumption rate by chicken of 0.2 x 0.1 = 0.02 kg DW soil/day.

Inorganics For metals (except cadmium, selenium, and zinc), Ba_{bird} values were not available in the literature. For cadmium, selenium, and zinc, U.S. EPA (1995a) cites *Ba* values that were derived by dividing uptake slopes [(g compound/kg dry DW tissue)/(g compound/kg DW feed)], obtained from U.S. EPA (1992), by a daily ingestion rate of 0.2 kilograms DW per day by poultry. To determine *BCF* values presented in Tables D-1 through D-3 in this appendix, reported dry weight *Ba* values were converted to fresh weight basis by assuming a tissue moisture content (by mass) of 75 percent for poultry (U.S. EPA 1997a; Pennington 1994).

Mercuric Compounds Based on assumptions made regarding speciation and fate and transport of mercury from stack emissions (as discussed in Chapter 2), elemental mercury is assumed not to deposit onto soils, water, or plants. Therefore, it is also not available in food items or media for ingestion and subsequent uptake by measurement receptors. As a result, no *BCF* values for elemental mercury are presented in Tables D-1 through D-3 of this appendix. If site-specific field data suggest otherwise, *Ba* values for elemental mercury can be derived from uptake slope factors provided in U.S. EPA (1992) and U.S. EPA (1995a), using the same consumption rates as were discussed earlier for the metals like cadmium, selenium, and zinc.

Ba_{bird} values for mercuric chloride and methyl mercury were derived from data in U.S. EPA (1997b). U.S. EPA (1997b) provides *Ba* values for mercury in poultry, but does not specify the form of mercury. To obtain the *Ba* values for mercuric chloride and methyl mercury presented in Tables D-1 through D-3 of this guidance, consistent with U.S. EPA (1997b) total mercury was assumed to be composed of 87 percent divalent mercury (as mercuric chloride) and 13 percent methyl mercury in herbivore animal tissue. Also, assuming that the *Ba* value provided in U.S. EPA (1997b) is for the total mercury in the animal tissue, then biotransfer factors in U.S. EPA (1997b) can be determined for mercuric chloride and methyl mercury, as follows:

- The default *Ba* value of 0.02 day/kg DW for total mercury obtained from U.S. EPA (1997b) was converted to a fresh weight basis assuming a 75 percent moisture content in poultry tissue (U.S. EPA 1997a; Pennington 1994). The fresh weight *Ba* value for total mercury was multiplied by 0.13 to obtain a Ba_{bird} value for methyl mercury, and by 0.87 to obtain a Ba_{bird} value for mercuric chloride.

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TABLES OF MEASUREMENT RECEPTOR *BCF* VALUES

Screening Level Ecological Risk Assessment Protocol

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TABLE D-1

BIOCONCENTRATION FACTORS FOR PLANTS TO WILDLIFE MEASUREMENT RECEPTORS

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Compound	Measurement Receptor													
	American Robin (BCF_{TP-OB})	Canvas Back (BCF_{TP-HB})	Deer Mouse (BCF_{TP-HM})	Least Shrew (BCF_{TP-OM})	Mallard Duck (BCF_{TP-OB})	Marsh Rice Rat (BCF_{TP-OM})	Marsh Wren (BCF_{TP-OB})	Mourning Dove (BCF_{TP-HB})	Muskrat (BCF_{TP-OM})	Northern Bobwhite (BCF_{TP-OB})	Salt-marsh Harvest Mouse (BCF_{TP-HM})	Short-tailed Shrew (BCF_{TP-OM})	Western Meadow Lark (BCF_{TP-OM})	White-footed Mouse (BCF_{TP-OM})
Dioxins and Furans														
2,3,7,8-TCDD	1.53e+02	6.85e+01	3.25e-02	3.37e-02	6.16e+01	2.39e-02	3.19e+02	1.20e+02	1.45e-02	1.20e+02	4.02e-02	3.37e-02	1.45e+02	3.33e-02
1,2,3,7,8-PeCDD	1.41e+02	6.30e+01	2.99e-02	3.10e-02	5.67e+01	2.20e-02	2.93e+02	1.11e+02	1.33e-02	1.11e+02	3.70e-02	3.10e-02	1.33e+02	3.07e-02
1,2,3,4,7,8-HxCDD	4.74e+01	2.12e+01	1.01e-02	1.04e-02	1.91e+01	7.41e-03	9.88e+01	3.72e+01	4.50e-03	3.72e+01	1.25e-02	1.04e-02	4.49e+01	1.03e-02
1,2,3,6,7,8-HxCDD	1.83e+01	8.22e+00	3.91e-03	4.04e-03	7.39e+00	2.87e-03	3.83e+01	1.44e+01	1.74e-03	1.44e+01	4.83e-03	4.04e-03	1.74e+01	4.00e-03
1,2,3,7,8,9-HxCDD	2.14e+01	9.59e+00	4.56e-03	4.71e-03	8.63e+00	3.35e-03	4.46e+01	1.68e+01	2.03e-03	1.68e+01	5.63e-03	4.71e-03	2.03e+01	4.67e-03
1,2,3,4,6,7,8-HpCDD	7.79e+00	3.49e+00	1.66e-03	1.72e-03	3.14e+00	1.22e-03	1.63e+01	6.13e+00	7.40e-04	6.13e+00	2.05e-03	1.72e-03	7.39e+00	1.70e-03
OCDD	1.83e+00	8.22e-01	3.91e-04	4.04e-04	7.39e-01	2.87e-04	3.83e+00	1.44e+00	1.74e-04	1.44e+00	4.83e-04	4.04e-04	1.74e+00	4.00e-04
2,3,7,8-TCDF	1.22e+02	5.48e+01	2.60e-02	2.69e-02	4.93e+01	1.91e-02	2.55e+02	9.61e+01	1.16e-02	9.61e+01	3.22e-02	2.69e-02	1.16e+02	2.67e-02
1,2,3,7,8-PeCDF	3.36e+01	1.51e+01	7.16e-03	7.41e-03	1.36e+01	5.26e-03	7.01e+01	2.64e+01	3.19e-03	2.64e+01	8.85e-03	7.41e-03	3.19e+01	7.34e-03
2,3,4,7,8-PeCDF	2.44e+02	1.10e+02	5.21e-02	5.39e-02	9.86e+01	3.83e-02	5.10e+02	1.92e+02	2.32e-02	1.92e+02	6.44e-02	5.39e-02	2.32e+02	5.34e-02
1,2,3,4,7,8-HxCDF	1.16e+01	5.21e+00	2.47e-03	2.56e-03	4.68e+00	1.82e-03	2.42e+01	9.13e+00	1.10e-03	9.13e+00	3.06e-03	2.56e-03	1.10e+01	2.53e-03
1,2,3,6,7,8-HxCDF	2.90e+01	1.30e+01	6.18e-03	6.40e-03	1.17e+01	4.54e-03	6.06e+01	2.28e+01	2.76e-03	2.28e+01	7.64e-03	6.40e-03	2.75e+01	6.34e-03
2,3,4,6,7,8-HxCDF	1.02e+02	4.59e+01	2.18e-02	2.26e-02	4.13e+01	1.60e-02	2.14e+02	8.05e+01	9.72e-03	8.05e+01	2.70e-02	2.26e-02	9.70e+01	2.23e-02
1,2,3,7,8,9-HxCDF	9.63e+01	4.32e+01	2.05e-02	2.12e-02	3.88e+01	1.51e-02	2.01e+02	7.57e+01	9.14e-03	7.57e+01	2.53e-02	2.12e-02	9.13e+01	2.10e-02
1,2,3,4,6,7,8-HpCDF	1.68e+00	7.54e-01	3.58e-04	3.70e-04	6.78e-01	2.63e-04	3.51e+00	1.32e+00	1.60e-04	1.32e+00	4.43e-04	3.70e-04	1.59e+00	3.67e-04
1,2,3,4,7,8,9-HpCDF	5.96e+01	2.67e+01	1.27e-02	1.31e-02	2.40e+01	9.33e-03	1.24e+02	4.69e+01	5.66e-03	4.69e+01	1.57e-02	1.31e-02	5.65e+01	1.30e-02
OCDF	2.44e+00	1.10e+00	5.21e-04	5.39e-04	9.86e-01	3.83e-04	5.10e+00	1.92e+00	2.32e-04	1.92e+00	6.44e-04	5.39e-04	2.32e+00	5.34e-04
Polynuclear Aromatic Hydrocarbons (PAHs)														
Benzo(a)pyrene	1.19e-02	5.32e-03	2.03e-02	2.10e-02	4.78e-03	1.49e-02	2.47e-02	9.32e-03	9.03e-03	9.32e-03	2.50e-02	2.10e-02	1.12e-02	2.08e-02
Benzo(a)anthracene	4.20e-03	1.88e-03	7.19e-03	7.44e-03	1.69e-03	5.28e-03	8.76e-03	3.30e-03	3.21e-03	3.30e-03	8.89e-03	7.44e-03	3.98e-03	7.37e-03
Benzo(b)fluoranthene	1.40e-02	6.29e-03	2.40e-02	2.48e-02	5.66e-03	1.76e-02	2.93e-02	1.10e-02	1.07e-02	1.10e-02	2.96e-02	2.48e-02	1.33e-02	2.46e-02
Benzo(k)fluoranthene	1.39e-02	6.25e-03	2.39e-02	2.47e-02	5.62e-03	1.75e-02	2.91e-02	1.10e-02	1.06e-02	1.10e-02	2.95e-02	2.47e-02	1.32e-02	2.44e-02
Chrysene	4.84e-03	2.17e-03	8.27e-03	8.56e-03	1.95e-03	6.08e-03	1.01e-02	3.81e-03	3.69e-03	3.81e-03	1.02e-02	8.56e-03	4.59e-03	8.47e-03
Dibenz(a,h)anthracene	3.11e-02	1.39e-02	5.31e-02	5.49e-02	1.25e-02	3.90e-02	6.48e-02	2.44e-02	2.37e-02	2.44e-02	6.57e-02	5.49e-02	2.95e-02	5.44e-02
Indeno(1,2,3-cd)pyrene	7.24e-02	3.25e-02	1.24e-01	1.28e-01	2.92e-02	9.12e-02	1.51e-01	5.69e-02	5.53e-02	5.69e-02	1.53e-01	1.28e-01	6.86e-02	1.27e-01
Polychlorinated Biphenyls (PCBs)														
Aroclor, 1016	2.23e-03	1.00e-03	3.82e-03	3.95e-03	9.01e-04	2.81e-03	4.66e-03	1.76e-03	1.70e-03	1.76e-03	4.72e-03	3.95e-03	2.12e-03	3.91e-03
Aroclor, 1254	1.42e-02	6.35e-03	2.43e-02	2.51e-02	5.71e-03	1.78e-02	2.96e-02	1.11e-02	1.08e-02	1.11e-02	3.00e-02	2.51e-02	1.34e-02	2.49e-02
Nitroaromatics														
1,3-Dinitrobenzene	2.73e-07	1.22e-07	4.67e-07	4.83e-07	1.10e-07	3.43e-07	5.70e-07	2.15e-07	2.08e-07	2.15e-07	5.77e-07	4.83e-07	2.59e-07	4.78e-07
2,4-Dinitrotoluene	8.70e-07	3.90e-07	1.49e-06	1.54e-06	3.51e-07	1.10e-06	1.82e-06	6.84e-07	6.65e-07	6.84e-07	1.85e-06	1.54e-06	8.25e-07	1.53e-06

