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**Appendix A4**

**Parameterization of Risk  
Assessment Model**

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## PARAMETERIZATION OF RISK ASSESSMENT MODEL

The following bullets detail how each of the variables in the risk assessment model were selected. Values reflect either site specific input from meeting with Laotian team members or Health Canada default values (Health Canada 2004).

- **C<sub>S</sub>** (Soil Concentration used by the accidental soil ingestion, inhalation of contaminated particles and dermal contact with contaminated soil pathways, units = mg/kg dry). The maximum soil concentrations of dioxins/furans + DL-PCB TEQs measured in soil were used for modeling. It was assumed that workers could be exposed to the maximum on-site concentrations, while local residents could only be exposed to the highest off-site soil concentration.
- **C<sub>Food</sub>** (Concentration measured in food, units = mg/kg wet). The maximum tissue concentration of dioxins/furans + DL-PCB TEQs measured was used in the model. Concentrations in a fish collected by a pond immediately off site were used in the model. Fish collected from the Chao Phraya River were not used as it was assumed that these fish could be exposed to many potential sources of contaminants in addition to the MEA site, and therefore would not be representative.
- **P<sub>Air</sub>** (Concentration of particulates suspended in the air, units = µg/m<sup>3</sup>). The Health Canada default value (0.76 µg/m<sup>3</sup>, as per USEPA 1992), was considered too low for Thailand. Instead, a value of 100 µg/m<sup>3</sup> was adopted during meetings with Thai team members.
- **IR<sub>S</sub>** (mass of soil per day accidentally ingested, units = mg/day). The rate value used was taken directly from the Health Canada default table (0.00002 kg/day). The same rate was used for both children and adults. This means that on a per body weight basis, children accidentally consume about double the amount of soil than an adult (children are 32.9 kg, compared to an adult weight of 60 kg; see Bw below).
- **IR<sub>Food</sub>** (mass of contaminated food per day ingested, units = kg/day). The default Canadian values were adopted for the model (0.11 kg/day for adults and 0.09 kg/day for children).
- **IR<sub>A</sub>** (volume of air inhaled each hour, units = m<sup>3</sup>/hr). This variable is used for the inhalation pathway only. The rate value for adults and children were taken directly from the Health Canada default values. Note that Health Canada default values are presented in units of m<sup>3</sup>/day and therefore were divided by 24 hrs/day to get units of m<sup>3</sup>/hr (0.66 m<sup>3</sup>/hr for adults and 0.6 m<sup>3</sup>/hr for children).
- **SA<sub>H</sub>** (surface area of skin exposed to contaminated soils, units = cm<sup>2</sup>). This variable was taken from the Health Canada default values. It was assumed that only the hands of workers and local residents would be exposed to

contaminated soils. The surface areas of hands were 890 cm<sup>2</sup> for adults and 590 cm<sup>2</sup> for children.

