Table 1 Summary of Selected Inputs to Screening Level Calculations

Parameter	Unit	EPA Default Values			Estabrook School Specific Values				EPA Assumptions	Estabrook School Assumptions
		Pre-school (3 to <6)	Elementary (6 to <12)	Staff (Adult)	Pre-school (3 to <6)	Pre-school with Lextended Day Program (3 to <6)	Elementary (6 to <12)	Staff (Adult)		
C_{air}-outdoor	ng/m^3	0.5			0.6				Harrad et al. (2009) estimated the average total PCBs in outdoor air in Toronto, Canada to be 0.51 ng/m3 (range = 0.1 to 1.4 ng/m3; 95th percentile = 1.2 ng/m3).	Geometric mean total PCB concentration (sum of 65 congeners) in outdoor air samples (n=20) collected from homes in Dartmouth and New Bedford Downtown, MA was 0.6 ng/m^3; range was 0.1 to 8.2 ng/m^3 (Vorhees et al., 1997).
C_{dust}	µg/g	0.22			0.69				Mean total PCB concentration (sum of PCBs containing 3 to 7 chlorines) in dust samples collected from 20 homes in Austin, TX was 0.22 ug/g; range was 0.047 to 0.62 ug/g and 95th percentile value was 0.52 ug/g (Harrad et al., 2009). The profile indicated that PCBs 1254, 1260, and 1242 dominated.	Geometric mean total PCB concentration (sum of 65 congeners) in dust samples (n=15) collected from homes in Dartmouth and New Bedford Downtown, MA was 0.69 ug/g; range was 0.26 to 3.6 ug/g and median value was 0.71 ug/g (Vorhees et al., 1999).
C_{soil}	µg/g	0.05			0.06				Urban background concentration of PCBs in soils (0.05 ug/g) based on samples collected from parks in Helsinki, Finland (concentration in Tampere, Finland parks was 0.025 ug/g)(Priha et al., 2005). Data for U.S. background concentrations are limited.	Geometric mean total PCB concentration (sum of 65 congeners) in yard soil samples (n=16) collected from homes in Dartmouth and New Bedford Downtown, MA was 0.06 ug/g; range was 0.015 to 0.29 ug/g and median value was 0.062 ug/g (Vorhees et al., 1999).
Diet	µg/kg-day	8.0E-03	3.0E-03	2.0E-03	1.9E-03	1.9E-03	1.2E-03	1.7E-03	Based on FDA total diet study for foods collected in 1997 in ATSDR (2000).	Calculated based on FDA total diet study for food collected in 2003.
School Days	days/ yr	180	180	185	182	182	182	184	The assumed exposure duration for children ages 3 to <19 is 180 days/year; 185 days/year is assumed for teachers/staff and daycare children; upper range may be 208 days/years for staff and daycare. Based on NCES (2009) data for 2006, the minimum number of days in school as required by States having such requirements, ranges from 160 to 187 days/year, with 180 days/year being the most common requirement (30 of 44 States). It is reasonable to assume that some schools run summer camp programs and the days spent at school for some children and staff may be as high as 240 days (180 + 60 days of summer camp).	Based on survey conducted at Estabrook School.
School Hours	hr/day	6.5	6.5	8	7	10.1	7	8.5	Mean total time in school (ETst) was assumed to be 6.5 hours/day for school age children and pre-school age (3 to <6 years) and 8 hours/day for adults and daycare toddlers (ages 1 to <3 years). Times spent attending school full-time from U.S. EPA (2008; Table 16-16) are 6.4, 6.1, 6.5, 6.7, and 5.8 hours/day for children ages 2 to <3, 3 to <6, 6 to <11, 11 to <16, and 16 to <21 years, respectively. Upper percentile (95th) values for these age groups of children are 10.5, 9.7, 8.3, 8.1, and 8.7 hours/day, respectively. The assumption of 6.5 hours/day appears to be supported by data provided by NCES (2009) for the minimum required length of hours/year in school by state. Among the states with such requirement, the highest is 1,137 hours/year or 6.3 hours/day, assuming 180 days/year in school (average for all states is a minimum time in school of 5.5 hours/day, assuming 180 days/year).	
Indoor at school	hr/day	6	6	8	6.5	9.4	6.5	8.5	Estimated as the sum of indoor (Etsi) and outdoor time (Etso) at school.	
Special Classroom Hours	hr/day	–	–	–	1.4	5.6	1.4	–		
Outdoor at school	hr/day	0.5	0.5	0	0.5	0.7	0.5	0		

EPA U.S. Environmental Protection Agency
C concentration
ng/m^3 nanograms per cubic meter
µg/g micrograms per gram
µg/kg-day micrograms per kilogram per day
– not yet accessed