TABLE D-1

BIOCONCENTRATION FACTORS FOR PLANTS TO WILDLIFE MEASUREMENT RECEPTORS

Compound	Measurement Receptor													
	American Robin (BCF_{TP-OB})	Canvas Back (BCF_{TP-HB})	Deer Mouse (BCF_{TP-HM})	Least Shrew (BCF_{TP-OM})	Mallard Duck (BCF_{TP-OB})	Marsh Rice Rat (BCF_{TP-OM})	Marsh Wren (BCF_{TP-OB})	Mourning Dove (BCF_{TP-HB})	Muskrat (BCF_{TP-OM})	Northern Bobwhite (BCF_{TP-OB})	Salt-marsh Harvest Mouse (BCF_{TP-HM})	Short-tailed Shrew (BCF_{TP-OM})	Western Meadow Lark (BCF_{TP-OM})	White-footed Mouse (BCF_{TP-OM})
2,6-Dinitrotoluene	6.79e-07	3.05e-07	1.16e-06	1.20e-06	2.74e-07	8.50e-07	1.42e-06	5.34e-07	5.16e-07	5.34e-07	1.43e-06	1.20e-06	6.44e-07	1.19e-06
Nitrobenzene	5.99e-07	2.69e-07	1.03e-06	1.06e-06	2.42e-07	7.53e-07	1.25e-06	4.71e-07	4.57e-07	4.71e-07	1.27e-06	1.06e-06	5.68e-07	1.05e-06
Pentachloronitrobenzene	3.85e-04	1.72e-04	6.59e-04	6.82e-04	1.55e-04	4.84e-04	8.02e-04	3.02e-04	2.94e-04	3.02e-04	8.15e-04	6.82e-04	3.65e-04	6.76e-04
Phthalate Esters														
Bis(2-ethylhexyl)phthalate	1.41e-03	6.33e-04	2.42e-03	2.50e-03	5.69e-04	1.77e-03	2.95e-03	1.11e-03	1.08e-03	1.11e-03	2.99e-03	2.50e-03	1.34e-03	2.47e-03
Di(n)octyl phthalate	1.88e+01	8.44e+00	3.22e+01	3.33e+01	7.59e+00	2.36e+01	3.93e+01	1.48e+01	1.43e+01	1.48e+01	3.98e+01	3.33e+01	1.78e+01	3.30e+01
Volatile Organic Compounds														
Acetone	5.28e-09	2.37e-09	9.05e-09	9.36e-09	2.13e-09	6.65e-09	1.10e-08	4.15e-09	4.03e-09	4.15e-09	1.12e-08	9.36e-09	5.01e-09	9.27e-09
Acrylonitrile	1.57e-08	7.03e-09	2.68e-08	2.77e-08	6.32e-09	1.97e-08	3.27e-08	1.23e-08	1.19e-08	1.23e-08	3.31e-08	2.77e-08	1.49e-08	2.75e-08
Chloroform	7.82e-07	3.50e-07	1.34e-06	1.39e-06	3.15e-07	9.87e-07	1.63e-06	6.14e-07	5.98e-07	6.14e-07	1.66e-06	1.39e-06	7.41e-07	1.38e-06
Crotonaldehyde	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dioxane	4.75e-09	2.13e-09	8.15e-09	8.43e-09	1.92e-09	5.99e-09	9.91e-09	3.74e-09	3.63e-09	3.74e-09	1.01e-08	8.43e-09	4.50e-09	8.35e-09
Formaldehyde	1.94e-08	8.68e-09	3.31e-08	3.43e-08	7.81e-09	2.44e-08	4.04e-08	1.52e-08	1.48e-08	1.52e-08	4.10e-08	3.43e-08	1.84e-08	3.40e-08
Vinyl chloride	1.23e-07	5.53e-08	2.11e-07	2.18e-07	4.98e-08	1.55e-07	2.58e-07	9.71e-08	9.40e-08	9.71e-08	2.61e-07	2.18e-07	1.17e-07	2.16e-07
Other Chlorinated Organics														
Hexachlorobenzene	2.80e-03	1.26e-03	4.79e-03	4.95e-03	1.13e-03	3.52e-03	5.85e-03	2.20e-03	2.13e-03	2.20e-03	5.92e-03	4.95e-03	2.66e-03	4.91e-03
Hexachlorobutadiene	4.75e-04	2.13e-04	8.09e-04	8.37e-04	1.92e-04	5.95e-04	9.91e-04	3.74e-04	3.61e-04	3.74e-04	1.00e-03	8.37e-04	4.50e-04	8.29e-04
Hexachlorocyclopentadiene	7.11e-04	3.19e-04	1.22e-03	1.26e-03	2.87e-04	8.94e-04	1.48e-03	5.59e-04	5.42e-04	5.59e-04	1.50e-03	1.26e-03	6.74e-04	1.25e-03
Pentachlorobenzene	1.08e-03	4.84e-04	1.84e-03	1.90e-03	4.35e-04	1.35e-03	2.25e-03	8.48e-04	8.20e-04	8.48e-04	2.27e-03	1.90e-03	1.02e-03	1.89e-03
Pentachlorophenol	1.06e-03	4.76e-04	1.81e-03	1.87e-03	4.28e-04	1.33e-03	2.21e-03	8.34e-04	8.07e-04	8.34e-04	2.24e-03	1.87e-03	1.01e-03	1.85e-03
Pesticides														
4,4-DDE	1.59e-02	7.13e-03	2.72e-02	2.81e-02	6.41e-03	2.00e-02	3.32e-02	1.25e-02	1.21e-02	1.25e-02	3.36e-02	2.81e-02	1.51e-02	2.78e-02
Heptachlor	9.10e-04	4.08e-04	1.56e-03	1.61e-03	3.67e-04	1.15e-03	1.90e-03	7.16e-04	6.95e-04	7.16e-04	1.93e-03	1.61e-03	8.63e-04	1.60e-03
Hexachlorophene	3.06e-01	1.37e-01	5.22e-01	5.40e-01	1.23e-01	3.84e-01	6.37e-01	2.40e-01	2.33e-01	2.40e-01	6.45e-01	5.40e-01	2.90e-01	5.35e-01
Inorganics														
Aluminum	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	NA	NA	5.99e-04	6.20e-04	NA	4.40e-04	NA	NA	2.67e-04	NA	7.41e-04	6.20e-04	NA	6.14e-04
Arsenic	NA	NA	1.20e-03	1.24e-03	NA	8.81e-04	NA	NA	5.34e-04	NA	1.48e-03	1.24e-03	NA	1.23e-03
Barium	NA	NA	8.99e-05	9.30e-05	NA	6.61e-05	NA	NA	4.01e-05	NA	1.11e-04	9.30e-05	NA	9.21e-05
Beryllium	NA	NA	5.99e-04	6.20e-04	NA	4.40e-04	NA	NA	2.67e-04	NA	7.41e-04	6.20e-04	NA	6.14e-04
Cadmium	4.71e-02	2.11e-02	7.19e-05	7.44e-05	1.90e-02	5.28e-05	9.82e-02	3.70e-02	3.21e-05	3.70e-02	8.89e-05	7.44e-05	4.46e-02	7.37e-05
Chromium (hexavalent)	NA	NA	3.30e-03	3.41e-03	NA	2.42e-03	NA	NA	1.47e-03	NA	4.08e-03	3.41e-03	NA	3.38e-03

TABLE D-1

BIOCONCENTRATION FACTORS FOR PLANTS TO WILDLIFE MEASUREMENT RECEPTORS

Compound	Measurement Receptor													
	American Robin (BCF_{TP-OB})	Canvas Back (BCF_{TP-HB})	Deer Mouse (BCF_{TP-HM})	Least Shrew (BCF_{TP-OM})	Mallard Duck (BCF_{TP-OB})	Marsh Rice Rat (BCF_{TP-OM})	Marsh Wren (BCF_{TP-OB})	Mourning Dove (BCF_{TP-HB})	Muskrat (BCF_{TP-OM})	Northern Bobwhite (BCF_{TP-OB})	Salt-marsh Harvest Mouse (BCF_{TP-HM})	Short-tailed Shrew (BCF_{TP-OM})	Western Meadow Lark (BCF_{TP-OM})	White-footed Mouse (BCF_{TP-OM})
Copper	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Cyanide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	NA	NA	1.80e-04	1.86e-04	NA	1.32e-04	NA	NA	8.02e-05	NA	2.22e-04	1.86e-04	NA	1.84e-04
Mercuric chloride	1.06e-02	4.76e-03	3.13e-03	3.24e-03	4.28e-03	2.30e-03	2.21e-02	8.34e-03	1.39e-03	8.34e-03	3.87e-03	3.24e-03	1.01e-02	3.21e-03
Methylmercury	1.59e-03	7.13e-04	4.68e-04	4.84e-04	6.41e-04	3.44e-04	3.32e-03	1.25e-03	2.08e-04	1.25e-03	5.78e-04	4.84e-04	1.51e-03	4.79e-04
Nickel	NA	NA	3.60e-03	3.72e-03	NA	2.64e-03	NA	NA	1.60e-03	NA	4.45e-03	3.72e-03	NA	3.68e-03
Selenium	5.02e-01	2.25e-01	1.36e-03	1.41e-03	2.02e-01	1.00e-03	1.05e+00	3.95e-01	6.07e-04	3.95e-01	1.68e-03	1.41e-03	4.76e-01	1.39e-03
Silver	NA	NA	1.80e-03	1.86e-03	NA	1.32e-03	NA	NA	8.02e-04	NA	2.22e-03	1.86e-03	NA	1.84e-03
Thallium	NA	NA	2.40e-02	2.48e-02	NA	1.76e-02	NA	NA	1.07e-02	NA	2.96e-02	2.48e-02	NA	2.46e-02
Zinc	3.89e-03	1.74e-03	5.39e-05	5.58e-05	1.57e-03	3.96e-05	8.11e-03	3.05e-03	2.40e-05	3.05e-03	6.67e-05	5.58e-05	3.68e-03	5.53e-05

Notes:

NA - Indicates insufficient data to determine value

HB - Herbivorous bird
HM - Herbivorous mammal
OB - Omnivorous bird
OM - Omnivorous mammal
TP - Terrestrial plant

– Values provided were determined as specified in the text of Appendix D. *BCF* values for omnivores were determined based on an equal diet. *BCF* values for dioxin and furan congeners determined using BEF values specified in Chapter 2.

