CanNorth

Canada North Environmental Services
Limited Partnership

EASTERN ATHABASCA REGIONAL MONITORING PROGRAM 2012 COMMUNITY REPORT

Final Report

Prepared by:

Canada North Environmental Services
Saskatoon, Saskatchewan

Prepared for:

Government of Saskatchewan
Regina, Saskatchewan

Project No. 1611

January 2014

211 Wheeler Street, Saskatoon, Saskatchewan, Canada S7P 0A4
Telephone: (306) 652-4432 Facsimile: (306) 652-4431 E-mail: info@cannorth.com

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

EXECUTIVE SUMMARY

The Eastern Athabasca Regional Monitoring Program (EARMP) was established in 2011 under the Province of Saskatchewan's Boreal Watershed Initiative. The EARMP framework includes two programs: a community program and a technical program. The technical program was established to monitor long-term changes in the aquatic environment far downstream of uranium operations in the Eastern Athabasca region. Results of the technical program are presented in a separate report. The community program was established to monitor the safety of traditionally harvested country foods by collecting and testing representative water, fish, berry, and mammal chemistry from the seven communities located in the region.

Harvesting and eating traditional country foods (berries, fish, and wild game) are an important part of Aboriginal culture in northern Saskatchewan and contribute to an overall healthy lifestyle through physical activity and healthy eating. The intent of the EARMP community program is to provide confidence to community members that their traditional country foods remain safe to eat.

The EARMP community sampling program included testing water, berries, fish, moose, and barren-ground caribou collected independently by, or with the aid of, community members from Black Lake, Camsell Portage, Fond du Lac Denesuline First Nation, Stony Rapids, Uranium City, Wollaston Lake, and Hatchet Lake Denesuline First Nation. The evaluation of the country foods data shows that most chemical concentrations are below available guidelines and similar to concentrations expected for the region. Furthermore, a Human Health Risk Assessment completed in 2013 using the EARMP community data confirmed the country foods assessed were safe to eat.

The 2011 and 2012 EARMP community data will act as a baseline for comparison in future monitoring years in order to continue to provide confidence that country foods are safe to eat and contribute to a healthy lifestyle.

1.0 INTRODUCTION

1.1 Background

The Eastern Athabasca Regional Monitoring Program (EARMP) is a joint, long-term environmental monitoring program established in 2011 under the Province of Saskatchewan's Boreal Watershed Initiative. The program is supported by contributions from several stakeholders including Cameco Corporation, AREVA Resources Canada Inc., and the Saskatchewan Ministry of Environment. One of the primary goals of the Boreal Watershed Initiative is to assess the ecological integrity of Saskatchewan's northern watersheds in order to address potential environmental concerns and to identify sustainable management practices in the region. The EARMP was designed to identify potential cumulative effects downstream of uranium mining and milling operations in the Eastern Athabasca region of northern Saskatchewan (Figure 1).

Cumulative effects are defined as impacts on the environment that result from the incremental impact of an action when added to other past, present, and foreseeable future actions (Joint Panel 1992). Cumulative effects might occur when projects overlap spatially, such as when two watersheds exposed to uranium mining and milling activities converge. Cumulative effects may also occur temporally if contaminants are emitted into the environment over extended periods of time. The EARMP was developed to establish baseline conditions and facilitate the examination of spatial and temporal changes over the long term.

Extensive amounts of environmental monitoring are completed near each uranium mining and milling operation in northern Saskatchewan. The operations are regulated by both federal and provincial agencies including Environment Canada, the Canadian Nuclear Safety Commission, and the Saskatchewan Ministry of Environment. In addition, regional sampling occurs through the Athabasca Working Group (AWG) Environmental Monitoring Program, which started in 2000. The EARMP was designed to complement other monitoring programs and allows a more comprehensive evaluation of potential cumulative effects from industry in northern Saskatchewan.

