

NIRB Part 1 Form

Project Proposal Information Requirements

Section 4: Project description

Project background:

Radioisotopes are toxic substances that are released into the environment by industrial activities, nuclear waste upgrading and disposal, nuclear weapons tests and nuclear accidents, and are transported to the Arctic on ocean currents and the atmosphere. Radioisotopes can be very similar to substances that are important to living organisms, including water and certain nutrients. Prospects of expanding industrial development and human habitation along with dramatic effects of climate change on Arctic landscapes and Ocean environments, has renewed interest in radiological risk assessments in the Arctic. In order to fill knowledge gaps of radiological risk to humans and wildlife in the Arctic, this project focuses on the environmental fate and transfer of radioisotopes commonly released to the environment from historic weapons tests, submarine accidents, waste disposal, nuclear accidents and nuclear power reactors: cesium, strontium and hydrogen. The project will consist of two component studies at two sites in Nunavut, Kugluktuk and CFS Alert, representing the southern and high northern Arctic, respectively, and will address two central research questions:

- 1) What will be the risk of fish contamination from a nuclear accident in near-shore ocean food webs?
- 2) What will be the risk of contamination of plant life due to atmospheric releases of radioactive water from nuclear reactors?

These component studies are planned as follows. Study 1: Developing a risk assessment model for Arctic charr in near-shore Arctic Ocean food webs. The Arctic Ocean study components will focus on Arctic char, as this species is an important food source for people. Char also migrate between ocean and freshwater and are therefore at higher risk to be exposed to accidental releases in both ocean and inland situations. Sampling activities for this study are planned for 2017-2018. We will seek assistance from communities and will employ a local guide with boat to help with collecting char and other marine organisms, such as crabs, shrimp and molluscs. The samples of char we require can be derived from wastes from subsistence catches: We require and accurate measurement of live fish length and weight, and only need 1) stomach contents and internal organs, 2) skin samples, 3) the head and backbone with attached scraps of muscle tissue for our further analyses. The edible filets are not needed for our analyses and can stay with the community.

Study 2: Revision of Canadian regulatory models for organic tritium in plants. The study investigating tritium accumulation by land plants will focus on perennial fruit-bearing plants and grasses. These plants may represent important food sources for people and grazing and browsing animals. Sampling for this study is planned for 2017 and will encompass collection of air moisture, precipitation, surface water, soil water, soil material, fresh plant leaves, fruits and roots. Air moisture will be collected using specialized apparatus, which pumps air through a drying medium to trap water. For woody plants only fruits and

fresh foliage will be collected. Grasses will be collected whole, including above-ground and below-ground parts. Soil samples will be collected using coring and surface-stripping techniques, removing approximately 2kg of material for analysis. This project will result in a mathematical models and parameters to assess risks from radioactive releases in the Canadian Arctic. Our analyses will also produce supporting data that is useful for future studies in wide-ranging contexts, including arctic food-web ecology, atmospheric processes and climate change. Results of this research project will be published as a series of articles in peer-reviewed scientific journals and copies will be made available to the Nunavut government and individual communities.