Table D-2

Bioconcentration Factors for Water to Wildlife Measurement Receptors

(Page 1 of 6)

Compound	Measurement Receptors										
	American Kestrel (BCF_{W-CB})	American Robin (BCF_{W-OB})	Canvas Back (BCF_{W-HB})	Deer Mouse (BCF_{W-HM})	Least Shrew (BCF_{W-OM})	Long-tailed Weasel (BCF_{W-OM})	Mallard Duck (BCF_{W-OB})	Marsh Rice Rat (BCF_{W-OM})	Marsh Wren (BCF_{W-OB})	Mink (BCF_{W-CM})	Mourning Dove (BCF_{W-OM})
Dioxins and Furans											
2,3,7,8-TCDD	4.30e+01	4.71e+01	2.21e+01	8.19e-03	9.34e-03	6.88e-03	2.00e+01	1.03e-02	9.46e+01	5.39e-03	3.75e+01
1,2,3,7,8-PeCDD	3.96e+01	4.34e+01	2.04e+01	7.54e-03	8.59e-03	6.33e-03	1.84e+01	9.44e-03	8.70e+01	4.96e-03	3.45e+01
1,2,3,4,7,8-HxCDD	1.33e+01	1.46e+01	6.86e+00	2.54e-03	2.89e-03	2.13e-03	6.21e+00	3.18e-03	2.93e+01	1.67e-03	1.16e+01
1,2,3,6,7,8-HxCDD	5.16e+00	5.66e+00	2.65e+00	9.83e-04	1.12e-03	8.25e-04	2.40e+00	1.23e-03	1.14e+01	6.47e-04	4.50e-01
1,2,3,7,8,9-HxCDD	6.02e+00	6.60e+00	3.10e+00	1.15e-03	1.31e-03	9.63e-04	2.80e+00	1.44e-03	1.32e+01	7.55e-04	5.25e+00
1,2,3,4,6,7,8-HpCDD	2.19e+00	2.40e+00	1.13e+00	4.18e-04	4.76e-04	3.51e-04	1.02e+00	5.23e-04	4.82e+00	2.75e-04	1.91e+00
OCDD	5.16e-01	5.66e-01	2.65e-01	9.83e-05	1.12e-04	8.25e-05	2.40e-01	1.23e-04	1.14e+00	6.47e-05	4.50e-01
2,3,7,8-TCDF	3.44e+01	3.77e+01	1.77e+01	6.55e-03	7.47e-03	5.50e-03	1.60e+01	8.21e-03	7.57e+01	4.31e-03	3.00e+01
1,2,3,7,8-PeCDF	9.46e+00	1.04e+01	4.87e+00	1.80e-03	2.05e-03	1.51e-03	4.40e+00	2.26e-03	2.08e+01	1.19e-03	8.25e+00
2,3,4,7,8-PeCDF	6.88e+01	7.54e+01	3.54e+01	1.31e-02	1.49e-02	1.10e-02	3.20e+01	1.64e-02	1.51e+02	8.62e-03	6.00e+01
1,2,3,4,7,8-HxCDF	3.27e+00	3.58e+00	1.68e+00	6.23e-04	7.10e-04	5.23e-04	1.52e+00	7.80e-04	7.19e+00	4.10e-04	2.85e+00
1,2,3,6,7,8-HxCDF	8.17e+00	8.95e+00	4.20e+00	1.56e-03	1.77e-03	1.31e-03	3.80e+00	1.95e-03	1.80e+01	1.02e-03	7.12e+00
2,3,4,6,7,8-HxCDF	2.88e+01	3.16e+01	1.48e+01	5.49e-03	6.26e-03	4.61e-03	1.34e+01	6.88e-03	6.34e+01	3.61e-03	2.51e+01
1,2,3,7,8,9-HxCDF	2.71e+01	2.97e+01	1.39e+01	5.16e-03	5.88e-03	4.33e-03	1.26e+01	6.47e-03	5.96e+01	3.40e-03	2.36e+01
1,2,3,4,6,7,8-HpCDF	4.73e-01	5.18e-01	2.43e-01	9.01e-05	1.03e-04	7.57e-05	2.20e-01	1.13e-04	1.04e+00	5.93e-05	4.12e-01
1,2,3,4,7,8,9-HpCDF	1.68e+01	1.84e+01	8.63e+00	3.20e-03	3.64e-03	2.68e-03	7.81e+00	4.00e-03	3.69e+01	2.10e-03	1.46e+01
OCDF	6.88e-01	7.54e-01	3.54e-01	1.31e-04	1.49e-04	1.10e-04	3.20e-01	1.64e-04	1.51e+00	8.62e-05	6.00e-01
Polynuclear Aromatic Hydrocarbons (PAHs)											
Benzo(a)pyrene	3.34e-03	3.67e-03	1.72e-03	5.10e-03	5.81e-03	4.28e-03	1.55e-03	3.75e-03	7.35e-03	3.36e-03	2.92e-03
Benzo(a)anthracene	1.18e-03	1.30e-03	6.08e-04	1.81e-03	2.06e-03	1.52e-03	5.50e-04	1.33e-03	2.60e-03	1.19e-03	1.03e-03
Benzo(b)fluoranthene	3.95e-03	4.34e-03	2.03e-03	6.03e-03	6.88e-03	5.07e-03	1.84e-03	4.44e-03	8.70e-03	3.97e-03	3.46e-03
Benzo(k)fluoranthene	3.92e-03	4.31e-03	2.02e-03	6.00e-03	6.84e-03	5.04e-03	1.83e-03	4.41e-03	8.64e-03	3.95e-03	3.43e-03
Chrysene	1.36e-03	1.50e-03	7.01e-04	2.08e-03	2.37e-03	1.75e-03	6.34e-04	1.53e-03	3.00e-03	1.37e-03	1.19e-03
Dibenz(a,h)anthracene	8.74e-03	9.61e-03	4.50e-03	1.34e-02	1.52e-02	1.12e-02	4.07e-03	9.84e-03	1.93e-02	8.79e-03	7.66e-03
Indeno(1,2,3-cd)pyrene	2.04e-02	2.24e-02	1.05e-02	3.12e-02	3.56e-02	2.62e-02	9.48e-03	2.29e-02	4.49e-02	2.05e-02	1.78e-02
Polychlorinated Biphenyls (PCBs)											
Aroclor 1016	6.28e-04	6.91e-04	3.24e-04	9.61e-04	1.10e-03	8.07e-04	2.93e-04	7.07e-04	1.38e-03	6.32e-04	5.50e-04
Aroclor 1254	3.98e-03	4.38e-03	2.05e-03	6.11e-03	6.96e-03	5.13e-03	1.86e-03	4.48e-03	8.78e-03	4.02e-03	3.49e-03
Nitroaromatics											
1,3-Dinitrobenzene	7.68e-08	8.45e-08	3.96e-08	1.18e-07	1.34e-07	9.87e-08	3.58e-08	8.65e-08	1.69e-07	7.73e-08	6.73e-08
2,4-Dinitrotoluene	2.45e-07	2.69e-07	1.26e-07	3.76e-07	4.28e-07	3.15e-07	1.14e-07	2.76e-07	5.39e-07	2.47e-07	2.14e-07

Table D-2

Bioconcentration Factors for Water to Wildlife Measurement Receptors

(Page 2 of 6)

