





**APPENDIX 6.12-C
Risk Assessment Models**

APPENDIX 6.12-C. RISK ASSESSMENT MODELS
For the Environmental Health Assessment

MODEL DESCRIPTION

Prediction of Estimated Daily Intakes for Humans

Using the COPC concentrations predicted in each relevant environmental medium, equations and assumptions provided by Health Canada (2007a) were used to estimate the daily intake of chemicals due to:

- Ingestion of soil;
- Dermal contact with soil;
- Inhalation of soil dust;
- Ingestion of surface water;
- Ingest of native vegetation (forage and berries);
- Ingestion of fish; and
- Ingestion of wildlife game.

Estimated daily intakes were calculated for each COPC for the baseline scenario. Estimated daily intakes were calculated for toddlers (receptor for non-carcinogenic risks) and adults (receptor for carcinogenic risks), using receptor-specific parameters provided by Health Canada (2007a) as shown in Table C-1.

Table C-1: Receptor Assumptions for Exposure Modeling of Estimated Daily Intakes.

Receptor Characteristics	Units	Value for Toddlers (systemic toxicity)	Value for Adults (cancer)
Age		7 mo - 4 yr	>20yr
Lifespan	yr		80
Body Weight	kg	16.5	70.7
Ingestion Rate			
soil	mg/d	80	20
water	L/d	0.6	1.5
forage	mg/d	500	1500
root vegetables	mg/d	105000	188000
medicinal herbs (First Nations)	mg/d	1000	3000
berries	mg/d	5000	23000
fish (First Nations)	mg/d	95000	220000
wild game	mg/d	85000	270000
Inhalation Rate	m ³ /d	9.3	15.8
Fraction From Site	unitless	1	1
Skin Surface Area	cm ² /d	3010	9110
Adherence Factor	mg/cm ²	0.1	0.1

Receptor Characteristics	Units	Value for Toddlers (systemic toxicity)	Value for Adults (cancer)
Exposure			
time	hr/d	24	24
frequency	d/yr	365	365
duration	yr	4.5	60 (80)
Averaging Time (non-carcinogen)	d	1642.5	21900
Averaging Time (carcinogen)	d		29200

Calculation of COPC intakes due to ingestion of soil

$$EDI = \frac{Conc_{soil} \cdot IngR_{soil} \cdot F \cdot RAF \cdot EF \cdot ED \cdot CF}{AT \cdot BW}$$

Where:

- EDI* = Estimated daily intake (mg/kg/day)
Conc_{soil} = COPC concentration in soil (99.5 mg/kg for nickel; 29 mg/kg for arsenic)
IngR_{soil} = Ingestion rate for soil (20 mg/d for adult receptor; 80 mg/day for toddlers; default recommended by Health Canada (2007a))
F = Fraction of COPC absorbed from site (1; 100% of COPCs assumed to be available from the project site)
RAF = Relative absorption factor for COPC (0.2 for nickel; 0.95 for arsenic)
EF = Exposure frequency (365 d/yr; conservative assumption)
ED = Exposure duration (60 yr; conservative assumption for adult life; 4.5 yr for toddlers)
CF = Conversion factor (1.0 x 10⁻⁶ kg/mg)
AT = Averaging time (29200 days; exposure frequency multiplied by exposure duration, for adult life; 1642.5 days for toddlers recommended by Health Canada (2007a))
BW = Body Weight (70.7 kg for adults; 16.5 kg for toddlers default recommended by Health Canada (2007a))

Therefore:

$$EDI_{cancer} = \frac{29\text{mg/kg} \cdot 20\text{mg/d} \cdot 1 \cdot 0.95 \cdot 365\text{d/yr} \cdot 60\text{yr} \cdot 1.0 \times 10^{-06}\text{kg/mg}}{29200\text{days} \cdot 70.7\text{kg}} = 5.9 \times 10^{-06}\text{mg/kg/d}$$

$$EDI_{noncancer} = \frac{99.5\text{mg/kg} \cdot 80\text{mg/d} \cdot 1 \cdot 0.2 \cdot 365\text{d/yr} \cdot 4.5\text{yr} \cdot 1.0 \times 10^{-06}\text{kg/mg}}{1642.5\text{days} \cdot 16.5\text{kg}} = 9.6 \times 10^{-05}\text{mg/kg/d}$$