The EARMP framework includes two programs: a community program and a technical program. The technical program was established to monitor potential long-term changes in the aquatic environment far far-field downstream of uranium mining and milling operations in the Eastern Athabasca region. Information from the technical program is

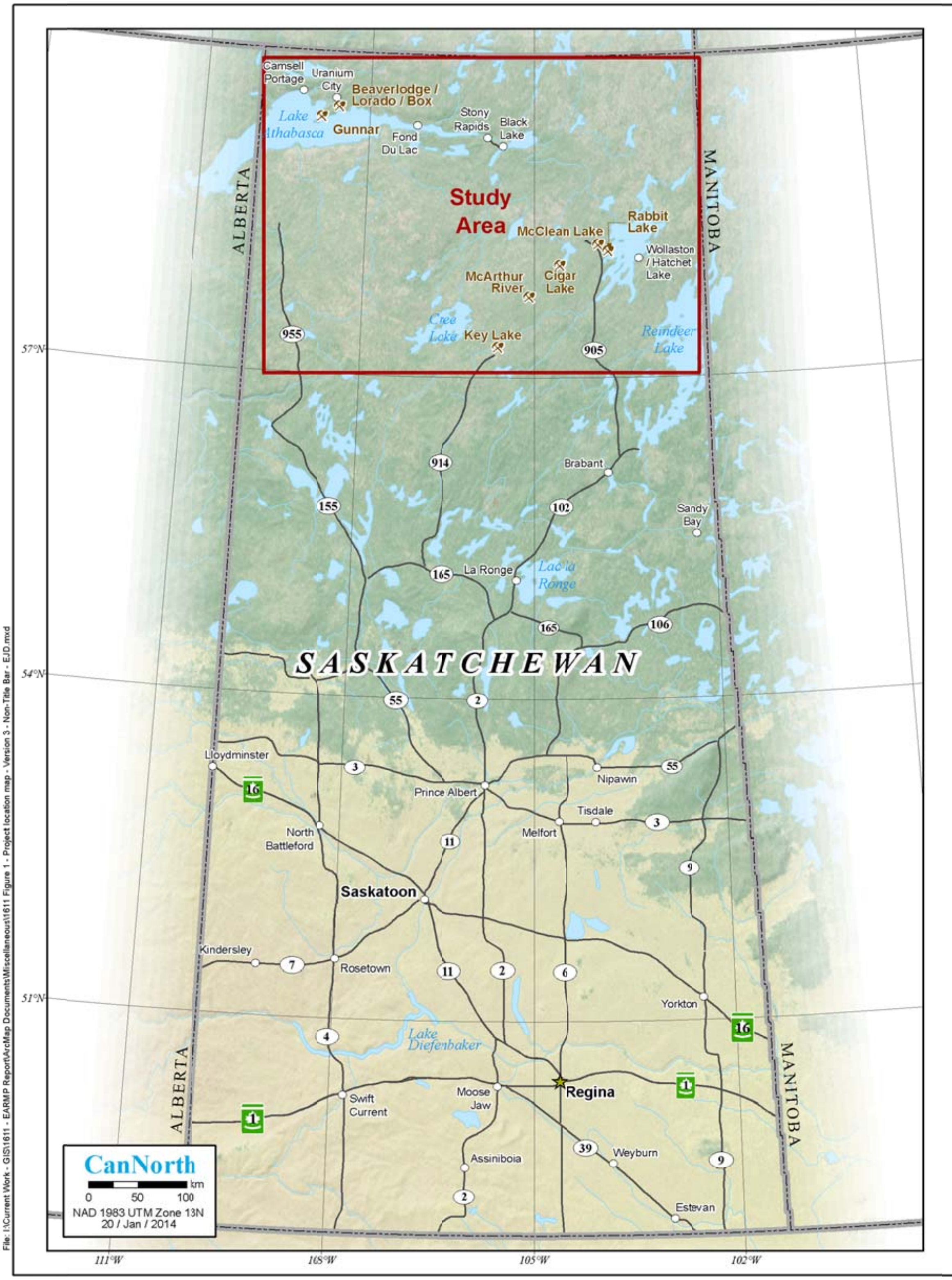


Figure 1
Study location.

presented in a separate report. The community program was established to monitor the safety of traditionally harvested country foods by collecting and testing water, fish, berry, and mammal samples from the seven communities located in the Eastern Athabasca region. The objective of this document is to discuss the study design and results of the EARMP community program.