Compound	Measurement Receptors										
	American Kestrel (BCF_{W-CB})	American Robin (BCF_{W-OB})	Canvas Back (BCF_{W-HB})	Deer Mouse (BCF_{W-HM})	Least Shrew (BCF_{W-OM})	Long-tailed Weasel (BCF_{W-OM})	Mallard Duck (BCF_{W-OB})	Marsh Rice Rat (BCF_{W-OM})	Marsh Wren (BCF_{W-OB})	Mink (BCF_{W-CM})	Mourning Dove (BCF_{W-OM})
2,6-Dinitrotoluene	1.91e-07	2.10e-07	9.84e-08	2.91e-07	3.32e-07	2.44e-07	8.90e-08	2.15e-07	4.21e-07	1.92e-07	1.67e-07
Nitrobenzene	1.69e-07	1.85e-07	8.68e-08	2.58e-07	2.94e-07	2.17e-07	7.86e-08	1.90e-07	3.72e-07	1.70e-07	1.48e-07
Pentachloronitrobenzene	1.08e-04	1.19e-04	5.57e-05	1.66e-04	1.89e-04	1.39e-04	5.04e-05	1.22e-04	2.38e-04	1.09e-04	9.47e-05
Phthalate Esters											
Bis(2-ethylhexyl)phthalate	3.97e-04	4.37e-04	2.05e-04	6.08e-04	6.93e-04	5.11e-04	1.85e-04	4.47e-04	8.75e-04	4.00e-04	3.48e-04
Di(n)octyl phthalate	5.30e+00	5.82e+00	2.73e+00	8.10e+00	9.23e+00	6.80e+00	2.47e+00	5.96e+00	1.17e+01	5.33e+00	4.64e+00
Volatile Organic Compounds											
Acetone	1.49e-09	1.63e-09	7.65e-10	2.28e-09	2.60e-09	1.91e-09	6.92e-10	1.67e-09	3.28e-09	1.50e-09	1.30e-09
Acrylonitrile	4.41e-09	4.84e-09	2.27e-09	6.74e-09	7.69e-09	5.66e-09	2.05e-09	1.27e-09	9.71e-09	4.44e-09	3.85e-09
Chloroform	2.20e-07	2.42e-07	1.13e-07	3.38e-07	3.85e-07	2.84e-07	1.02e-07	2.47e-07	4.84e-07	2.22e-07	1.93e-07
Crotonaldehyde	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dioxane	1.34e-09	1.47e-09	6.88e-10	2.05e-09	2.34e-09	1.72e-09	6.23e-10	1.50e-09	2.95e-09	1.35e-09	1.17e-09
Formaldehyde	5.45e-09	5.99e-09	2.80e-09	8.34e-09	9.51e-09	7.01e-09	2.54e-09	6.13e-09	1.20e-08	5.49e-09	4.77e-09
Vinyl chloride	3.47e-08	3.82e-08	1.79e-08	5.31e-08	6.05e-08	4.46e-08	1.62e-08	3.91e-08	7.65e-08	3.49e-08	3.04e-08
Other Chlorinated Organics											
Hexachlorobenzene	7.88e-04	8.67e-04	4.06e-04	1.21e-03	1.37e-03	1.01e-03	3.67e-04	8.87e-04	1.74e-03	7.93e-04	6.90e-04
Hexachlorobutadiene	1.34e-04	1.47e-04	6.88e-05	2.04e-04	2.32e-04	1.71e-04	6.23e-05	1.51e-04	2.94e-04	1.34e-04	1.17e-04
Hexachlorocyclopentadiene	2.00e-04	2.20e-04	1.03e-04	3.06e-04	3.49e-04	2.57e-04	9.31e-05	2.25e-04	4.40e-04	2.02e-04	1.75e-04
Pentachlorobenzene	3.04e-04	3.34e-04	1.56e-04	4.63e-04	5.28e-04	3.89e-04	1.41e-04	3.42e-04	6.69e-04	3.05e-04	2.66e-04
Pentachlorophenol	2.99e-04	3.28e-04	1.54e-04	4.56e-04	5.19e-04	3.83e-04	1.39e-04	3.36e-04	6.58e-04	3.00e-04	2.61e-04
Pesticides											
4,4-DDE	4.47e-03	4.92e-03	2.30e-03	6.83e-03	7.79e-03	5.74e-03	2.08e-03	5.03e-03	9.85e-03	4.50e-03	3.92e-03
Heptachlor	2.56e-04	2.82e-04	1.32e-04	3.92e-04	4.47e-04	3.29e-04	1.19e-04	2.88e-04	5.64e-04	2.58e-04	2.24e-04
Hexachlorophene	8.59e-02	9.45e-02	4.42e-02	1.31e-01	1.50e-01	1.10e-01	4.00e-02	9.67e-02	1.89e-01	8.65e-02	7.53e-02
Inorganics											
Aluminum	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	NA	NA	NA	1.51e-04	1.72e-04	1.27e-04	NA	NA	NA	9.93e-05	NA
Arsenic	NA	NA	NA	3.02e-04	3.44e-04	2.53e-04	NA	NA	NA	1.99e-04	NA
Barium	NA	NA	NA	2.26e-05	2.58e-05	1.90e-05	NA	NA	NA	1.49e-05	NA
Beryllium	NA	NA	NA	1.51e-04	1.72e-04	1.27e-04	NA	NA	NA	9.93e-05	NA
Cadmium	1.32e-02	1.46e-02	6.82e-03	1.81e-05	2.06e-05	1.52e-05	6.17e-03	1.49e-02	2.92e-02	1.19e-05	1.16e-02
Chromium (hexavalent)	NA	NA	NA	8.30e-04	9.46e-04	6.97e-04	NA	NA	NA	5.46e-04	NA

Table D-2

Bioconcentration Factors for Water to Wildlife Measurement Receptors

(Page 3 of 6)

Compound	Measurement Receptors										
	American Kestrel (BCF_{W-CB})	American Robin (BCF_{W-OB})	Canvas Back (BCF_{W-HB})	Deer Mouse (BCF_{W-HM})	Least Shrew (BCF_{W-OM})	Long-tailed Weasel (BCF_{W-OM})	Mallard Duck (BCF_{W-OB})	Marsh Rice Rat (BCF_{W-OM})	Marsh Wren (BCF_{W-OB})	Mink (BCF_{W-CM})	Mourning Dove (BCF_{W-OM})
Copper	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Cyanide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	NA	NA	NA	4.53e-05	5.16e-05	3.80e-05	NA	NA	NA	2.98e-05	NA
Mercuric Chloride	2.99e-03	3.27e-03	1.54e-03	7.88e-04	8.98e-04	6.63e-04	1.39e-03	2.99e-03	6.57e-03	5.18e-04	2.61e-03
Methylmercury	4.48e-04	4.90e-04	2.30e-04	1.18e-04	1.34e-04	9.91e-05	2.08e-04	5.05e-04	9.85e-04	7.74e-05	3.90e-04
Nickel	NA	NA	NA	9.05e-04	1.03e-03	7.60e-04	NA	NA	NA	5.96e-04	NA
Selenium	1.41e-01	1.55e-01	7.27e-02	3.42e-04	3.90e-04	2.88e-04	6.58e-02	1.59e-01	3.11e-01	2.25e-04	1.24e-01
Silver	NA	NA	NA	4.53e-04	5.16e-04	3.80e-04	NA	NA	NA	2.98e-04	NA
Thallium	NA	NA	NA	6.03e-03	6.88e-03	5.07e-03	NA	NA	NA	3.97e-03	NA
Zinc	1.09e-03	1.20e-03	5.63e-04	1.36e-05	1.55e-05	1.14e-05	5.09e-04	1.23e-03	2.41e-03	8.93e-06	9.57e-04

Notes:

NA - Indicates insufficient data to determine value

HB - Herbivorous bird
HM - Herbivorous mammal
OB - Omnivorous bird
OM - Omnivorous mammal
TP - Terrestrial plant

– Values provided were determined as specified in the text of Appendix D. *BCF* values for omnivores were determined based on an equal diet. *BCF* values for dioxin and furan congeners determined using BEF values specified in Chapter 2.

Table D-2

Bioconcentration Factors for Water to Wildlife Measurement Receptors

(Page 4 of 6)

Compound	Measurement Receptors										
	Muskrat (BCF_{W-OM})	Northern Bobwhite (BCF_{W-OB})	Northern Harrier (BCF_{W-CM})	Red Fox (BCF_{W-CM})	Red-tailed Hawk (BCF_{W-HM})	Salt-marsh Harvest Mouse (BCF_{W-HM})	Short-tailed Shrew (BCF_{W-OM})	Spotted Sandpiper (BCF_{W-CSB})	Swift Fox (BCF_{W-OM})	Western Meadow Lark (BCF_{W-OM})	White-footed Mouse (BCF_{W-OM})
Dioxins and Furans											
2,3,7,8-TCDD	5.33e-03	3.75e+01	2.06e+01	4.69e-03	2.06e+01	8.60e-03	8.18e-03	5.99e+01	5.07e-03	4.51e+01	8.24e-03
1,2,3,7,8-PeCDD	4.90e-03	3.45e+01	1.90e+01	4.31e-03	1.90e+01	7.91e-03	7.53e-03	5.51e+01	4.66e-03	4.15e+01	7.58e-03
1,2,3,4,7,8-HxCDD	1.65e-03	1.16e+01	6.39e+00	1.45e-03	6.39e+00	2.67e-03	2.54e-03	1.86e+01	1.57e-03	1.40e+01	2.55e-03
1,2,3,6,7,8-HxCDD	6.40e-05	4.50e+00	2.47e+00	5.62e-04	2.47e+00	1.03e-03	9.82e-04	7.18e+00	6.08e-04	5.41e+00	9.89e-04
1,2,3,7,8,9-HxCDD	7.46e-04	5.25e+00	2.88e+00	6.56e-04	2.88e+00	1.20e-03	1.15e-03	8.38e+00	7.10e-04	6.31e+00	1.15e-03
1,2,3,4,6,7,8-HpCDD	2.72e-04	1.91e+00	1.05e+00	2.39e-04	1.05e+00	4.39e-04	4.17e-04	3.05e+00	2.59e-04	2.30e+00	4.20e-04
OCDD	6.40e-05	4.50e-01	2.47e-01	5.62e-05	2.47e-01	1.03e-04	9.82e-05	7.18e-01	6.08e-05	5.41e-01	9.89e-05
2,3,7,8-TCDF	4.26e-03	3.00e+01	1.65e+01	3.75e-03	1.65e+01	6.88e-03	6.55e-03	4.79e+01	4.06e-03	3.61e+01	6.59e-03
1,2,3,7,8-PeCDF	1.17e-03	8.25e+00	4.53e+00	1.03e-03	4.53e+00	1.89e-03	1.80e-03	1.32e+01	1.12e-03	9.91e+00	1.81e-03
2,3,4,7,8-PeCDF	8.53e-03	6.00e+01	3.30e+01	7.50e-03	3.30e+01	1.38e-02	1.31e-02	9.58e+01	8.11e-03	7.21e+01	1.32e-02
1,2,3,4,7,8-HxCDF	4.05e-04	2.85e+00	1.57e+00	3.56e-04	1.57e+00	6.54e-04	6.22e-04	4.55e+00	3.85e-04	3.42e+00	6.26e-04
1,2,3,6,7,8-HxCDF	1.01e-03	7.12e+00	3.92e+00	8.91e-04	3.92e+00	1.63e-03	1.55e-03	1.14e+01	9.63e-04	8.56e+00	1.57e-03
2,3,4,6,7,8-HxCDF	3.57e-03	2.51e+01	1.38e+01	3.14e-03	1.38e+01	5.76e-03	5.48e-03	4.01e+01	3.40e-03	3.02e+01	5.52e-03
1,2,3,7,8,9-HxCDF	3.36e-03	2.36e+01	1.30e+01	2.95e-03	1.30e+01	5.42e-03	5.15e-03	3.77e+01	3.19e-03	2.84e+01	5.19e-03
1,2,3,4,6,7,8-HpCDF	5.86e-05	4.12e-01	2.27e-01	5.16e-05	2.27e-01	9.46e-05	9.00e-05	6.58e-01	5.58e-05	4.96e-01	9.06e-05
1,2,3,4,7,8,9-HpCDF	2.08e-03	1.46e+01	8.04e+00	1.83e-03	8.04e+00	0.00e+00	3.19e-03	2.33e+01	1.98e-03	1.76e+01	3.21e-03
OCDF	8.53e-05	6.00e-01	3.30e-01	7.50e-05	3.30e-01	1.38e-04	1.31e-04	9.58e-01	8.11e-05	7.21e-01	1.32e-04
Polynuclear aromatic hydrocarbons (PAHs)											
Benzo(a)pyrene	3.32e-03	2.92e-03	1.60e-03	2.92e-03	1.60e-03	5.35e-03	5.09e-03	4.64e-03	3.16e-03	3.49e-03	5.13e-03
Benzo(a)anthracene	1.18e-03	1.03e-03	5.66e-04	1.04e-03	5.66e-04	1.90e-03	1.81e-03	1.64e-03	1.12e-03	1.24e-03	1.82e-03
Benzo(b)fluoranthene	3.93e-03	3.46e-03	1.89e-03	3.45e-03	1.89e-03	6.34e-03	6.03e-03	5.49e-03	3.73e-03	4.13e-03	6.07e-03
Benzo(k)fluoranthene	3.91e-03	3.43e-03	1.88e-03	3.44e-03	1.88e-03	6.30e-03	6.00e-03	5.46e-03	3.72e-03	4.10e-03	6.04e-03
Chrysene	1.35e-03	1.19e-03	6.53e-04	1.19e-03	6.53e-04	2.19e-03	2.08e-03	1.89e-03	1.29e-03	1.42e-03	2.09e-03
Dibenz(a,h)anthracene	8.70e-03	7.66e-03	4.19e-03	7.65e-03	4.19e-03	1.40e-02	1.33e-02	1.22e-02	8.27e-03	9.14e-03	1.34e-02
Indeno(1,2,3-cd)pyrene	2.03e-02	1.78e-02	9.76e-03	1.79e-02	9.76e-03	3.28e-02	3.12e-02	2.83e-02	1.93e-02	2.13e-02	3.14e-02
Polychlorinated biphenyls (PCBs)											
Aroclor 1016	6.25e-04	5.50e-04	3.01e-04	5.50e-04	3.01e-04	1.01e-03	9.60e-04	8.74e-04	5.95e-04	6.57e-04	9.66e-04
Aroclor 1254	3.98e-03	3.49e-03	1.91e-03	3.50e-03	1.91e-03	6.41e-03	6.10e-03	5.54e-03	3.78e-03	4.16e-03	6.14e-03
Nitroaromatics											
1,3-Dinitrobenzene	7.65e-08	6.73e-08	3.68e-08	6.72e-08	3.68e-08	1.23e-07	1.17e-07	1.07e-07	7.27e-08	8.03e-08	1.18e-07
2,4-Dinitrotoluene	2.44e-07	2.14e-07	1.17e-07	2.15e-07	1.17e-07	3.94e-07	3.75e-07	3.41e-07	2.32e-07	2.56e-07	3.78e-07