Calculation of COPC intakes due to dermal contact with soil

$$EDI = \frac{(Conc_{soil} \cdot SA_{hands} \cdot AF_{hands}) + (Conc_{soil} \cdot SA_{other} \cdot AF_{other}) \cdot F \cdot RAF \cdot EF \cdot ED \cdot CF}{AT \cdot BW}$$

<i>EDI</i>	=	Estimated daily intake (mg/kg/day)
<i>Conc_{soil}</i>	=	COPC concentration in soil (99.5 mg/kg for nickel; 29 mg/kg for arsenic)
<i>SA</i>	=	Exposed skin surface area (430 cm ² (hands), 2580 cm ² (other than hands) 3010 cm ² (total) for toddlers, 890 cm ² (hands), 8220 cm ² (other than hands) 9110 cm ² (total) for adults)
<i>AF</i>	=	adherence factor (0.1 mg/cm ² /event; default value for skin soil loading to hands, 0.01 mg/cm ² /event; default value for skin loading skin surface area other than hands recommended by Health Canada (2007a) – used as a conservative assumption for all skin surfaces)
<i>F</i>	=	Fraction of COPC absorbed from site (1; 100% of COPCs assumed to be available from the project site)
<i>RAF</i>	=	Relative absorption factor for COPC (0.2 for nickel; 0.03 for arsenic)
<i>EF</i>	=	Exposure frequency (365 d/yr; conservative assumption)
<i>ED</i>	=	Exposure Duration (4.5 yr for toddlers, 60 yr for adults; conservative assumption)
<i>CF</i>	=	Conversion Factor (1.0 x 10 ⁻⁶ kg/mg)
<i>AT</i>	=	Averaging time (29200 days; exposure frequency multiplied by exposure duration, for adult life; 1642.5 days for toddlers recommended by Health Canada (2007a))
<i>BW</i>	=	Body Weight (16.5 kg for toddlers, 70.7 kg for adults; default recommended by Health Canada (2007a))

Therefore:

$$EDI_{cancer} = \frac{(29\text{mg/kg}\cdot 890\text{cm}^2\cdot 0.1\text{mg/cm}^2/\text{d}) + (29\text{mg/kg}\cdot 8220\text{cm}^2\cdot 0.01\text{mg/cm}^2/\text{d})\cdot 1\cdot 0.03\cdot 365\text{d/yr}\cdot 60\text{yr}\cdot 1.0\times 10^{-06}\text{kg/mg}}{29200\text{days}\cdot 70.7\text{kg}} = 1.6 \times 10^{-06}\text{mg/kg/d}$$

$$EDI_{noncancer} = \frac{(99.5\text{mg/kg}\cdot 430\text{cm}^2\cdot 0.1\text{mg/cm}^2/\text{d}) + (99.5\text{mg/kg}\cdot 2580\text{cm}^2\cdot 0.01\text{mg/cm}^2/\text{d})\cdot 1\cdot 0.2\cdot 365\text{d/yr}\cdot 4.5\text{yr}\cdot 1.0\times 10^{-06}\text{kg/mg}}{1642.5\text{days}\cdot 16.5\text{kg}} = 8.3 \times 10^{-05}\text{mg/kg/d}$$

Calculation of COPC intakes due to inhalation of soil

$$EDI = \frac{Conc_{soil} \cdot 0.00076 \cdot InhR \cdot F \cdot RAF \cdot EF \cdot ED \cdot CF}{AT \cdot BW}$$

Where:

<i>ED</i>	=	estimated daily intake (mg/kg/day)
<i>Conc_{soil}</i>	=	COPC concentration in soil (99.5 mg/kg for nickel; 29 mg/kg for arsenic)
<i>InhR</i>	=	Inhalation rate (9.3 m ³ /day for toddlers, 15.8 m ³ /day for adult receptor; default recommended by Health Canada (2007a))

<i>F</i>	=	Fraction of COPC absorbed from site (1; 100% of COPCs assumed to be available from the project site)
<i>RAF</i>	=	Relative absorption factor for COPC (1; default recommended by Health Canada (2007a) for all inhalation COPC exposures)
<i>EF</i>	=	Exposure frequency (365 d/yr; conservative assumption)
<i>ED</i>	=	Exposure Duration (4.5 yr for toddlers, 60 yr for adults; conservative assumption)
<i>CF</i>	=	Conversion Factor (1.0×10^{-6} kg/mg)
<i>AT</i>	=	Averaging time (29200 days; exposure frequency multiplied by exposure duration, for adult life; 1642.5 days for toddlers recommended by Health Canada (2007a))
<i>BW</i>	=	Body Weight (16.5 kg for toddlers, 70.7 kg for adults; default recommended by Health Canada (2007a))