1.1.1 Uranium Mining and Milling Operations in the Region

There are five active uranium mines in the Eastern Athabasca region. These include Key Lake, McArthur River, McClean Lake, Rabbit Lake, and Cigar Lake. In addition, other decommissioned and/or abandoned uranium mine sites are located within the region and near the community of Uranium City. The locations of these uranium mining and milling operations are presented in Figure 2. Extensive monitoring in the local study areas generally includes testing the air, soil, vegetation, water, sediment, benthic invertebrates, and fish (EcoMetrix 2010a, 2010b; SENES 2010, 2012; AREVA 2012). These sampling programs are designed specifically for each mine and are a requirement under the provincial operating licence. Summary descriptions of each site are provided in Appendix A.

1.1.2 Communities in the Region

There are seven communities in the region, including Black Lake, Fond du Lac Denesuline First Nation, Stony Rapids, Wollaston Lake, Hatchet Lake Denesuline First Nation, Camsell Portage, and Uranium City (Figure 2). For the EARMP community program, the communities of Wollaston Lake and Hatchet Lake Denesuline First Nation were assessed together, creating a total of six community study areas. Summary descriptions of each community are provided in Appendix A.

1.2 EARMP Community Program Objectives

The EARMP community program was developed to address potential concerns about the safety of country foods that community members routinely consume. Country foods can be defined as “traditional native foods that are obtained from the land, such as wild game, birds, fish, and berries by local residents during subsistence hunting and gathering” (Peace-Athabasca Delta Group Project 1972). Country food studies in Hatchet Lake and

