

## Soil Sampling Guide for Local Background Reference Sites

This document provides a consistent soil sampling approach for use in the assessment of substance concentrations in the soil of background reference sites. Alternative sampling approaches may also be used.

### Definitions

Terms used in this guidance are defined in the ministry's [Procedure 8, "Definitions and Acronyms for Contaminated Sites."](#)

### Regulatory considerations

Procedures and requirements for establishing background concentrations of substances in soil under the Contaminated Sites Regulation are set out in [Protocol 4, "Establishing Background Concentrations in Soil."](#)

### Suggested soil sampling approach

#### Selection of a reference site

Local background reference sites must be identified, selected, and documented in accordance with the requirements of Protocol 4.

#### Materials classification

In addition to the local background reference site selection requirements of Protocol 4, the following procedures are recommended:

- Check available soil, terrain, or surficial geology maps to determine the type of surficial material at the background reference site.
- Wherever possible, locate the local background reference site such that it has the same surficial material as the site of interest for which the background soil concentration is to be established.
- If information on soils and terrain are not available for the site, have a terrain survey for the site conducted.
- Document the classification of reference site materials for inclusion as a component of Protocol 4 data submission requirements.

### Soil sampling locations

Wherever possible, the local background reference site should be approximately 1 ha in size. At any reference site, a minimum of four randomly selected soil sampling locations should be identified as follows (see Figure 1):

1. Locate the approximate centre of the site.
2. Divide the site through the centre point into two halves. This is the division line.
3. Draw a line perpendicular to the division line through the centre to

further divide the site into four quadrants. This is the perpendicular line.

4. Randomly select one soil sampling location for each of the four recommended 50 x 50 m quadrants. For example, using a 1-40 random number table, randomly select two numbers: the first is the number of metres perpendicular to the division line; and the second is the number of metres the sampling site is located to the right or left of the perpendicular, depending on the quadrant you are working in.

### Soil sampling

Once the sampling locations have been selected, a minimum of three soil samples should be collected at each soil sampling point:

- a surface sample, obtained from 0 m to 0.1 m from the surface of the site;
- a shallow sub-surface sample obtained from 0.5 m to 0.6 m from the surface of the site; and
- a deep sub-surface sample obtained from 0.9 m to 1.0 m from the surface of the site.

Under this approach, a minimum of 12 discrete soil samples would be collected from the reference site.

In collecting soil samples, the following should be consulted:

- [Technical Guidance 1: "Site Characterization and Confirmation Testing"](#);
- [Technical Guidance 5: "Sampling and Determining Soil pH at Soil Relocation Receiving Sites"](#); and
- any other appropriate general soil sampling procedures described in the

["British Columbia Field Sampling Manual"](#).

### Chemical analyses

Soil samples should be chemically analyzed for all potential contaminants of concern relevant to the site of interest. Samples should be analyzed only by laboratories registered under the [Environmental Data Quality Assurance Regulation](#) or accredited by the [Canadian Association for Laboratory Accreditation](#), or by laboratories holding equivalent qualifications.

Chemical analyses must be performed in accordance with the methods acceptable to the Director and the results documented in accordance with [Protocol 4](#).

### Statistical data evaluation (identification of anomalous results)

As an aid to evaluating the background chemical analytical data obtained, the following equations<sup>1</sup> are recommended for use in identifying anomalous results:

$$\text{Upper cut-off value} = \text{Upper Quartile value (75}^{\text{th}} \text{ percentile)} + 1.5 (\text{interquartile range})$$

$$\text{Lower cut-off value} = \text{Lower Quartile value (25}^{\text{th}} \text{ percentile)} - 1.5 (\text{interquartile range})$$

Results that do not fall between the upper and lower cut-off values can be considered anomalous. Soil sampling points giving rise to anomalous data should be re-sampled and re-analyzed.

[Technical Guidance 12, "Statistics for Contaminated Sites"](#), which deals with

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<sup>1</sup> Hoaglin, D.C., F. Mosteller and J.W. Tukey. (1983). *Understanding Robust and Exploratory Data Analysis*. Wiley: New York.

statistical outliers, may also be a useful reference.

### **Data submission**

All information relevant to the reference site and data collected in the reference site soil sampling program form a component of the “Establishing Site Specific Background Concentration in Soil” report required for a Director’s decision under Option 2 of [Protocol 4](#). This includes but is not necessarily limited to:

- the selection of a reference site,
- the location of soil sampling points,
- sampling logs and other documentation of soil sampling procedures followed,
- the soil sample chemical analytical results, and
- the statistical data evaluation performed

*For more information, please direct inquiries to [site@gov.bc.ca](mailto:site@gov.bc.ca).*

### *Revision History*

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	June 2005		
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**Figure 1. Identification of reference site soil sampling points.**

