# Technical Information Sheet

# CNSC Screening Levels for the Independent Environmental Monitoring Program

November 2018

## What is the Independent Environmental Monitoring Program?

The Independent Environmental Monitoring Program (IEMP) is a planned environmental sampling initiative led by the Canadian Nuclear Safety Commission (CNSC) and designed to verify that the public and the environment around licensed nuclear facilities are protected.

The IEMP is separate from, but complementary to, the CNSC's existing compliance verification program. The IEMP involves taking samples from public areas around nuclear facilities, and measuring and analyzing the amount of radiological (nuclear) and hazardous substances in those samples. CNSC staff collect the samples and send them to the CNSC's state-of-the-art laboratory for testing and analysis.

The IEMP is in place for facilities in all segments of the nuclear fuel cycle: uranium mines and mills, uranium and nuclear processing facilities, nuclear power plants, research and medical isotope production facilities, and waste management facilities.

## What standards or guidelines are the IEMP results compared to?

IEMP results for hazardous substances (e.g., lead and iron) in most environmental media (e.g., water, air, soil or food) and radionuclides (e.g., tritium and cesium-137) in water are compared to appropriate federal and provincial environmental standards, guidelines or criteria.

In 2013, the CNSC developed and began implementing screening levels for radionuclides where no federal and provincial standards and guidelines existed.

### Quick Facts

- Environmental protection programs are in place at CNSC-licensed facilities to ensure adequate protection of the environment and the health and safety of the public.
- The CNSC's IEMP provides independent verification that licensees' required environmental protection programs are effective.
- CNSC screening levels were developed to provide a benchmark to compare measured IEMP results and information about risk. Screening levels are not regulatory limits.
- Results are published on our website using an illustrated, user-friendly map and open-data format.

Additionally, the CNSC established screening levels for both hazardous substances and radionuclides based on an Indigenous diet in northern Saskatchewan.

## What are CNSC screening levels?

A screening level for a particular radionuclide in a particular environmental medium represents the activity or mass concentration in that medium which, if consumed as part of a typical Canadian diet all year long, would result in 10% of the public dose limit of 1 millisievert per year (1 mSv/year).

Similarly, a screening level for a hazardous substance in a particular environmental medium represents the mass concentration in that medium which, if consumed as part of a typical diet all year long, would result in 10% of Health Canada's tolerable daily intake (TDI) rate for the hazardous substance.

Both the public dose limit and the TDI represent levels at which no health impacts are expected.

## How are screening levels applied?

CNSC staff compare the measured contaminant levels to relevant guidelines and CNSC screening levels to determine if the results are safe for human health and the environment.

## Why does the CNSC need to develop its own screening levels?

The CNSC developed screening levels for radionuclides where no environmental standards, guidelines or criteria exist for human and environmental health. Screening levels are not regulatory limits. They were developed to provide a benchmark to compare measured IEMP results and information about risk.

## What methodology was used to develop the screening levels?

Screening levels for radionuclides were developed based on the conservative default model assumptions and methodology of CSA standard N288.1, *Guidelines for calculating derived release limits for radioactive material in airborne and liquid effluents for normal operation of nuclear facilities* and the *Compendium of Dose Coefficients Based on ICRP Publication 60* (ICRP Publication 119).

A reference dose of 0.1 mSv/year, or 10% of the public dose limit of 1 mSv/year, was used to develop screening levels for radionuclides. This approach is consistent with the methodology used by other national (i.e., Health Canada) and international (i.e., World Health Organization) agencies for developing drinking water guidelines for radionuclides, and it considers a dose at which no health impacts are expected.

Screening levels for hazardous substances were developed using the mean daily intake rate, average body weight of the adult/child receptor, and 10% of Health Canada's tolerable daily intake (TDI) rates of the hazardous substance. Screening levels for hazardous substances are based on 10% of the TDI in order to account for exposure to contaminants from multiple primary exposure pathways.

Both approaches allow exposure from multiple contaminants (e.g., radionuclide or hazardous substance) and from different exposure pathways to be considered.

## Do screening levels apply to licensee data?

Screening levels are not used as compliance verification criteria when reviewing licensees' environmental monitoring results. The CNSC conducts other activities to verify compliance of licensees' programs. These activities include technical reviews of licensees' results, as well as site inspections. However, the licensees' data are considered when assessing IEMP results, to verify that the licensee's data are in agreement with the range of what was measured in the IEMP.

## Are the screening levels too conservative?

The screening levels were developed using a methodology that is consistent with national and international guidance. This methodology is conservative in nature, which results in lower screening levels than if conservatism was not applied. The large difference often seen between the measured values and the screening levels confirms that actual doses received by members of the public from a given pathway are a small fraction of the reference dose of 0.1 mSv/year.

## What does it mean if measured values are above screening levels?

A screening level provides an early indication that there may be a risk. Exceeding a screening level does not confirm that there is a risk to the public; it triggers a more detailed investigation by CNSC staff. This investigation may include additional sampling in the area and/or a more detailed dose/risk assessment considering multiple exposure pathways.

For example, results from the 2016 McClean Lake IEMP sampling campaign showed concentrations of selenium in fish that were above the screening level for human health at both the exposure and reference (locations not affected by facility operations) stations. Concentrations at both monitoring locations were also similar.

As a first step, CNSC staff compared the selenium in fish results from the IEMP to an extensive database of background data in the region and noticed that the IEMP results were within natural background levels. Next, CNSC staff did a more detailed risk assessment by taking a highly conservative representative child and adult receptor, and looked at their exposure to selenium from multiple exposure pathways. These pathways included the ingestion of fish, water, blueberries, and Labrador tea. The total amount of selenium ingested was then compared to Health Canada's tolerable daily intake (TDI) for selenium. The results showed that only 30% of the TDI had been reached. Based on the in-depth assessment, CNSC staff concluded that no adverse health effects due to selenium at these levels were expected from the consumption of fish.

## How can the CNSC confirm the health and safety of the public and the environment from IEMP results?

The IEMP results provide a snapshot in time of the contaminants in the environment surrounding the facility.

If IEMP results are below screening levels, this confirms that the public and the environment in the vicinity of a nuclear facility are protected from releases from that facility, and that there are no health impacts expected.

**For more information:**

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