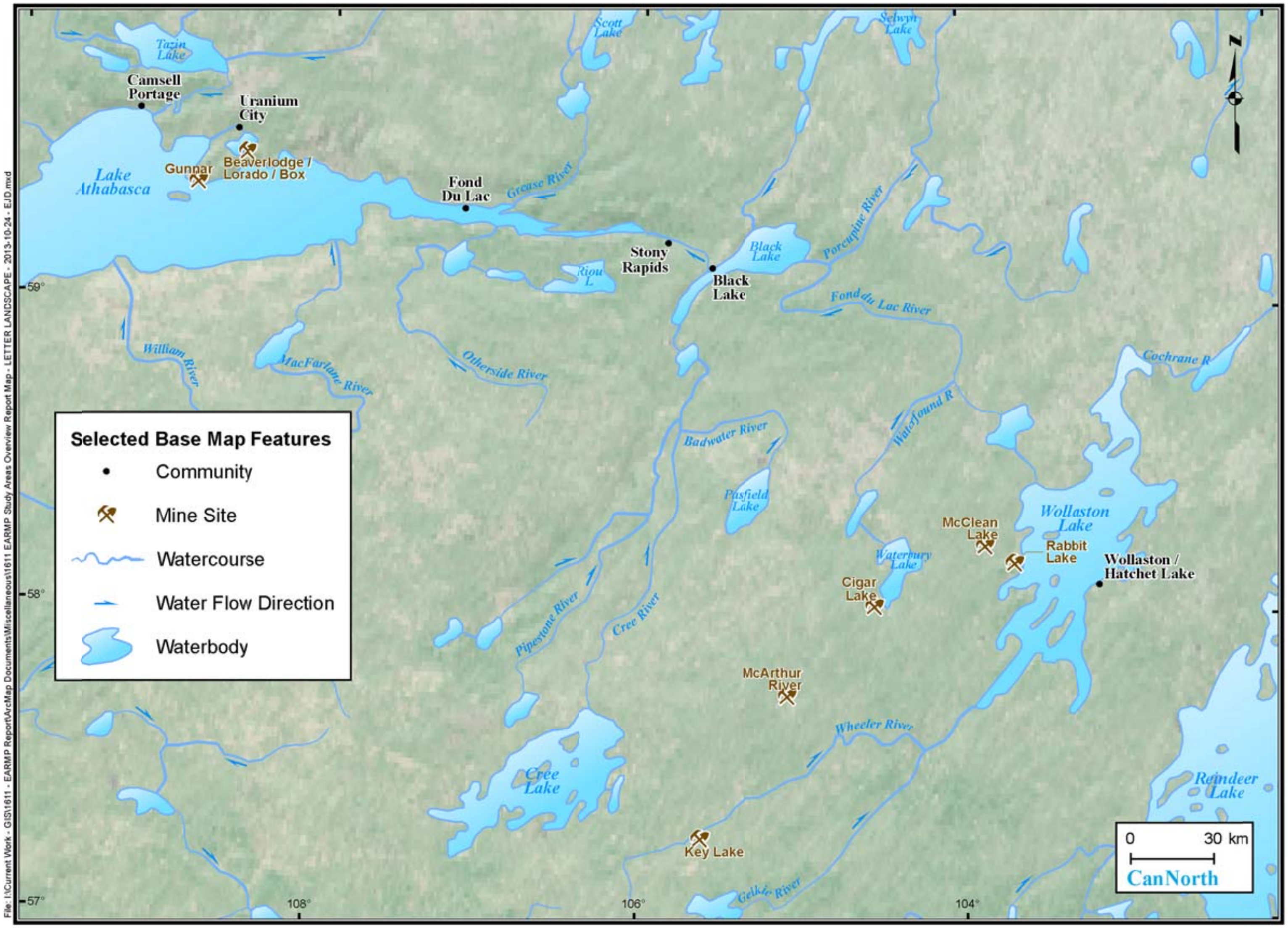


Figure 2

Study area overview.

Uranium City have established that fish, berries, and wild game are important food sources for communities located in northern Saskatchewan (CanNorth 1999, 2011). In this way, the EARMP community program provides important information to the residents of northern Saskatchewan. Additional information on the use of country foods in northern Saskatchewan and the health benefits associated their consumption is provided in Appendix A.

The EARMP community monitoring program objectives are to:

1. determine the safety of traditionally harvested food for local consumption;
2. establish long-term monitoring at community sampling areas to assess variability and potential changes over time;
3. build mutually beneficial relationships as well as engage and involve community members in the gathering of information for the program; and,
4. communicate monitoring results to community members and other stakeholders through reporting, public media, and meetings.

1.3 Summary of EARMP Community Program Framework

1.3.1 Community Involvement

The community monitoring program relies on the participation of community members for the selection of sampling locations and sample collection. Prior to commencing the fieldwork in the summer of 2011, notices describing a new environmental monitoring program were distributed to the band chief/mayor and council for distribution and discussion within each community. The purpose of the notices was to invite community members to select representatives from each community to carry out the country foods sampling for the EARMP. Community members were selected from each community and provided training in the collection and shipping procedures for the EARMP community sampling program.

The collection of country foods samples is carried out in one of two ways: either independently by the community member or in conjunction with a representative of CanNorth, who is responsible for the management of the program. The sampling locations within each community were established during the field training session when physical variables such as water depth, fishing locations, and berry patches could be determined.

1.3.2 Study Design and Objectives of the 2011/2012 Program

The specific objectives of the 2011/2012 EARMP community monitoring program are to:

(1) determine the safety of traditionally harvested foods by monitoring foods gathered from areas selected by each community in 2011 and 2012; and,
(2) establish a baseline set of data (2011 and 2012) for each community sampling area to be used to assess variability and potential changes over time.

In consultation with community members, samples of water, fish (lake trout, lake whitefish, and/or northern pike), blueberry[1], and ungulates (moose and/or barren ground caribou) were collected from each of the six EARMP community sampling areas in 2011 and 2012. As discussed above, sample selection and collection was completed directly by, or with the assistance of, community residents. Although a full suite of chemical parameters were measured for each sample, this report focused on a smaller list of chemicals[2], which have been identified as the chemicals of most interest for uranium operations by regulatory agencies, environmental assessments, as well as other monitoring programs. Table 1 summarizes the reduced list of chemicals.

TABLE 1

Chemicals assessed for the EARMP community program.

Chemicals	
Aluminum	Molybdenum
Ammonia*	Nickel
Arsenic	Polonium-210
Cadmium	Radium-226
Cobalt	Selenium
Copper	Thorium-230
Iron	Uranium
Lead	Vanadium
Lead-210	Zinc
Mercury**	

*For water only.
**Mercury is not associated with uranium mining and milling operations (refer to Appendix A for more information).

[1] Bog cranberry samples were also collected in 2011.
[2] Referred to as Constituents of Potential Concern by industry.