Table 2 Comparison of EPA Reference Dose for Aroclor 1254 and Aroclor 1016

Parameter	Aroclor 1254[a]	Aroclor 1016[b]
NOAEL	None	0.007 mg/kg-day
LOAEL	0.005 mg/kg-day	0.028 mg/kg-day
Endpoint	Ocular exudate, inflamed and prominent Meibomian glands, distorted growth of finger and toe nails; IgG and IgM antibodies in response to SRBC were reduced after 23 months of exposure but only the IgM antibodies were clearly decreased after 55 months.	Adult monkeys that ingested 0.007 or 0.028 mg/kg-day doses of Aroclor 1016 for approximately 22 months showed no evidence of overt toxicity. Effects occurring in the offspring of these monkeys consisted of hairline hyper-pigmentation at greater than or equal to 0.007 mg/kg-day, and decreased birth weight and possible neurologic impairment at 0.028 mg/kg-day.[d]
Uncertainty Factors	**300 Total** 10 (Sensitive sub-populations) 3 (Inter-species) 10 (LOAEL instead of NOAEL)	**100 Total** 3 (Sensitive sub-populations) 3 (Inter-species) 3 (Limitations of data) 3 (subchronic to chronic)
RfD (Oral)	0.00002 mg/kg-day (20 ng/kg-day)	0.00007 mg/kg-day (70 ng/kg-day)
Confidence in Oral RfD	Study—medium Database—medium RfD—medium	Study—medium Database—medium RfD—medium

EPA U.S. Environmental Protection Agency
NOAEL no observed adverse effect level
LOAEL lowest observed adverse effect level
mg/kg-day milligrams per kilograms per day
RfD reference dose
ng/kg-day nanograms per kilograms per day

[a] EPA Integrated Risk Information System (IRIS). Aroclor 1254 (CASRN 11097-69-1). Accessed September 16, 2010. http://www.epa.gov/iris/subst/0389.htm

[b] EPA Integrated Risk Information System (IRIS). Aroclor 1016; CASRN 12674-11-2. Accessed September 16, 2010. http://www.epa.gov/iris/subst/0462.htm

[c] Principal and Supporting References for Oral RfD for Aroclor 1254:

Arnold DL, Bryce F, Stapley R, et al. 1993a. Toxicological consequences of Aroclor 1254 ingestion by female Rhesus (Macaca mulatta) monkeys, Part 1A: Prebreeding phase - clinical health findings. Food Chem. Toxicol. 31: 799-810.

Arnold DL, Bryce F, Karpinski K, et al. 1993b. Toxicological consequences of Aroclor 1254 ingestion by female Rhesus (Macaca mulatta) monkeys, Part 1B: Prebreeding phase - clinical and analytical laboratory findings. Food Chem. Toxicol. 31: 811-824.

Tryphonas H, Hayward S, O'Grady L, et al. 1989. Immunotoxicity studies of PCB (Aroclor 1254) in the adult rhesus (Macaca mulatta) monkey - preliminary report. Int. J. Immunopharmacol. 11: 199-206.

Tryphonas H, Luster MI, Schiffman G, et al. 1991a. Effect of chronic exposure of PCB (Aroclor 1254) on specific and nonspecific immune parameters in the rhesus (Macaca mulatta) monkey. Fund. Appl. Toxicol. 16(4): 773-786.

Tryphonas H, Luster MI, White KL, et al. 1991b. Effects of PCB (Aroclor 1254) on non-specific immune parameters in Rhesus (Macaca mulatta) monkeys. Int. J. Immunopharmacol. 13: 639-648.

[d] Principal and Supporting References for Oral RfD for Aroclor 1016:

Barsotti DA and van Miller JP. 1984. Accumulation of a commercial polychlorinated biphenyl mixture (Aroclor 1016) in adult rhesus monkeys and their nursing infants. Toxicology. 30: 31-44.

Levin ED, Schantz SL and Bowman RE. 1988. Delayed spatial alternation deficits resulting from perinatal PCB exposure in monkeys. Arch. Toxicol. 62: 267-273.

Schantz SL, Levin ED, Bowman RE, et al. 1989. Effects of perinatal PCB exposure on discrimination-reversal learning in monkeys. Neurotoxicol. Teratol. 11: 243-250.

Schantz SL, Levin ED and Bowman RE. 1991. Long-term neurobehavioral effects of perinatal polychlorinated biphenyl (PCB) exposure in monkeys. Environ. Toxicol. Chem. 10: 747-756.

Table 3 Inputs for Scenario A of the Site-Specific Risk Assessment, Estabrook Elementary, Lexington, Massachusetts

Number of Calendar School Days, October 17, 2010 – October 16, 2011	Number of Full-Day Equivalent School Days, October 17, 2010 – October 16, 2011[a]	Homeroom Indoor Air PCB Concentration (ng m^{-3})		Special Classroom PCB Concentration (ng m^{-3})	
		Summer	Winter	Summer	Winter
182	161	180	350	117	233

PCB polychlorinated biphenyl
ng/m3 nanograms per cubic meter

[a] accounts for half days every Thursday and selected other days

Table 4 Inputs for Scenario B of the Site-Specific Risk Assessment, Estabrook Elementary, Lexington, Massachusetts