$$EDI_{cancer} = \frac{29\text{mg/kg} \cdot 0.00076 \cdot 15.8\text{m}^3 \cdot 1 \cdot 1 \cdot 365\text{d/yr} \cdot 60\text{yr} \cdot 1.0 \times 10^{-06}\text{kg/mg}}{29200\text{days} \cdot 70.7\text{kg}}$$

$$= 3.7 \times 10^{-09}\text{mg/kg/d}$$

$$EDI_{non-cancer} = \frac{99.5\text{mg/kg} \cdot 0.00076 \cdot 9.3\text{m}^3 \cdot 1 \cdot 1 \cdot 365\text{d/yr} \cdot 4.5\text{yr} \cdot 1.0 \times 10^{-06}\text{kg/mg}}{1642.5\text{days} \cdot 16.5\text{kg}}$$

$$= 4.3 \times 10^{-08}\text{mg/kg/d}$$

Calculation of COPC intakes due to ingestion of surface water

$$EDI = \frac{Conc_w \cdot IngR_w \cdot F \cdot RAF \cdot EF \cdot ED \cdot CF}{AT \cdot BW}$$

Where:

<i>EDI</i>	=	estimated daily intake (mg/kg/day)
<i>Conc_w</i>	=	COPC concentration in surface water (7.8×10^{-03} mg/L for nickel; 4.0×10^{-03} mg/L for arsenic)
<i>IngR_w</i>	=	Ingestion rate for water (0.6 L/d for toddlers, 1.5L/d for adults; default recommended by Health Canada (2007a))
<i>F</i>	=	Fraction of COPC absorbed from site (1; 100% of COPCs assumed to be available from the project site)
<i>RAF</i>	=	Relative absorption factor for COPCs (0.2 for nickel; 0.95 for arsenic)
<i>EF</i>	=	Exposure frequency (182.5 d/yr; conservative assumption)
<i>ED</i>	=	Exposure Duration (4.5 yr for toddlers, 60 yr for adults; conservative assumption)
<i>CF</i>	=	Conversion Factor (1.0×10^{-3} kg/mg)
<i>AT</i>	=	Averaging time (10950 days; exposure frequency multiplied by exposure duration, for adult life; 821.25 days for toddlers recommended by Health Canada (2007a))
<i>BW</i>	=	Body Weight (16.5 kg for toddlers, 70.7 kg for adults; default recommended by Health Canada (2007a))

Therefore:

$$EDI_{cancer} = \frac{0.004\text{mg/L} \cdot 1.5\text{L/d} \cdot 1 \cdot 0.95 \cdot 182.5\text{d/yr} \cdot 60\text{yr} \cdot 1.0 \times 10^{-03}\text{kg/mg}}{10950\text{days} \cdot 70.7\text{kg}} = 8.1 \times 10^{-05}\text{mg/kg/d}$$

$$EDI_{noncancer} = \frac{0.0078\text{mg/L} \cdot 0.6\text{L/d} \cdot 1 \cdot 0.2 \cdot 182.5\text{d/yr} \cdot 4.5\text{yr} \cdot 1.0 \times 10^{-03}\text{kg/mg}}{821.25\text{days} \cdot 16.5\text{kg}} = 5.6 \times 10^{-05}\text{mg/kg/d}$$

Calculation of COPC intakes due to ingestion of native vegetation (*Vaccinium spp*)

$$EDI = \frac{Conc_{veg} \cdot IngR_{veg} \cdot F \cdot RAF \cdot EF \cdot ED \cdot CF}{AT \cdot BW}$$

Where:

- EDI* = Estimated daily intake (mg/kg/day)
- Conc_{veg}* = COPC concentration in native vegetation (1.7 mg/kg for nickel; 0.025 for arsenic)
- IngR_{veg}* = Ingestion rate for forage (500 mg/day for toddlers, 1500 mg/day for adults; based on Alberta Health and Wellness Report, March 2007)
- F* = Fraction of COPC absorbed from site (1; 100% of COPCs assumed to be available from the project site)
- RAF* = Relative absorption factor for COPC (0.2 for nickel; 0.95 for arsenic)
- EF* = Exposure frequency (365 d/yr; conservative assumption)
- ED* = Exposure Duration (4.5 yr for toddlers, 60 yr for adults; conservative assumption)
- CF* = Conversion Factor (1.0 x 10⁻⁶ kg/mg)
- % inorganic* = proportion of inorganic arsenic, (0.37 based on Alberta Health and Wellness Report, March 2007)
- AT* = Averaging time (29200 days; exposure frequency multiplied by exposure duration, for adult life; 1642.5 days for toddlers recommended by Health Canada (2007a))
- BW* = Body Weight (16.5 kg for toddlers, 70.7 kg for adults; default recommended by Health Canada (2007a))