Chemistry results from the country foods tested in 2011/2012 were compared to available guidelines and to chemical concentrations measured in country foods collected throughout northern Saskatchewan during other monitoring programs (i.e., regional reference range). Comparing the EARMP country foods results to available guidelines and regional reference data is valuable because most foods have detectable levels of environmental chemicals, but that does not mean they are a concern to human health.

The 2011 and 2012 chemistry results were further used to complete a Human Health Risk Assessment that established whether the country foods in the region are considered safe to eat. A full description of the data sources used for comparison is provided in Appendix A.

1.4 Report Structure

The EARMP community report is subdivided into six major sections:

1.0 Introduction
2.0 Water Quality
3.0 Fish Chemistry
4.0 Berry Chemistry
5.0 Mammal Chemistry
6.0 Summary and Conclusions

Sections 2.0 to 5.0 provide an overall summary of the water, fish, berry, and mammal chemistry results from 2011 and 2012. Section 6.0 provides an overall conclusion about the country foods assessed in the region.

This document is streamlined so that the main text provides a summary of the most important information, with further background information and details of the analysis presented in appendices. Appendix A expands on the EARMP community program framework and provides detailed information on the study area, study design, and data sources. Appendix B presents the detailed data analyses completed on the 2011 and 2012 community data, while the raw data are provided in Appendix C. The Human Health Risk Assessment completed using the 2011 and 2012 EARMP community data is provided in Appendix D.

2.0 WATER QUALITY

Surface water samples were collected by hand at one waterbody of interest near each community by community members and CanNorth field staff. Waterbodies assessed included Black Lake, Ellis Bay of Lake Athabasca near Camsell Portage, the Fond du Lac River near Fond du Lac, the Fond du Lac River near Stony Rapids, the Fredette River near Uranium City, and Welcome Bay of Wollaston Lake (Figure 3). All samples were preserved as required and kept refrigerated until chemical analysis was completed. All water samples were submitted to the Saskatchewan Research Council (SRC) analytical laboratory for chemical analysis. The detailed water quality data analysis is presented in Appendix B and summarized below. The raw water quality data are presented in Appendix C.

Concentrations of the chemicals in the water were very low, with most chemicals at levels so low the laboratory could not measure them even with the use of laboratory techniques known for their ability to measure low levels of chemicals. Chemicals that were at measurable levels were all lower than the Canadian Drinking Water Quality guidelines (HC 2012) and the Canadian Water Quality guidelines for the protection of freshwater aquatic life (CCME 2013). Additionally, chemical concentrations were within the range of concentrations expected for the region, with one exception. Uranium concentrations in the water samples from the Fredette River near Uranium City were higher than the regional reference range, but they were well below both guidelines indicating that the water is safe for people to drink and does not represent a risk to aquatic life (refer to Appendix B for further details). Table 2 summarizes the 2011 and 2012 community water quality sampling program results.

TABLE 2

Summary results of the 2011 and 2012 EARMP community water quality program.

Community	Below Drinking Water Guideline	Below Environmental Guideline	Within Regional Reference Range	Human Health Risk Assessment Completed	Safe to Drink
Black Lake	✓	✓	✓	✓	Yes
Camsell Portage	✓	✓	✓	✓	Yes
Fond du Lac	✓	✓	✓	✓	Yes
Stony Rapids	✓	✓	✓	✓	Yes
Uranium City	✓	✓	✓; 1 exception	✓	Yes
Wollaston Lake/Hatchet Lake	✓	✓	✓	✓	Yes

A Human Health Risk Assessment was completed using all components of the diet, including the community water information collected in 2011 and 2012. This assessment determined the water in each community sampling area is safe to drink (Appendix D).

