

Demystifying Risk Assessment

The risk-based approach is one of two major ways that site owners and operators may choose to manage contaminated sites under BC's contaminated sites legislation. This approach addresses the risks to human health and the environment and has been used to regulate sites in BC since 1987.

Why is a risk-based approach needed?

Numerical soil and water standards are most often used to determine when substance concentrations have been reduced to acceptable levels. At some sites, removing substances is not possible or practical because of technological, physical, or financial constraints. In these cases, the substances must be managed onsite to ensure they do not pose a hazard to human or environmental health.

Using the risk-based approach allows a site owner (or someone contracted on the owner's behalf) to estimate the risks associated with leaving substances in place. This information is then used to design appropriate risk management solutions to eliminate the risks or reduce them to appropriate levels.

What is risk assessment?

It is an important tool that can be used to evaluate and predict the severity of existing and potential future impacts from substances at sites. It can only be used within a site-specific context, which means that every risk assessment is unique to the site for which it was prepared.

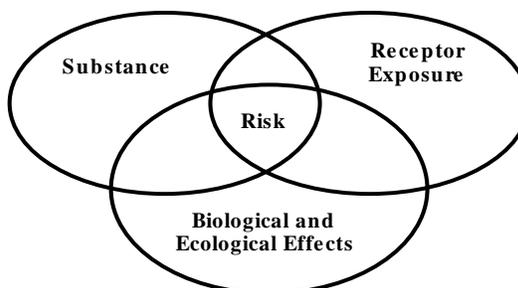
Every risk assessment provides the following types of information:

- documentation of the substances at a site, their location, and the extent of any contamination occurring on- and offsite;
- estimation of the size and likelihood of risks and hazards to human and non-human receptors on- and offsite; and
- documentation and evaluation of the effectiveness of measures proposed to manage contamination in place.

How does risk assessment determine if a risk to health exists?

The fundamental goal of risk assessment is to estimate levels of risk and hazard to human and environmental health. The mere presence of a substance or contaminant at a site does not necessarily constitute a risk. For a risk to exist, the following three basic conditions must be met:

- substances must be present;
- these substances must have the potential to cause toxic or other adverse biological effects – that is, the substances must be hazardous; and
- “pathways” must exist by which humans, animals, or plants (“receptors”) may be exposed to the substances.



What exposure pathways are considered?

Risk assessment considers all the exposure pathways for existing and possible receptors on- and offsite. A receptor could be any person, animal, or plant exposed to substances.

An exposure pathway is the potential route a substance may take to come in contact with a receptor.

Substances in environmental media such as soil, air, food, surface, or groundwater may come into contact with receptors through different routes. For example, substances in soil may be ingested, inhaled, or absorbed through the skin, or it may accumulate in food such as crops or livestock grown onsite.

How is the risk estimated?

Risk assessment uses mathematical models to predict the “dose” – the amount of a substance a receptor receives through any specific exposure pathway. These predicted doses can be added up and compared with a dose of the substance that is considered safe. Provided the safe dose is not exceeded, it is assumed that there is little risk that exposure to the substance will adversely affect the health of receptors.

The hazard and risk calculated for a site can be expressed in mathematical terms as either a hazard quotient or a risk estimate.

- Hazard quotients are calculated for substances that do not cause cancer. A hazard quotient is the dose of a substance received from a site (the estimated daily intake) divided by the safe dose for the substance (the reference dose).
- Risk estimates are derived for cancer-causing substances. In the Contaminated Sites Regulation, risks are expressed as the probability of cancer occurring in an individual from exposure to a substance.

How are the risk estimates used?

Hazard and risk estimates calculated for a site can be compared with the risk-based standards specified in the Regulation. If the risk estimates exceed the risk-based standards, the site may need to be managed to reduce estimated impacts to levels equal to, or less than, the standards. If a site uses risk management solutions to address the hazard and risk, the site is called a “risk-managed” site. They require special monitoring and inspection to ensure the remedial solutions used are maintained and effective.

How are environmental impacts assessed?

The mathematical modelling described above is always required to assess human health effects at risk-assessed sites. But often, because of data and toxicological limitations, it is not practical or possible to take such a quantitative approach when assessing impacts on the environment. However, it is possible to prepare a more general qualitative environmental risk assessment report for the site. Thus, depending on the complexity of the site, environmental impact reports may be either qualitative or quantitative.

At a minimum, environmental risk assessment reports must assess the following:

- the potential on- and offsite environmental impacts arising from substances before and after site remediation or redevelopment; and
- the procedures, including monitoring requirements, designed to reduce significant environmental health impacts identified either on- or offsite from contaminants remaining in place.

Note: This summary is solely for the convenience of the reader. The current legislation and regulations should be consulted for complete information.

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