Therefore:

$$EDI_{cancer} = \frac{0.025\text{mg/kg} \cdot 1500\text{mg/d} \cdot 1 \cdot 0.95 \cdot 365\text{d/yr} \cdot 60\text{yr} \cdot 1.0 \times 10^{-06}\text{kg/mg} \cdot 0.37}{29200\text{days} \cdot 70.7\text{kg}} = 1.4 \times 10^{-07}\text{mg/kg/d}$$

$$EDI_{noncancer} = \frac{1.7\text{mg/kg} \cdot 500\text{mg/d} \cdot 1 \cdot 0.2 \cdot 365\text{d/yr} \cdot 4.5\text{yr} \cdot 1.0 \times 10^{-06}\text{kg/mg}}{1642.5\text{days} \cdot 16.5\text{kg}} = 1.0 \times 10^{-05}\text{mg/kg/d}$$

Calculation of COPC intakes due to ingestion of native vegetation (*Berries*)

$$EDI = \frac{Conc_{berries} \cdot IngR_{berries} \cdot F \cdot RAF \cdot EF \cdot ED \cdot CF}{AT \cdot BW}$$

Where:

<i>EDI</i>	=	estimated daily intake (mg/kg/day)
<i>Conc_{berries}</i>	=	COPC concentration in native vegetation (1g for nickel, 0.025 for arsenic)
<i>IngR_{berries}</i>	=	Ingestion rate for medicinal plants (5000 g/day for toddlers, 23000 g/day for adults; based on Alberta Health and Wellness Report, March 2007)
<i>F</i>	=	Fraction of COPC absorbed from site (1; 100% of COPCs assumed to be available from the project site)
<i>RAF</i>	=	Relative absorption factor for COPC (0.2 for nickel; 0.95 for arsenic)
<i>EF</i>	=	Exposure frequency (365 d/yr; conservative assumption)
<i>ED</i>	=	Exposure Duration (4.5 yr for toddlers, 60 yr for adults; conservative assumption)
<i>CF</i>	=	Conversion Factor (1.0 x 10 ⁻⁶ kg/mg)
<i>% inorganic</i>	=	proportion of inorganic arsenic, (0.37 based on Alberta Health and Wellness Report, March 2007)
<i>AT</i>	=	Averaging time (29200 days; exposure frequency multiplied by exposure duration, for adult life; 1642.5 days for toddlers recommended by Health Canada (2007a))
<i>BW</i>	=	Body Weight (16.5 kg for toddlers, 70.7 kg for adults; default recommended by Health Canada (2007a))

Therefore:

$$EDI_{cancer} = \frac{0.025\text{mg/kg} \cdot 23000\text{mg/d} \cdot 1 \cdot 0.95 \cdot 365\text{d/yr} \cdot 60\text{yr} \cdot 1.0 \times 10^{-6}\text{kg/mg} \cdot 0.37}{29200\text{days} \cdot 70.7\text{kg}} = 2.1 \times 10^{-6}\text{mg/kg/d}$$

$$EDI_{noncancer} = \frac{1\text{mg/kg} \cdot 5000\text{mg/d} \cdot 1 \cdot 0.2 \cdot 365\text{d/yr} \cdot 4.5\text{yr} \cdot 1.0 \times 10^{-6}\text{kg/mg}}{1642.5\text{days} \cdot 16.5\text{kg}} = 6.1 \times 10^{-5}\text{mg/kg/d}$$

Calculation of COPC intakes due to ingestion of fish

$$EDI = \frac{Conc_{fish} \cdot IngR_{fish} \cdot F \cdot RAF \cdot EF \cdot ED \cdot CF}{AT \cdot BW}$$

Where:

