



## ***TECHNICAL BULLETIN FOR CONTAMINATED SITES***

Effective date: September 24, 2018

### **Regional Background Concentrations for Select Inorganic Substances in Groundwater**

#### **Purpose**

This document establishes regional background concentration estimates for arsenic, lithium, selenium, vanadium and uranium in groundwater in British Columbia.

#### **Regulatory Authority**

Groundwater that contains a substance at concentrations above the applicable numerical water standard at a site but below the local background concentration for that substance, as determined under this technical bulletin or Protocol 9 – Determining Background Groundwater Quality (Protocol 9), would not be considered contaminated under Section 11 (3) of the Contaminated Sites Regulation (CSR). Similarly, groundwater that has been remediated for a substance to concentrations above the applicable numerical water standard for the site but below the local background concentration for that substance as determined under this technical bulletin or Protocol 9 would be considered satisfactorily remediated under Section 17 (2) (b) of the CSR.

#### **General**

This technical bulletin was developed by undertaking a data collection and analysis program which included the following components:

1. Researching representative groundwater data sources and compiling a database of relevant groundwater information and inorganic substance concentrations;
2. Developing a monitoring well selection criteria to filter out data with potential bias from anthropogenic sources;
3. Evaluating the geology and stratigraphy in selected regions of British Columbia to establish representative conditions;
4. Conducting a statistical analysis of the collected data to determine the 95<sup>th</sup> percentile concentration of selected inorganic substances in each of the selected regions;
5. Defining appropriate boundaries for each region based on representative geological conditions;
6. Establishing regional background groundwater concentration estimates based on the 95<sup>th</sup> percentile substance concentrations.

Regional background groundwater concentration estimates have been established for the following regions:

1. Lower Mainland Region: divided into two sub-regions based on surficial geology;

2. Southern Vancouver Island: encompassing the area between Victoria and Nanaimo
3. Thompson-Okanagan Region: encompassing the area between Kamloops and Kelowna

Regional background concentration estimates for arsenic, lithium, selenium, uranium and vanadium in groundwater are presented in Table 1.

**Table 1. Background concentration estimates of inorganic substances in the Lower Mainland, Thompson-Okanagan and South Vancouver Island Regions**

Regions and Sub-Regions		Lower Mainland Region				Thompson-Okanagan Region		South Vancouver Island Region	
		Lower Mainland - Subregion 1		Lower Mainland - Subregion 2					
Substance	Sch 3.2 DW	Background concentration	n	Background concentration	n	Background concentration	n	Background concentration	n
Arsenic	10	<b>37</b>	45	<b>13</b>	32	<b>13</b>	20	9	29
Lithium	8	<b>28</b>	18	<b>19</b>	18	<b>96</b>	15	<b>33</b>	20
Selenium	10	4	40	6	31	<b>107</b>	22	6	27
Uranium	20	11	44	19	31	<b>84</b>	18	12*	28
Vanadium	20	19	25	<b>26</b>	23	<b>30</b>	14	5*	22

Notes: Concentrations are reported in ug/L  
 Concentrations are reported as the 95th percentile  
 \* 95th percentile calculated according to a normal distribution where a lognormal distribution cannot be applied  
 n Number of background sites used  
**Bold italics** Concentrations greater than the CSR Sch. 3.2 Drinking Water Standard

Regional background groundwater concentration estimates for substances listed in Table 1 may be considered equivalent to local background concentrations of substances in groundwater for the purposes of sections 11 (3), 17 (2) (b) and 45 (3) (b) of the Regulation.

### Qualifying for Regional Background Groundwater Concentrations

To qualify for the use of regional background groundwater concentrations in this technical bulletin the following conditions must be satisfied:

1. The site must fall within the geographic boundaries of one of the regions identified in Table 1 and shown on the regional maps presented at the following hyperlinks:
  - [Lower Mainland Subregion 1](#)
  - [Lower Mainland Subregion 2](#)
  - [Thompson-Okanagan Region \(Kamloops\)](#)
  - [Thomspon-Okanagan Region \(Kelowna\)](#)
  - [South Vancouver Island Region](#)
2. The regional background concentration estimates must be applied to groundwater obtained from a non-consolidated overburden aquifer, not a bedrock aquifer.
3. The regional background concentration estimates must be applied to groundwater, not surface water.

## Procedures and Reporting of Regional Background Groundwater Concentrations

The use of regional background concentration estimates in groundwater as described in this technical bulletin does not require a Director's decision. Rather, investigation reports prepared in support of applications to the ministry must clearly indicate the approach and the background concentrations in groundwater that were applied.

Substances investigated or remediated to regional background concentrations must be listed in Schedule C of the instrument and the following clause must be included in the cover letter:

Please be aware that regional background concentrations in groundwater were used in the <investigation><remediation> of the site. This instrument does not certify that site groundwater is suitable for unrestricted water uses. Should the groundwater be used for drinking water purposes, treatment may be required prior to consumption.

### Closure

1. For substances or geographic locations not included in this technical bulletin, local background concentrations of substances in groundwater can be established using procedures outlined in Protocol 9 "Determining Groundwater Background Quality".
2. The interim provincial concentration estimate for cobalt remains in effect until regional background concentration estimates are established. The cs-elink establishing the provincial estimate is provided below:

#### Cobalt Interim Background Groundwater Estimate

The ministry is hereby extending the cobalt interim background groundwater concentration estimate of 20 µg/L. The value of 20 µg/L was originally established on October 4, 2002. This measure is in response to a change in the drinking water standard for cobalt, approved under the Stage 11 amendment to the Contaminated Sites Regulation. The interim background groundwater concentration estimate for cobalt is expected to remain in effect while the ministry concludes the development of background groundwater estimates for selected metals on a region by region basis for the Province. If this work is successful, regional Background Groundwater Estimates will subsequently be incorporated into a revised Protocol 9 "Determining Groundwater Background Quality".

Responsible persons may use the interim background groundwater concentration estimate for cobalt of 20 µg/L when assessing the presence of contamination at sites in the Province. Applications for a Director's decision under Protocol 9 are not required for use of this background estimate. Rather, a statement in the site investigation report that cobalt concentrations in groundwater do not exceed the referenced cobalt interim background groundwater concentration estimate will suffice for satisfying CSR 11 (3) that the site is not a contaminated site for cobalt in groundwater.

**Associated Contaminated Site Documents:**

[Protocol 9, "Determining Background Groundwater Quality"](#)

**Definitions:** Terms used in this guidance are defined in the ministry's [Procedure 8, "Definitions and Acronyms for Contaminated Sites."](#) Readers are advised to review definitions for the following terms before using this document:

- background concentration
- contamination
- detailed site investigation
- legal instrument
- numerical water standards
- preliminary site investigation
- remediation

*For more information, contact the Environmental Emergencies and Land Remediation Branch at [site@gov.bc.ca](mailto:site@gov.bc.ca).*