Table D-2

Bioconcentration Factors for Water to Wildlife Measurement Receptors

(Page 5 of 6)

	Measurement Receptors										
Compound	**Muskrat (BCF_{W-OM})**	**Northern Bobwhite (BCF_{W-OB})**	**Northern Harrier (BCF_{W-CM})**	**Red Fox (BCF_{W-CM})**	**Red-tailed Hawk (BCF_{W-HM})**	**Salt-marsh Harvest Mouse (BCF_{W-HM})**	**Short-tailed Shrew (BCF_{W-OM})**	**Spotted Sandpiper (BCF_{W-CSB})**	**Swift Fox (BCF_{W-OM})**	**Western Meadow Lark (BCF_{W-OM})**	**White-footed Mouse (BCF_{W-OM})**
2,6-Dinitrotoluene	1.89e-07	1.67e-07	9.16e-08	1.67e-07	9.16e-08	3.06e-07	2.91e-07	2.66e-07	1.80e-07	2.00e-07	2.93e-07
Nitrobenzene	1.68e-07	1.48e-07	8.08e-08	1.48e-07	8.08e-08	2.71e-07	2.58e-07	2.35e-07	1.60e-07	1.76e-07	2.59e-07
Pentachloronitrobenzene	1.08e-04	9.47e-05	5.18e-05	9.49e-05	5.18e-05	1.74e-04	1.66e-04	1.50e-04	1.03e-04	1.13e-04	1.67e-04
Phthalate Esters											
Bis(2-ethylhexyl)phthalate	3.96e-04	3.48e-04	1.90e-04	3.48e-04	1.90e-04	6.38e-04	6.07e-04	5.52e-04	3.76e-04	4.15e-04	6.11e-04
Di(n)octyl phthalate	5.27e+00	4.64e+00	2.54e+00	4.64e+00	2.54e+00	8.51e+00	8.09e+00	7.37e+00	5.01e+00	5.54e+00	8.15e+00
Volatile Organic Compounds											
Acetone	1.48e-09	1.30e-09	7.12e-10	1.30e-09	7.12e-10	2.39e-09	2.28e-09	2.07e-09	1.41e-09	1.55e-09	2.29e-09
Acrylonitrile	4.39e-09	3.85e-09	2.11e-09	3.86e-09	2.11e-09	7.08e-09	6.73e-09	6.14e-09	4.17e-09	4.62e-09	6.78e-09
Chloroform	2.20e-07	1.93e-07	1.05e-07	1.93e-07	1.05e-07	3.55e-07	3.38e-07	3.06e-07	2.09e-07	2.30e-07	3.40e-07
Crotonaldehyde	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dioxane	1.33e-09	1.17e-09	6.41e-10	1.17e-09	6.41e-10	2.15e-09	2.05e-09	1.86e-09	1.27e-09	1.40e-09	2.06e-09
Formaldehyde	5.43e-09	4.77e-09	2.61e-09	4.77e-09	2.61e-09	8.76e-09	8.33e-09	7.58e-09	5.16e-09	5.69e-09	8.39e-09
Vinyl chloride	3.45e-08	3.04e-08	1.66e-08	3.04e-08	1.66e-08	5.58e-08	5.30e-08	4.83e-08	3.29e-08	3.63e-08	5.34e-08
Other Chlorinated Organics											
Hexachlorobenzene	7.84e-04	6.90e-04	3.78e-04	6.90e-04	3.78e-04	1.27e-03	1.20e-03	1.10e-03	7.46e-04	8.24e-04	1.21e-03
Hexachlorobutadiene	1.33e-04	1.17e-04	6.41e-05	1.17e-04	6.41e-05	2.13e-04	2.04e-04	1.86e-04	1.26e-04	1.40e-04	2.05e-04
Hexachlorocyclopentadiene	1.99e-04	1.75e-04	9.58e-05	1.75e-04	9.58e-05	3.22e-04	3.06e-04	2.78e-04	1.90e-04	2.09e-04	3.08e-04
Pentachlorobenzene	3.01e-04	2.66e-04	1.45e-04	2.65e-04	1.45e-04	4.86e-04	4.63e-04	4.22e-04	2.87e-04	3.17e-04	4.66e-04
Pentachlorophenol	2.96e-04	2.61e-04	1.43e-04	2.61e-04	1.43e-04	4.78e-04	4.55e-04	4.15e-04	2.82e-04	3.12e-04	4.58e-04
Pesticides											
4,4-DDE	4.45e-03	3.92e-03	2.14e-03	3.91e-03	2.14e-03	7.18e-03	6.83e-03	6.22e-03	4.23e-03	4.67e-03	6.87e-03
Heptachlor	2.55e-04	2.24e-04	1.23e-04	2.24e-04	1.23e-04	4.12e-04	3.92e-04	3.56e-04	2.43e-04	2.68e-04	3.94e-04
Hexachlorophene	8.55e-02	7.53e-02	4.12e-02	7.52e-02	4.12e-02	1.38e-01	1.31e-01	1.20e-01	8.13e-02	8.98e-02	1.32e-01
Inorganics											
Aluminum	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	9.82e-05	NA	NA	8.63e-05	NA	1.58e-04	1.51e-04	NA	9.33e-05	NA	1.52e-04
Arsenic	1.96e-04	NA	NA	1.73e-04	NA	3.17e-04	3.01e-04	NA	1.87e-04	NA	3.03e-04
Barium	1.47e-05	NA	NA	1.29e-05	NA	2.38e-05	2.26e-05	NA	1.40e-05	NA	2.28e-05
Beryllium	9.82e-05	NA	NA	8.63e-05	NA	1.58e-04	1.51e-04	NA	9.33e-05	NA	1.52e-04
Cadmium	1.18e-05	1.16e-02	6.35e-03	1.04e-05	6.35e-03	1.90e-05	1.81e-05	1.84e-02	1.12e-05	1.38e-02	1.82e-05
Chromium (hexavalent)	5.40e-04	NA	NA	4.75e-04	NA	8.71e-04	8.29e-04	NA	5.13e-04	NA	8.34e-04

Table D-2

Bioconcentration Factors for Water to Wildlife Measurement Receptors

(Page 6 of 6)

Compound	Measurement Receptors										
	Muskrat (BCF_{W-OM})	Northern Bobwhite (BCF_{W-OB})	Northern Harrier (BCF_{W-CM})	Red Fox (BCF_{W-CM})	Red-tailed Hawk (BCF_{W-HM})	Salt-marsh Harvest Mouse (BCF_{W-HM})	Short-tailed Shrew (BCF_{W-OM})	Spotted Sandpiper (BCF_{W-CSB})	Swift Fox (BCF_{W-OM})	Western Meadow Lark (BCF_{W-OM})	White-footed Mouse (BCF_{W-OM})
Copper	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Cyanide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	2.94e-05	NA	NA	2.59e-05	NA	4.75e-05	4.52e-05	NA	2.80e-05	NA	4.55e-05
Mercuric chloride	5.13e-04	2.61e-03	1.43e-03	4.50e-04	1.43e-03	8.25e-04	7.88e-04	4.16e-03	4.88e-04	3.13e-03	2.99e-03
Methylmercury	7.66e-05	3.90e-04	2.14e-04	6.73e-05	2.14e-04	1.24e-04	1.18e-04	6.23e-04	7.28e-05	4.69e-04	1.18e-04
Nickel	5.89e-04	NA	NA	5.18e-04	NA	9.50e-04	9.04e-04	NA	5.60e-04	NA	9.10e-04
Selenium	2.23e-04	1.24e-01	6.76e-02	1.96e-04	6.76e-02	3.60e-04	3.42e-04	1.96e-01	2.12e-04	1.48e-01	3.44e-04
Silver	2.94e-04	NA	NA	2.59e-04	NA	4.75e-04	4.52e-04	NA	2.80e-04	NA	4.55e-04
Thallium	3.93e-03	NA	NA	3.45e-03	NA	6.34e-03	6.03e-03	NA	3.73e-03	NA	6.07e-03
Zinc	8.83e-06	9.57e-04	5.24e-04	7.77e-06	5.24e-04	1.43e-05	1.36e-05	1.52e-03	8.40e-06	1.14e-03	1.37e-05

Notes:

NA - Indicates insufficient data to determine value

HB - Herbivorous bird
HM - Herbivorous mammal
OB - Omnivorous bird
OM - Omnivorous mammal
TP - Terrestrial plant

– Values provided were determined as specified in the text of Appendix D. *BCF* values for omnivores were determined based on an equal diet. *BCF* values for dioxin and furan congeners determined using BEF values specified in Chapter 2.