<i>EDI</i>	=	estimated daily intake (mg/kg/day)
<i>Conc_{fish}</i>	=	COPC concentration in fish (0.26 mg/kg for nickel; 0.13 mg/kg for arsenic)
<i>IngR_{fish}</i>	=	Ingestion rate for fish (95000 mg/day for toddlers, 220000 mg/day for adults; based on study by Wein et al. (1991) for native population)
<i>F</i>	=	Fraction of COPC absorbed from site (1; 100% of COPCs assumed to be available from the project site)
<i>RAF</i>	=	Relative absorption factor for COPC, (0.2 for nickel; 0.95 for arsenic)
<i>EF</i>	=	Exposure frequency (365 days/yr; conservative assumption)
<i>ED</i>	=	Exposure Duration (4.5 yr for toddlers, 60 yr for adults; conservative assumption)
<i>CF</i>	=	Conversion Factor (1.0 x 10 ⁻⁶ kg/mg)
<i>% inorganic</i>	=	proportion of inorganic arsenic, (0.37 based on Alberta Health and Wellness Report, March 2007)

- AT* = Averaging Time (1642.5 days for toddlers, 29200 for adults; exposure frequency multiplied by exposure duration)
- BW* = Body Weight (16.5 kg for toddlers, 70.7 kg for adults; default recommended by Health Canada (2007a))

Therefore:

$$EDI_{cancer} = \frac{0.065\text{mg/kg} \cdot 220000\text{mg/d} \cdot 1 \cdot 0.95 \cdot 365\text{d/yr} \cdot 60\text{yr} \cdot 1.0 \times 10^{-06}\text{kg/mg} \cdot 0.37}{29200\text{days} \cdot 70.7\text{kg}} = 1.0 \times 10^{-04}\text{mg/kg/d}$$

$$EDI_{noncancer} = \frac{0.26\text{mg/kg} \cdot 95000\text{mg/d} \cdot 1 \cdot 0.2 \cdot 365\text{d/yr} \cdot 4.5\text{yr} \cdot 1.0 \times 10^{-06}\text{kg/mg}}{1642.5\text{days} \cdot 16.5\text{kg}} = 3.0 \times 10^{-04}\text{mg/kg/d}$$

Calculation of COPC intakes due to ingestion of wildlife game

$$EDI = \frac{Conc_{game} \cdot IngR_{game} \cdot F \cdot RAF \cdot EF \cdot ED \cdot CF}{AT \cdot BW}$$

Where:

- EDI* = estimated daily intake (mg/kg/day)
- Conc_{game}* = COPC concentration in wildlife game (6.8x10⁻³ mg/kg for nickel; 5.8x10⁻⁴ mg/kg for arsenic)
- IngR_{game}* = Ingestion rate for wildlife game (85000 mg/day for toddlers, 270000 mg/day for adults; default recommended by Health Canada (2007a))
- F* = Fraction of COPC absorbed from site (1; 100% of COPCs assumed to be available from the project site)
- RAF* = Relative absorption factor for COPC (365 days/yr; conservative assumption)
- EF* = Exposure frequency (365 days/yr; conservative assumption)
- ED* = Exposure Duration (4.5 yr for toddlers, 60 yr for adults; conservative assumption)
- CF* = Conversion Factor (1.0 x 10⁻³ kg/g)
- % inorganic* = proportion of inorganic arsenic, (0.37 based on Alberta Health and Wellness Report, March 2007)
- AT* = Averaging Time (1642.5 days for toddlers, 29200 for adults; exposure frequency multiplied by exposure duration)
- BW* = Body Weight (16.5 kg for toddlers, 70.7 kg for adults; default recommended by Health Canada (2007a))

Therefore:

$$EDI_{cancer} = \frac{5.8 \times 10^{-04}\text{mg/kg} \cdot 270000\text{mg/d} \cdot 1 \cdot 0.95 \cdot 365\text{d/yr} \cdot 60\text{yr} \cdot 1.0 \times 10^{-06}\text{kg/mg} \cdot 0.37}{29200\text{days} \cdot 70.7\text{kg}} = 5.8 \times 10^{-07}\text{mg/kg/d}$$

$$EDI_{noncancer} = \frac{6.8 \times 10^{-03}\text{mg/kg} \cdot 85000\text{mg/d} \cdot 1 \cdot 0.2 \cdot 365\text{d/yr} \cdot 4.5\text{yr} \cdot 1.0 \times 10^{-06}\text{kg/mg}}{1642.5\text{days} \cdot 16.5\text{kg}} = 7.0 \times 10^{-06}\text{mg/kg/d}$$

Estimates of Health Risks

After daily intakes for non-carcinogenic and carcinogenic COPCs were estimated (Table C-2 and Table C-3) for each relevant exposure pathway, non-cancer and cancer risks were evaluated using equations and assumptions provided by Health Canada (2007a).