- **SL<sub>H</sub>** (Soil loading to exposed skin, indicates the usual surface area coverage per volume of contaminated soil, units = g/cm<sup>2</sup> - event). The Health Canada default value (0.0001 g/cm<sup>2</sup> for hands) was adopted.
- **AF<sub>GIT</sub>** (absorption factor across the gastro intestinal tract, units = unitless). This variable was used both for accidental soil ingestion and food ingestion pathways. There are no readily available AF<sub>GIT</sub> values for total dioxins/furans + DL-PCB TEQs. In these cases, Health Canada guidance recommends adopting a conservative estimate of “1”. This indicates that 100% of chemical is absorbed across the gastrointestinal tract into the body.
- **AF<sub>Inh</sub>** (Absorption Factor for the lungs, units = unitless). There are no readily available AF<sub>GIT</sub> values for total dioxins/furans + DL-PCB TEQs. In these cases, Health Canada guidance recommends adopting a conservative estimate of “1”. This indicates that 100% of chemical is absorbed across the lungs into the body.
- **AF<sub>Skin</sub>** (Absorption Factor for the skin, units = unitless). For dioxins/furans + DL-PCB, an AF<sub>Skin</sub> of 14% was adopted, this is the absorption factor for PCB Aroclor mixtures commonly applied by the USEPA (cited in Mayes et al., 2002).
- **EF** (number of dermal exposures per day, units = events/day). It was assumed that there would only be only one daily exposure to contaminated soils.
- **D<sub>hours</sub>** (number of hours a day that an individual is potentially exposed, units = hrs/day). D<sub>hours</sub> is used by the accidental ingestion and inhalation of contaminated particle pathways, but the value is slightly different for each exposure pathway. For accidental soil ingestion, it is assumed that individuals may only be exposed while they are near contaminated soils and also awake (i.e., 16 hours a day). The model assumed eight of potential exposure for MEA employees, and 16 possible hours of exposure for local residents local residents. For inhalation of contaminated particles it was assumed that individuals may be exposed at any time that they are near contaminated soils, therefore the model assumed eight hours for MEA employees and 24 hours for local residents.
- **D<sub>days</sub>** (number of days per week, or days per year, that an individual is potentially exposed, units = days/week or days/year). D<sub>days</sub> is used by all the exposure pathways, but the value is slightly different for each. For accidental soil ingestion, inhalation of contaminated particles and dermal contact, it was assumed that MEA employees would be potentially exposed five days a week, while local residents would be exposed seven days a week. The numbers were selected during meetings with Thai team members. The food ingestion pathway uses days per year, which indicates the number of days each year that contaminated food items may be ingested (24 days/year). In this risk assessment it was assumed that only fish or other meat sources collected from the site were potentially contaminated.

- **D<sub>weeks</sub>** (number of weeks per year that an individual is potentially exposed, units = weeks/year). **D<sub>weeks</sub>** is used by the accidental soil ingestion, inhalation of contaminated particles and dermal contact pathways. It was assumed that the person (either an employee or local resident) would be potentially exposed most weeks of the year, but would not be at the site during short periods of holiday or vacation. The numbers were based on interviews with employees, and were selected during meetings with Thai team members. For the inhalation of contaminated particulates pathway, **D<sub>weeks</sub>**, should be multiplied by the proportion of weeks per year without rainfall. As it is likely that air-borne particulates will only be available for inhalation when soils are dry. In this risk assessment, application of the proportion of dry weeks was not necessary, as the inhalation pathway was not a significant contributor to total daily dose.
- **D<sub>years</sub>** (number of years that an individual is potentially exposed, units = years). **D<sub>years</sub>** is used by all exposure pathways, only used in the non-threshold model (i.e., the carcinogen model). MEA employees were assumed to be working at the site for approximately 20 years, while local residents were assumed to be living in the community for 20 years. The numbers were based on interviews with employees and local residents, and were selected during meetings with Thai team members.
- **BW** (Body weight, units = kg). Adults were assumed to weight 69.3 kg. The adult BW was developed during discussions with Thai team members. The child body weight was estimated to be 32.9 kg.
- **LE** (Life expectancy, the number of year that the person is likely to live, units = years). LE is only used in the non-threshold model (i.e., the carcinogen model). It was assumed that the average life expectancy was 70 years. The live expectancy value was developed during discussions with Thai team members.

#### References:

Health Canada. 2004. Federal Contaminated Site Risk Assessment in Canada Part I: Guidance on human health Preliminary Quantitative Risk Assessment (PQRA), Cat. H46-2/04-367E, ISBN 0-662-38244-7. Accessed on line at <http://www.hc-sc.gc.ca/ewh-semt/contamsite/risk-risque-eng.php> in July 2008.

Mayes BA, Brown GL, Mondello FJ, Holtzclaw KW, Hamilton SB, Ramsey AA.. 2002. Dermal absorption in rhesus monkeys of polychlorinated biphenyls from soil contaminated with Aroclor 1260. *Regul Toxicol Pharmacol.*, 35:289-95.