TABLE D-3

BIOCONCENTRATION FACTORS FOR SOIL/SEDIMENT TO WILDLIFE MEASUREMENT RECEPTORS

Compound	Measurement Receptors										
	American Kestrel (BCF_{S-CB})	American Robin (BCF_{S-OB})	Canvas Back (BCF_{S-HB})	Deer Mouse (BCF_{S-HM})	Least Shrew (BCF_{S-OM})	Long-tailed Weasel (BCF_{S-OM})	Mallard Duck (BCF_{S-OB})	Marsh Rice Rat (BCF_{S-OM})	Marsh Wren (BCF_{S-OB})	Mink (BCF_{S-CM})	Mourning Dove (BCF_{S-OM})
Dioxins and Furans											
2,3,7,8-TCDD	4.78e-01	4.92e+00	6.26e-01	7.81e-05	7.41e-04	1.62e-04	1.09e+00	1.70e-04	6.74e+00	1.05e-04	2.41e+00
1,2,3,7,8-PeCDD	4.40e-01	4.53e+00	5.76e-01	7.19e-05	6.81e-04	1.49e-04	1.01e+00	1.56e-04	6.20e+00	9.66e-05	2.22e+00
1,2,3,4,7,8-HxCDD	1.48e-01	1.53e+00	1.94e-01	2.42e-05	2.30e-04	5.02e-05	3.39e-01	5.26e-05	2.09e+00	3.25e-05	7.48e-01
1,2,3,6,7,8-HxCDD	5.74e-02	5.90e-01	7.51e-02	9.37e-06	8.89e-05	1.94e-05	1.31e-01	2.04e-05	8.09e-01	1.26e-05	2.89e-02
1,2,3,7,8,9-HxCDD	6.69e-02	6.89e-01	8.77e-02	1.09e-05	1.04e-04	2.27e-05	1.53e-01	2.38e-05	9.44e-01	1.47e-05	3.38e-01
1,2,3,4,6,7,8-HpCDD	2.44e-02	2.51e-01	3.19e-02	3.98e-06	3.78e-05	8.26e-06	5.58e-02	8.66e-06	3.44e-01	5.35e-06	1.23e-01
OCDD	5.74e-03	5.90e-02	7.51e-03	9.37e-07	8.89e-06	1.94e-06	1.31e-02	2.04e-06	8.09e-02	1.26e-06	2.89e-02
2,3,7,8-TCDF	3.83e-01	3.94e+00	5.01e-01	6.25e-05	5.93e-04	1.30e-04	8.75e-01	1.36e-04	5.39e+00	8.40e-05	1.93e+00
1,2,3,7,8-PeCDF	1.05e-01	1.08e+00	1.38e-01	1.72e-05	1.63e-04	3.56e-05	2.41e-01	3.74e-05	1.48e+00	2.31e-05	5.31e-01
2,3,4,7,8-PeCDF	7.65e-01	7.87e+00	1.00e+00	1.25e-04	1.19e-03	2.59e-04	1.75e+00	2.72e-04	1.08e+01	1.68e-04	3.86e+00
1,2,3,4,7,8-HxCDF	3.63e-02	3.74e-01	4.76e-02	5.94e-06	5.63e-05	1.23e-05	8.31e-02	1.29e-05	5.12e-01	7.98e-06	1.83e-01
1,2,3,6,7,8-HxCDF	9.09e-02	9.35e-01	1.19e-01	1.48e-05	1.41e-04	3.08e-05	2.08e-01	3.23e-05	1.28e+00	1.99e-05	4.58e-01
2,3,4,6,7,8-HxCDF	3.20e-01	3.30e+00	4.19e-01	5.23e-05	4.96e-04	1.09e-04	7.33e-01	1.14e-04	4.52e+00	7.03e-05	1.62e+00
1,2,3,7,8,9-HxCDF	3.01e-01	3.10e+00	3.94e-01	4.92e-05	4.67e-04	1.02e-04	6.89e-01	1.07e-04	4.25e+00	6.61e-05	1.52e+00
1,2,3,4,6,7,8-HpCDF	5.26e-03	5.41e-02	6.89e-03	8.59e-07	8.15e-06	1.78e-06	1.20e-02	1.87e-06	7.42e-02	1.15e-06	2.65e-02
1,2,3,4,7,8,9-HpCDF	1.86e-01	1.92e+00	2.44e-01	3.05e-05	2.89e-04	6.32e-05	4.27e-01	6.62e-05	2.63e+00	4.09e-05	9.40e-01
OCDF	7.65e-03	7.87e-02	1.00e-02	1.25e-06	1.19e-05	2.59e-06	1.75e-02	2.72e-06	1.08e-01	1.68e-06	3.86e-02
Polynuclear Aromatic Hydrocarbons (PAHs)											
Benzo(a)pyrene	3.71e-05	3.81e-04	4.85e-05	4.86e-05	4.61e-04	1.01e-04	8.50e-05	6.21e-05	5.22e-04	6.53e-05	1.87e-04
Benzo(a)anthracene	1.32e-05	1.35e-04	1.72e-05	1.73e-05	1.64e-04	3.58e-05	3.01e-05	2.20e-05	1.85e-04	2.32e-05	6.63e-05
Benzo(b)fluoranthene	4.39e-05	4.50e-04	5.74e-05	5.75e-05	5.46e-04	1.19e-04	1.01e-04	7.35e-05	6.18e-04	7.73e-05	2.22e-04
Benzo(k)fluoranthene	4.36e-05	4.48e-04	5.71e-05	5.73e-05	5.43e-04	1.19e-04	1.00e-04	7.30e-05	6.14e-04	7.69e-05	2.20e-04
Chrysene	1.52e-05	1.55e-04	1.98e-05	1.99e-05	1.88e-04	4.12e-05	3.47e-05	2.54e-05	2.13e-04	2.67e-05	7.64e-05
Dibenz(a,h)anthracene	9.73e-05	9.98e-04	1.27e-04	1.27e-04	1.21e-03	2.64e-04	2.23e-04	1.63e-04	1.37e-03	1.71e-04	4.91e-04
Indeno(1,2,3-cd)pyrene	2.27e-04	2.32e-03	2.96e-04	2.98e-04	2.82e-03	6.18e-04	5.19e-04	3.79e-04	3.19e-03	4.00e-04	1.14e-03
Polychlorinated Biphenyls (PCBs)											
Aroclor 1016	6.99e-06	7.17e-05	9.14e-06	9.16e-06	8.69e-05	1.90e-05	1.60e-05	1.17e-05	9.83e-05	1.23e-05	3.53e-05
Aroclor 1254	4.43e-05	4.55e-04	5.80e-05	5.83e-05	5.52e-04	1.21e-04	1.02e-04	7.42e-05	6.24e-04	7.83e-05	2.24e-04
Nitroaromatics											
1,3-Dinitrobenzene	8.55e-10	8.77e-09	1.12e-09	1.12e-09	1.06e-08	2.32e-09	1.96e-09	1.43e-09	1.20e-08	1.51e-09	4.31e-09
2,4-Dinitrotoluene	2.72e-09	2.79e-08	3.56e-09	3.58e-09	3.40e-08	7.43e-09	6.24e-09	4.56e-09	3.83e-08	4.81e-09	1.37e-08
2,6-Dinitrotoluene	2.13e-09	2.18e-08	2.78e-09	2.78e-09	2.63e-08	5.76e-09	4.87e-09	3.56e-09	2.99e-08	3.73e-09	1.07e-08

TABLE D-3

BIOCONCENTRATION FACTORS FOR SOIL/SEDIMENT TO WILDLIFE MEASUREMENT RECEPTORS

Compound	Measurement Receptors										
	American Kestrel (BCF_{S-CB})	American Robin (BCF_{S-OB})	Canvas Back (BCF_{S-HB})	Deer Mouse (BCF_{S-HM})	Least Shrew (BCF_{S-OM})	Long-tailed Weasel (BCF_{S-OM})	Mallard Duck (BCF_{S-OB})	Marsh Rice Rat (BCF_{S-OM})	Marsh Wren (BCF_{S-OB})	Mink (BCF_{S-CM})	Mourning Dove (BCF_{S-OM})
Nitrobenzene	1.88e-09	1.92e-08	2.45e-09	2.46e-09	2.33e-08	5.10e-09	4.30e-09	3.14e-09	2.64e-08	3.31e-09	9.47e-09
Pentachloronitrobenzene	1.20e-06	1.23e-05	1.57e-06	1.58e-06	1.50e-05	3.28e-06	2.76e-06	2.01e-06	1.69e-05	2.13e-06	6.07e-06
Phthalate Esters											
Bis(2-ethylhexyl)phthalate	4.42e-06	4.53e-05	5.78e-06	5.80e-06	5.50e-05	1.20e-05	1.01e-05	7.40e-06	6.22e-05	7.79e-06	2.23e-05
Di(n)octyl phthalate	5.89e-02	6.04e-01	7.71e-02	7.72e-02	7.32e-01	1.60e-01	1.35e-01	9.86e-02	8.29e-01	1.04e-01	2.97e-01
Volatile Organic Compounds											
Acetone	1.65e-11	1.70e-10	2.16e-11	2.17e-11	2.06e-10	4.51e-11	3.79e-11	2.77e-11	2.33e-10	2.92e-11	8.34e-11
Acrylonitrile	4.91e-11	5.05e-10	6.42e-11	6.43e-11	6.10e-10	1.33e-10	1.12e-10	2.11e-11	6.92e-10	8.64e-11	2.47e-10
Chloroform	2.45e-09	2.51e-08	3.20e-09	3.22e-09	3.06e-08	6.68e-09	5.60e-09	4.09e-09	3.44e-08	4.33e-09	1.23e-08
Crotonaldehyde	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dioxane	1.49e-11	1.53e-10	1.94e-11	1.96e-11	1.86e-10	4.06e-11	3.41e-11	2.49e-11	2.09e-10	2.63e-11	7.50e-11
Formaldehyde	6.06e-11	6.21e-10	7.92e-11	7.95e-11	7.54e-10	1.65e-10	1.39e-10	1.01e-10	8.52e-10	1.07e-10	3.06e-10
Vinyl chloride	3.86e-10	3.96e-09	5.05e-10	5.06e-10	4.80e-09	1.05e-09	8.85e-10	6.47e-10	5.44e-09	6.80e-10	1.95e-09
Other Chlorinated Organics											
Hexachlorobenzene	8.77e-06	8.99e-05	1.15e-05	1.15e-05	1.09e-04	2.38e-05	2.01e-05	1.47e-05	1.23e-04	1.54e-05	4.42e-05
Hexachlorobutadiene	1.49e-06	1.53e-05	1.95e-06	1.94e-06	1.84e-05	4.02e-06	3.40e-06	2.49e-06	2.10e-05	2.61e-06	7.50e-06
Hexachlorocyclopentadiene	2.22e-06	2.28e-05	2.91e-06	2.92e-06	2.77e-05	6.06e-06	5.09e-06	3.72e-06	3.13e-05	3.92e-06	1.12e-05
Pentachlorobenzene	3.38e-06	3.46e-05	4.42e-06	4.42e-06	4.19e-05	9.16e-06	7.74e-06	5.65e-06	4.75e-05	5.93e-06	1.70e-05
Pentachlorophenol	3.32e-06	3.41e-05	4.34e-06	4.34e-06	4.12e-05	9.01e-06	7.61e-06	5.56e-06	4.67e-05	5.84e-06	1.68e-05
Pesticides											
4,4-DDE	4.98e-05	5.10e-04	6.51e-05	6.52e-05	6.18e-04	1.35e-04	1.14e-04	8.33e-05	7.00e-04	8.76e-05	2.51e-04
Heptachlor	2.85e-06	2.92e-05	3.73e-06	3.74e-06	3.55e-05	7.76e-06	6.53e-06	4.77e-06	4.01e-05	5.03e-06	1.44e-05
Hexachlorophene	9.56e-04	9.81e-03	1.25e-03	1.25e-03	1.19e-02	2.60e-03	2.19e-03	1.60e-03	1.35e-02	1.68e-03	4.82e-03
Inorganics											
Aluminum	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	NA	NA	NA	1.44e-06	1.36e-05	2.98e-06	NA	NA	NA	1.93e-06	NA
Arsenic	NA	NA	NA	2.88e-06	2.73e-05	5.97e-06	NA	NA	NA	3.87e-06	NA
Barium	NA	NA	NA	2.16e-07	2.05e-06	4.48e-07	NA	NA	NA	2.90e-07	NA
Beryllium	NA	NA	NA	1.44e-06	1.36e-05	2.98e-06	NA	NA	NA	1.93e-06	NA
Cadmium	1.47e-04	1.51e-03	1.93e-04	1.73e-07	1.64e-06	3.58e-07	3.37e-04	2.47e-04	2.07e-03	2.32e-07	7.43e-04
Chromium (hexavalent)	NA	NA	NA	7.91e-06	7.50e-05	1.64e-05	NA	NA	NA	1.06e-05	NA
Copper	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Cyanide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE D-3