Non-carcinogenic risks were evaluated by the calculation of a Hazard Quotient (HQ) using the estimated daily intakes that were determined for toddlers, along with toxicological reference values for each COPC. Carcinogenic risks were assessed by the Incremental Lifetime Cancer Risks (ILCR) based on the estimated daily intakes that were determined for adults, along with unit risk factors for each COPC.

Hazard Quotients and Incremental Lifetime Cancer Risks were calculated for baseline scenarios.

Systemic toxicants and calculation of the hazard quotient (HQ)

$$\text{Hazard Quotient} = \frac{\text{Estimated Daily Intake}}{\text{Toxicological Reference Value}}$$

Therefore, the calculation for nickel HQ for toddlers from soil ingestion is:

$$\text{Hazard Quotient} = \frac{9.6 \times 10^{-05}}{2.0 \times 10^{-02}} = 4.8 \times 10^{-03}$$

Carcinogens and calculation of the incremental lifetime cancer risk (ILCR)

$$\text{Incremental Lifetime Cancer Risk} = \text{Estimated Daily Intake} \times \text{Unit Risk}$$

Therefore, the calculation of arsenic ILCR for adult from soil ingestion is:

$$\text{Incremental Lifetime Cancer Risk} = 5.9 \times 10^{-06} \cdot 1.8 (\text{mg/kg/day})^{-01} = 1.0 \times 10^{-05}$$

Table C-2: Non-Carcinogenic Estimated Daily Intake for Chemicals of Potential Concern Associated with Kitsault Mine Project

Metal COPC	Estimated Daily Intake (mg/kg/d)							
	Soil			Water	Plant Tissue	Blueberry	Wildgame	Fish
	<i>Ingestion</i>	<i>Dermal</i>	<i>Inhalation</i>	<i>Ingestion</i>	<i>Ingestion</i>	<i>Ingestion</i>	<i>Ingestion</i>	<i>Ingestion</i>
<i>Arsenic</i>	1.3×10^{-4}	3.6×10^{-6}	1.2×10^{-8}	1.4×10^{-4}	2.7×10^{-7}	2.7×10^{-6}	1.0×10^{-6}	2.5×10^{-4}
<i>Chromium</i>	6.1×10^{-6}	4.0×10^{-5}	4.2×10^{-8}	1.2×10^{-7}	2.0×10^{-7}	2.0×10^{-6}	3.8×10^{-7}	2.5×10^{-5}
<i>Molybdenum</i>	4.6×10^{-4}	4.0×10^{-6}	4.1×10^{-8}	1.2×10^2	3.4×10^{-5}	3.4×10^{-4}	6.0×10^{-6}	1.2×10^{-4}
<i>Nickel</i>	9.6×10^{-5}	8.3×10^{-5}	4.3×10^{-8}	1.5×10^{-5}	6.1×10^{-6}	6.1×10^{-5}	7.0×10^{-6}	2.4×10^{-4}
<i>Selenium</i>	6.8×10^{-6}	5.9×10^{-8}	6.0×10^{-10}	1.1×10^{-5}	1.5×10^{-5}	1.5×10^{-4}	1.1×10^{-6}	5.0×10^{-3}

Table C-3: Carcinogenic Estimated Daily Intake for COPCs Associated with Kitsault Mine Project

Metal COPC	Estimated Daily Intake (mg/kg/d)							
	Soil			Water	Plant Tissue	Blueberry	Wildgame	Fish
	<i>Ingestion</i>	<i>Dermal</i>	<i>Inhalation</i>	<i>Ingestion</i>	<i>Ingestion</i>	<i>Ingestion</i>	<i>Ingestion</i>	<i>Ingestion</i>
<i>Arsenic</i>	5.9×10^{-6}	1.6×10^{-6}	3.7×10^{-9}	8.1×10^{-5}	1.4×10^{-7}	2.1×10^{-6}	5.8×10^{-7}	1.0×10^{-4}

REFERENCE

Health Canada. 2007a. Federal Contaminated Site Risk Assessment in Canada. Part I: Guidance for Preliminary Quantitative Risk Assessment.

Alberta Health and Wellness, 2007. Assessment of the Potential Lifetime Cancer Risks Associated with Exposure to Inorganic Arsenic among Indigenous People living in the Wood Buffalo Region of Alberta. March 2007. Public Health Surveillance and Environmental Health.