

## EVALUATION OF RISK BASED CONCENTRATIONS FOR CHRONIC EXPOSURE TO ARSENIC

LJB Inc.  
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LJB Inc. evaluated the arsenic risk based concentrations (RBC) using the standard exposure dose formula and exposure assumptions of the Agency for Toxic Substances and Disease Registry (ATSDR), a federal public health agency of the U.S. Department of Health and Human Services, as described below. Pica exposure was not evaluated. For the chronic arsenic RBC, US EPA assumed that a child who repeatedly visits a park ingests 200 milligrams (mg) or 0.0002 kilograms (kg) of contaminated soil per day for 48 days a year for 10 years (~22 hours/week). The average weight for this child was assumed to be 20 kg. A relative bioavailability of 50% was used. Allowing an exposure dose equal to EPA's chronic reference dose of 0.0003 mg/kg/day, the RBC is calculated for 189 ppm (the highest value identified at the soccer field).

For ATSDR's evaluation an exposure dose for each age of child from 1 to 15 years old was calculated. These exposure doses were then compared to ATSDR's minimal risk level (MRL) for chronic exposure to arsenic of 0.0003 mg/kg/day. Assumptions regarding exposure frequency and relative bioavailability were obtained from the EPA Exposure Factors Handbook. The exposure dose formula is:

$$ed = c * ir * ef * af / bw$$

where:

- ed* = exposure dose;
- c* = concentration in media of interest;
- ir* = ingestion rate;
- ef* = exposure factor;
- af* = absorption factor; and
- bw* = body weight.

Values used to calculate the exposure dose are as follow:

<i>c</i> =	set at the chronic RBC of 189 ppm arsenic.
<i>ir</i> =	0.0002 kg/day for children under 5; 0.0001 kg/day for children 5 years and older.
<i>ef</i> =	0.132; equal to (48/365), fraction of days per year exposure occurs.
<i>af</i> =	0.5, equal to 50% relative bioavailability.
<i>bw</i> =	average body weight for 1-, 3-, 5-, 7-, 11-, and 15-year old children, equal to 11, 15, 20, 25, 40, and 65 kg, respectively

The site specific exposure dose per age group is as follow:

	1 yr old	3 yr old	5 yr old	7 yr old	11 yr old	15 yr old
<i>Exposure dose = (mg/kg/day)</i>	<b>0.000227</b>	<b>0.000166</b>	<b>6.24E-05</b>	<b>4.99E-05</b>	<b>3.12E-05</b>	<b>1.92E-05</b>

All of the calculated values are less than the ATSDR's minimal risk levels for chronic exposure to arsenic of 0.0003 mg/kg/day.

Based on the defined US EPA parameters the maximum concentration expectable per age group and the ratio relative to the site-specific concentration of 189 ppm is as follow:s

	1 yr old	3 yr old	5 yr old	7 yr old	11 yr old	15 yr old
<i>Max c (ppm) =</i>	<b>250.0</b>	<b>340.9</b>	<b>909.1</b>	<b>1,136.4</b>	<b>1818.2</b>	<b>2954.5</b>
<i>Site ed/max c (%)</i>	<b>0.76</b>	<b>0.55</b>	<b>0.21</b>	<b>0.17</b>	<b>0.10</b>	<b>0.06</b>