BIOCONCENTRATION FACTORS FOR SOIL/SEDIMENT TO WILDLIFE MEASUREMENT RECEPTORS

Compound	Measurement Receptors										
	American Kestrel (BCF_{S-CB})	American Robin (BCF_{S-OB})	Canvas Back (BCF_{S-HB})	Deer Mouse (BCF_{S-HM})	Least Shrew (BCF_{S-OM})	Long-tailed Weasel (BCF_{S-OM})	Mallard Duck (BCF_{S-OB})	Marsh Rice Rat (BCF_{S-OM})	Marsh Wren (BCF_{S-OB})	Mink (BCF_{S-CM})	Mourning Dove (BCF_{S-OM})
Lead	NA	NA	NA	4.32e-07	4.09e-06	8.95e-07	NA	NA	NA	5.80e-07	NA
Mercuric chloride	3.32e-05	3.42e-04	4.35e-05	7.52e-06	7.10e-05	1.56e-05	7.60e-05	5.57e-05	4.68e-04	1.01e-05	1.68e-04
Methylmercury	4.98e-06	5.12e-05	6.52e-06	1.12e-06	1.06e-05	2.33e-06	1.14e-05	8.34e-06	7.02e-05	1.51e-06	2.51e-05
Nickel	NA	NA	NA	8.63e-06	8.18e-05	1.79e-05	NA	NA	NA	1.16e-05	NA
Selenium	1.57e-03	1.61e-02	2.05e-03	3.27e-06	3.10e-05	6.77e-06	3.60e-03	2.63e-03	2.21e-02	4.39e-06	7.92e-03
Silver	NA	NA	NA	4.32e-06	4.09e-05	8.95e-06	NA	NA	NA	5.80e-06	NA
Thallium	NA	NA	NA	5.75e-05	5.46e-04	1.19e-04	NA	NA	NA	7.73e-05	NA
Zinc	1.22e-05	1.25e-04	1.59e-05	1.29e-07	1.23e-06	2.69e-07	2.79e-05	2.04e-05	1.71e-04	1.74e-07	6.13e-05

Notes:

NA - Indicates insufficient data to determine value

HB - Herbivorous bird
HM - Herbivorous mammal
OB - Omnivorous bird
OM - Omnivorous mammal
S - Soil/Sediment

– Values provided were determined as specified in the text of Appendix D. *BCF* values for omnivores were determined based on an equal diet. *BCF* values for dioxin and furan congeners determined using BEF values specified in Chapter 2.

TABLE D-3

BIOCONCENTRATION FACTORS FOR SOIL/SEDIMENT TO WILDLIFE MEASUREMENT RECEPTORS

(Page 4 of 6)

	Measurement Receptors										
Compound	**Muskrat (BCF_{S-OM})**	**Northern Bobwhite (BCF_{S-OB})**	**Northern Harrier (BCF_{S-CM})**	**Red Fox (BCF_{S-CM})**	**Red-tailed Hawk (BCF_{S-HM})**	**Salt-marsh Harvest Mouse (BCF_{S-HM})**	**Short-tailed Shrew (BCF_{S-OM})**	**Spotted Sandpiper (BCF_{S-CSB})**	**Swift Fox (BCF_{S-OM})**	**Western Meadow Lark (BCF_{S-OM})**	**White-footed Mouse (BCF_{S-OM})**
Dioxins and Furans											
2,3,7,8-TCDD	3.48e-05	4.13e+00	3.42e+00	8.19e-05	3.42e+00	9.66e-05	7.41e-04	1.43e+01	9.41e-05	4.78e+00	1.47e-04
1,2,3,7,8-PeCDD	3.20e-05	3.80e+00	3.15e+00	7.53e-05	3.15e+00	8.88e-05	6.81e-04	1.31e+01	8.66e-05	4.40e+00	1.35e-04
1,2,3,4,7,8-HxCDD	1.08e-05	1.28e+00	1.06e+00	2.54e-05	1.06e+00	2.99e-05	2.30e-04	4.43e+00	2.92e-05	1.48e+00	4.55e-05
1,2,3,6,7,8-HxCDD	4.18e-07	4.95e-01	4.11e-01	9.82e-06	4.11e-01	1.16e-05	8.89e-05	1.71e+00	1.13e-05	5.74e-01	1.76e-05
1,2,3,7,8,9-HxCDD	4.87e-06	5.78e-01	4.79e-01	1.15e-05	4.79e-01	1.35e-05	1.04e-04	2.00e+00	1.32e-05	6.69e-01	2.05e-05
1,2,3,4,6,7,8-HpCDD	1.78e-06	2.11e-01	1.75e-01	4.17e-06	1.75e-01	4.92e-06	3.78e-05	7.28e-01	4.80e-06	2.44e-01	7.48e-06
OCDD	4.18e-07	4.95e-02	4.11e-02	9.82e-07	4.11e-02	1.16e-06	8.89e-06	1.71e-01	1.13e-06	5.74e-02	1.76e-06
2,3,7,8-TCDF	2.79e-05	3.30e+00	2.74e+00	6.55e-05	2.74e+00	7.72e-05	5.93e-04	1.14e+01	7.53e-05	3.83e+00	1.17e-04
1,2,3,7,8-PeCDF	7.66e-06	9.08e-01	7.53e-01	1.80e-05	7.53e-01	2.12e-05	1.63e-04	3.14e+00	2.07e-05	1.05e+00	3.23e-05
2,3,4,7,8-PeCDF	5.57e-05	6.60e+00	5.48e+00	1.31e-04	5.48e+00	1.55e-04	1.19e-03	2.28e+01	1.51e-04	7.65e+00	2.35e-04
1,2,3,4,7,8-HxCDF	2.65e-06	3.14e-01	2.60e-01	6.22e-06	2.60e-01	7.34e-06	5.63e-05	1.09e+00	7.15e-06	3.63e-01	1.12e-05
1,2,3,6,7,8-HxCDF	6.62e-06	7.84e-01	6.50e-01	1.56e-05	6.50e-01	1.83e-05	1.41e-04	2.71e+00	1.79e-05	9.09e-01	2.79e-05
2,3,4,6,7,8-HxCDF	2.33e-05	2.77e+00	2.29e+00	5.48e-05	2.29e+00	6.47e-05	4.96e-04	9.56e+00	6.30e-05	3.20e+00	9.83e-05
1,2,3,7,8,9-HxCDF	2.19e-05	2.60e+00	2.16e+00	5.16e-05	2.16e+00	6.08e-05	4.67e-04	8.99e+00	5.93e-05	3.01e+00	9.24e-05
1,2,3,4,6,7,8-HpCDF	3.83e-07	4.54e-02	3.77e-02	9.00e-07	3.77e-02	1.06e-06	8.15e-06	1.57e-01	1.04e-06	5.26e-02	1.61e-06
1,2,3,4,7,8,9-HpCDF	1.36e-05	1.61e+00	1.33e+00	3.19e-05	1.33e+00	0.00e+00	2.89e-04	5.57e+00	3.67e-05	1.86e+00	5.72e-05
OCDF	5.57e-07	6.60e-02	5.48e-02	1.31e-06	5.48e-02	1.55e-06	1.19e-05	2.28e-01	1.51e-06	7.65e-02	2.35e-06
Polynuclear aromatic hydrocarbons (PAHs)											
Benzo(a)pyrene	2.17e-05	3.19e-04	2.66e-04	5.10e-05	2.66e-04	6.01e-05	4.61e-04	1.11e-03	5.86e-05	3.72e-04	9.13e-05
Benzo(a)anthracene	7.69e-06	1.13e-04	9.41e-05	1.81e-05	9.41e-05	2.13e-05	1.64e-04	3.93e-04	2.08e-05	1.32e-04	3.24e-05
Benzo(b)fluoranthene	2.57e-05	3.78e-04	3.14e-04	6.03e-05	3.14e-04	7.11e-05	5.46e-04	1.31e-03	6.93e-05	4.40e-04	1.08e-04
Benzo(k)fluoranthene	2.55e-05	3.75e-04	3.12e-04	6.00e-05	3.12e-04	7.08e-05	5.43e-04	1.30e-03	6.90e-05	4.37e-04	1.08e-04
Chrysene	8.85e-06	1.30e-04	1.08e-04	2.08e-05	1.08e-04	2.45e-05	1.88e-04	4.53e-04	2.39e-05	1.52e-04	3.73e-05
Dibenz(a,h)anthracene	5.68e-05	8.37e-04	6.97e-04	1.34e-04	6.97e-04	1.58e-04	1.21e-03	2.91e-03	1.54e-04	9.75e-04	2.39e-04
Indeno(1,2,3-cd)pyrene	1.33e-04	1.95e-03	1.62e-03	3.12e-04	1.62e-03	3.68e-04	2.82e-03	6.77e-03	3.59e-04	2.27e-03	5.59e-04
Polychlorinated biphenyls (PCBs)											
Aroclor 1016	4.08e-06	6.01e-05	5.01e-05	9.60e-06	5.01e-05	1.13e-05	8.69e-05	2.09e-04	1.10e-05	7.01e-05	1.72e-05
Aroclor 1254	2.60e-05	3.81e-04	3.17e-04	6.11e-05	3.17e-04	7.20e-05	5.52e-04	1.32e-03	7.02e-05	4.44e-04	1.09e-04
Nitroaromatics											
1,3-Dinitrobenzene	5.00e-10	7.35e-09	6.12e-09	1.17e-09	6.12e-09	1.39e-09	1.06e-08	2.55e-08	1.35e-09	8.57e-09	2.10e-09
2,4-Dinitrotoluene	1.60e-09	2.34e-08	1.95e-08	3.75e-09	1.95e-08	4.43e-09	3.40e-08	8.14e-08	4.32e-09	2.73e-08	6.73e-09