Time Period	Number of School Days	School Activities	Building Remediation Activity	Homeroom PCB Concentration (ng/m^{-3})		Special Classroom PCB Concentration (ng/m^{-3})	
				Summer	Winter	Summer	Winter
8/31/2010 through 9/11/2010	1.5	Half day on 8/31; full day on 9/1; no students inside school building during second week of school	PCB-containing caulk removed from exterior window frames and window glazing encapsulated	459[a]	–	459	–
9/12/2010 through 9/18/2010	4.5	Regular school schedule	Improved ventilation throughout school; supplemental ventilation in Rooms 1 – 4	118[b]	–	194[e]	–
9/19/2010 through 9/25/2010	4.5	Regular school schedule	Further improvements to ventilation; continued supplemental ventilation in Rooms 1 – 4; encapsulation of approximately 75% of interior caulk.	63[c]	–	97[f]	–
9/26/2010 through 10/16/2010	11.5	Regular school schedule. All kindergarten classes in modular rooms (Room7A-C)	Evalution of ceiling tile contributions to indoor air PCBs, Rooms 1 – 6.	5[d]	–	5	–
10/17/2010 through 8/30/2011	136	Regular school schedule.	To be determined	190	380	127[g]	253[g]

PCB polychlorinated biphenyl
ng/m3 nanograms per cubic meter
OA outdoor air

a Median concentration of total PCBs in indoor air measured on July 22, 2010
b Concentration in Room 1 during round 3
c Concentration in Room 1 during round 4
d Concentration in Room 7A during round 3
e Concentration measured in the art room and library during round 3
f One half the concentration measured in the art room and library during round 3
g Two-thirds of the classroom concentration based on measurements from round 3

Table 5 Inputs of Annual Average Concentrations of PCBs in Indoor Air to the Site-specific Risk Assessment as well as Selected Intermediate Outputs for Scenario C, Estabrook Elementary, Lexington, Massachusetts[a]

School	**Estabrook Elementary**						**Middle**			**High**			
Grade	**K**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Inputs to the Site-Specific Risk Assessment													
School indoor concentration (ng/m^{-3})	459[b]	459	459	459	459	[d]	45[c]	45	45	45	45	45	45
Intermediate Outputs of the Site-Specific Risk Assessment													
School-related exposure ($ng\ kg^{-1}\ day^{-1}$)	36	36	36	36	36	[d]	1.6	1.6	1.6	1.6	1.4	1.4	1.4
Background exposure ($ng\ kg^{-1}\ day^{-1}$)	6.7	4.2	4.2	4.2	4.2	4.2	2.9	2.9	2.9	2.9	2.7	2.7	2.7
Total exposure ($ng\ kg^{-1}\ day^{-1}$)	43	28	28	28	28	[d]	4.5	4.5	4.5	4.5	4.1	4.1	4.1

PCBs polychlorinated biphenyls
ng/m^3 nanograms per cubic meter
$ng\ kg^{-1}\ day^{-1}$ nanograms of PCBs per kilogram body weight per day

a Other inputs to Scenario D are listed in Table 1 or available from the EPA Exposure Calculator
b Median concentration of total PCBs in indoor air of the School measured on July 22, 2010
c Median concentration of total PCBs in indoor air of Clarke Middle School on July 21, 2010
d Target concentration of total PCBs in indoor air to be calculated from the site-specific risk assessment

Table 6 Estimated Targets for Concentrations (ng/m^3) of Polychlorinated Biphenyls in Indoor Air of Estabrook Elementary School, Lexington, Massachusetts, for Four Scenarios

Scenario		Target Concentration in Indoor Air	
Identifier	**Description**	**Aroclor 1254 RfD[a]**	**Aroclor 1016 RfD[b]**
A	October 17, 2010 – October 16, 2011	230	990
B	August 31, 2010 – August 30, 2011	230	1010
C	Kindergarten – Twelfth Grade	1,300	14,000
D	Time in School, August 31, 2010 – August 30, 2011	310	1,200

ng/m^3 nanograms per cubic meter
RfD reference dose for chronic exposure developed by U.S. Environmental Protection Agency

[a] RfD of 20 nanograms Aroclor 1254 per kilogram body weight per day.
[b] RfD of 70 nanograms Aroclor 1016 per kilogram body weight per day.

Table 7 Overview of PCB Concentrations in Air and Blood from a Study of PCB-contaminated Schools in Germany[1]

	School 1	School 2	School 3	Control	Estabrook
PCBs in Air (ng/m^3)					
Average (max)	635 (1587)	7,490 (10655)	3,541 (10125)	NA	450 (1800)
PCBs in Serum (μg/L)					
PCB 28	0.045	0.098	0.057	0.035	NA
PCB 138	0.66				NA
PCB 153	0.95				NA
PCB 180	0.7				NA
Total PCBs	"Taken together the present results and observations of authors, it may be concluded that indoor air concentrations with PCB mixtures of low and medium chlorination, that are below 1,000 ng/m^3 have no observable effect to the PCB level of exposed individuals."				NA

PCB polychlorinated biphenyl
ng/m^3 nanograms per cubic meter
NA not available
μg/L micrograms per liter

[1] Gabrio T, et al. 2000. PCB-blood levels in teachers, working in PCB-contaminated schools. *Chemosphere 40*: 1055-1062.