

Statistical Criteria for Characterizing a Volume of Contaminated Material

This document is one of several from the ministry on characterizing sites that may be contaminated.

Single population of samples

Material such as soil, fill, sludge, or water can become contaminated by similar processes and events. Analytical data derived from samples of these materials may therefore represent a single population. A statistical evaluation of the data may be done, and the specific volume of material that the data represent may be characterized and classified.

BC soil quality classes

Using the standards in the Contaminated Sites Regulation under the *Environmental Management Act*, the quality of materials such as fill and soil may be placed into eight different classes:

- hazardous waste (HW)
- waste (>IL<HW)
- industrial quality (<IL)
- commercial quality (<CL)
- residential quality (<RL)
- urban park quality (<PL)
- agricultural quality (<AL)
- wildlands quality (<WL)

A material is placed in one of these classes by being compared with numerical standards in the Regulation. For any substance and land use, a single standard is chosen that can be used to define if material is contaminated, or if site remediation requirements are satisfied.

Classifying a specific volume of material

The following conditions must be met before the ministry considers that a material belongs in a specific class:

- the data is demonstrably representative of one population; and, for that data set,
- the upper 90th percentile of the sample concentrations is less than the criterion concentration;
- the upper 95% confidence limit of the average concentration of the samples is less than the criterion concentration; and
- no sample within the data set has a concentration exceeding two times the criterion concentration.

Determining if a volume of material represents a single population

The most important – and the most difficult – of the above conditions to satisfy is ensuring that the data represents one population. The following must be carefully considered:

- any similar characteristics about a material;
- any site areas with similar land uses; and
- any potential for different substance concentration populations within a material.

Dealing with background concentrations and skewed distributions

Statistical analysis of data from a site may reveal a lognormal distribution if the data includes measurements of background concentrations of substances. It must be shown that the data within the positively skewed tail of the

lognormal distribution is not part of another population, representing a much more contaminated mass of material.

Professional advice

The ministry may require a detailed and rigorous data evaluation before accepting any request for classification of a potentially contaminated material. We encourage

consultation with professional statisticians who can analyze results, make hypotheses, and develop supportive arguments.

For more information, contact the Environmental Management Branch at site@gov.bc.ca