TABLE D-3

BIOCONCENTRATION FACTORS FOR SOIL/SEDIMENT TO WILDLIFE MEASUREMENT RECEPTORS

(Page 5 of 6)

	Measurement Receptors										
Compound	**Muskrat (BCF_{S-OM})**	**Northern Bobwhite (BCF_{S-OB})**	**Northern Harrier (BCF_{S-CM})**	**Red Fox (BCF_{S-CM})**	**Red-tailed Hawk (BCF_{S-HM})**	**Salt-marsh Harvest Mouse (BCF_{S-HM})**	**Short-tailed Shrew (BCF_{S-OM})**	**Spotted Sandpiper (BCF_{S-CSB})**	**Swift Fox (BCF_{S-OM})**	**Western Meadow Lark (BCF_{S-OM})**	**White-footed Mouse (BCF_{S-OM})**
2,6-Dinitrotoluene	1.24e-09	1.83e-08	1.52e-08	2.91e-09	1.52e-08	3.43e-09	2.63e-08	6.35e-08	3.34e-09	2.13e-08	5.21e-09
Nitrobenzene	1.10e-09	1.61e-08	1.34e-08	2.58e-09	1.34e-08	3.04e-09	2.33e-08	5.61e-08	2.96e-09	1.88e-08	4.62e-09
Pentachloronitrobenzene	7.05e-07	1.04e-05	8.62e-06	1.66e-06	8.62e-06	1.96e-06	1.50e-05	3.60e-05	1.91e-06	1.21e-05	2.97e-06
Phthalate esters											
Bis(2-ethylhexyl)phthalate	2.58e-06	3.80e-05	3.16e-05	6.07e-06	3.16e-05	7.17e-06	5.50e-05	1.32e-04	6.98e-06	4.43e-05	1.09e-05
Di(n)octyl phthalate	3.44e-02	5.07e-01	4.22e-01	8.09e-02	4.22e-01	9.55e-02	7.32e-01	1.76e+00	9.31e-02	5.91e-01	1.45e-01
Volatile organic compounds											
Acetone	9.68e-12	1.42e-10	1.18e-10	2.28e-11	1.18e-10	2.69e-11	2.06e-10	4.94e-10	2.62e-11	1.66e-10	4.08e-11
Acrylonitrile	2.87e-11	4.42e-10	3.51e-11	6.74e-11	3.51e-10	7.95e-11	6.10e-10	1.46e-09	7.75e-11	4.91e-10	1.21e-10
Chloroform	1.44e-09	2.10e-08	1.75e-08	3.38e-09	1.75e-08	3.98e-09	3.06e-08	7.31e-08	3.88e-09	2.45e-08	6.05e-09
Crotonaldehyde	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dioxane	8.72e-12	1.28e-10	1.06e-10	2.05e-11	1.06e-10	2.42e-11	1.86e-10	4.44e-10	2.36e-11	1.49e-10	3.67e-11
Formaldehyde	3.55e-11	5.21e-10	4.34e-10	8.34e-11	4.34e-10	9.83e-11	7.54e-10	1.81e-09	9.58e-11	6.07e-10	1.49e-10
Vinyl chloride	2.26e-10	3.32e-09	2.77e-09	5.31e-10	2.77e-09	6.26e-10	4.80e-09	1.15e-08	6.10e-10	3.87e-09	9.51e-10
Other chlorinated organics											
Hexachlorobenzene	5.12e-06	7.54e-05	6.28e-05	1.20e-05	6.28e-05	1.42e-05	1.09e-04	2.62e-04	1.38e-05	8.79e-05	2.16e-05
Hexachlorobutadiene	8.65e-07	1.28e-05	1.06e-05	2.04e-06	1.06e-05	2.40e-06	1.84e-05	4.44e-05	2.34e-06	1.49e-05	3.65e-06
Hexachlorocyclopentadiene	1.30e-06	1.91e-05	1.59e-05	3.06e-06	1.59e-05	3.61e-06	2.77e-05	6.64e-05	3.52e-06	2.23e-05	5.49e-06
Pentachlorobenzene	1.97e-06	2.90e-05	2.42e-05	4.63e-06	2.42e-05	5.46e-06	4.19e-05	1.01e-04	5.32e-06	3.39e-05	8.30e-06
Pentachlorophenol	1.94e-06	2.86e-05	2.38e-05	4.55e-06	2.38e-05	5.37e-06	4.12e-05	9.93e-05	5.23e-06	3.33e-05	8.16e-06
Pesticides											
4,4-DDE	2.90e-05	4.28e-04	3.56e-04	6.83e-05	3.56e-04	8.06e-05	6.18e-04	1.49e-03	7.85e-05	4.99e-04	1.22e-04
Heptachlor	1.67e-06	2.45e-05	2.04e-05	3.92e-06	2.04e-05	4.62e-06	3.55e-05	8.51e-05	4.51e-06	2.86e-05	7.03e-06
Hexachlorophene	5.59e-04	8.22e-03	6.85e-03	1.31e-03	6.85e-03	1.55e-03	1.19e-02	2.86e-02	1.51e-03	9.58e-03	2.35e-03
Inorganics											
Aluminum	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	6.41e-07	NA	NA	1.51e-06	NA	1.78e-06	1.36e-05	NA	1.73e-06	NA	2.70e-06
Arsenic	1.28e-06	NA	NA	3.01e-06	NA	3.56e-06	2.73e-05	NA	3.47e-06	NA	5.40e-06
Barium	9.62e-08	NA	NA	2.26e-07	NA	2.67e-07	2.05e-06	NA	2.60e-07	NA	4.05e-07
Beryllium	6.41e-07	NA	NA	1.51e-06	NA	1.78e-06	1.36e-05	NA	1.73e-06	NA	2.70e-06
Cadmium	7.69e-08	1.27e-03	1.05e-03	1.81e-07	1.05e-03	2.13e-07	1.64e-06	4.40e-03	2.08e-07	1.48e-03	3.24e-07
Chromium (hexavalent)	3.53e-06	NA	NA	8.29e-06	NA	9.78e-06	7.50e-05	NA	9.53e-06	NA	1.49e-05

TABLE D-3

BIOCONCENTRATION FACTORS FOR SOIL/SEDIMENT TO WILDLIFE MEASUREMENT RECEPTORS

Compound	Measurement Receptors										
	Muskrat (BCF_{S-OM})	Northern Bobwhite (BCF_{S-OB})	Northern Harrier (BCF_{S-CM})	Red Fox (BCF_{S-CM})	Red-tailed Hawk (BCF_{S-HM})	Salt-marsh Harvest Mouse (BCF_{S-HM})	Short-tailed Shrew (BCF_{S-OM})	Spotted Sandpiper (BCF_{S-CSB})	Swift Fox (BCF_{S-OM})	Western Meadow Lark (BCF_{S-OM})	White-footed Mouse (BCF_{S-OM})
Copper	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Cyanide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	1.92e-07	NA	NA	4.52e-07	NA	5.33e-07	4.09e-06	NA	5.20e-07	NA	8.11e-07
Mercuric chloride	3.35e-06	2.87e-04	2.38e-04	7.88e-06	2.38e-04	9.29e-06	7.10e-05	9.92e-04	9.03e-06	3.32e-04	1.41e-05
Methylmercury	5.00e-07	4.30e-05	3.56e-05	1.18e-06	3.56e-05	1.39e-06	1.06e-05	1.49e-04	1.35e-06	4.98e-05	2.11e-06
Nickel	3.85e-06	NA	NA	9.04e-06	NA	1.07e-05	8.18e-05	NA	1.04e-05	NA	1.62e-05
Selenium	1.46e-06	1.35e-02	1.12e-02	3.42e-06	1.12e-02	4.04e-06	3.10e-05	4.69e-02	3.93e-06	1.57e-02	6.13e-06
Silver	1.92e-06	NA	NA	4.52e-06	NA	5.33e-06	4.09e-05	NA	5.20e-06	NA	8.11e-06
Thallium	2.57e-05	NA	NA	6.03e-05	NA	7.11e-05	5.46e-04	NA	6.93e-05	NA	1.08e-04
Zinc	5.77e-08	1.05e-04	8.71e-05	1.36e-07	8.71e-05	1.60e-07	1.23e-06	3.63e-04	1.56e-07	1.22e-04	2.43e-07

Notes:

NA - Indicates insufficient data to determine value

HB - Herbivorous bird
HM - Herbivorous mammal
OB - Omnivorous bird
OM - Omnivorous mammal
S - Soil/Sediment

– Values provided were determined as specified in the text of Appendix D. *BCF* values for omnivores were determined based on an equal diet. *BCF* values for dioxin and furan congeners determined using BEF values specified in Chapter 2.