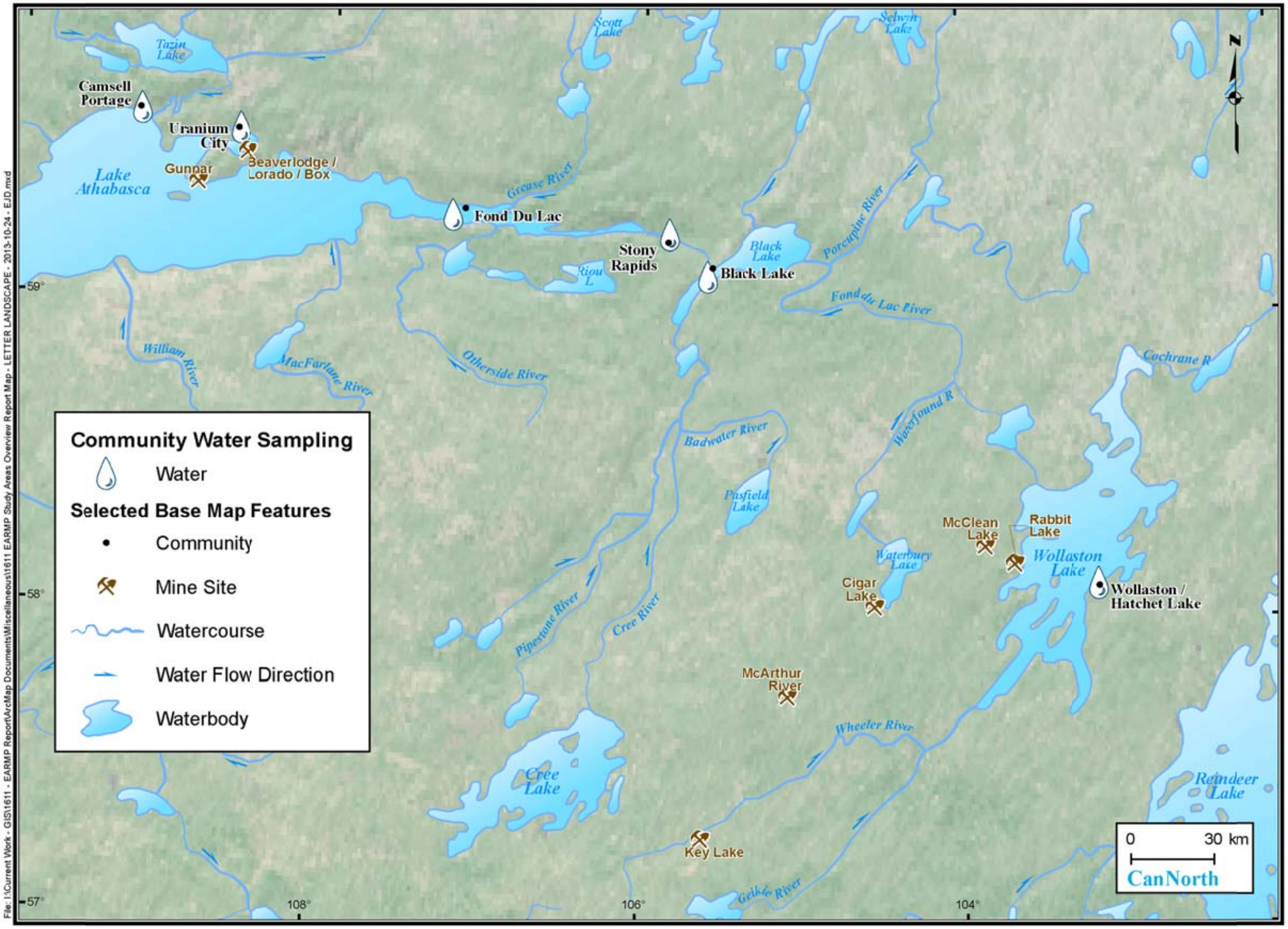


Figure 3
Water quality sampling areas, 2011 and 2012.

3.0 FISH CHEMISTRY

Fish chemistry samples were collected by community members using overnight gill nets set at waterbodies near their communities or by angling (Figure 4). Fish collected from each community included lake trout and lake whitefish. Northern pike were also collected from Uranium City and Camsell Portage. Five samples of each species from each of the six study areas in each year were targeted; however, this target was not always achieved (see Appendix B for sample sizes).

All fish collected for chemistry near the communities were frozen and shipped to CanNorth offices in Saskatoon where they were identified to species, measured (fork length) to the nearest 1 mm, weighed to the nearest 20 g, and sexed. A visual external health assessment was completed for each fish, and the stomach contents were described. In addition, ageing structures (otoliths[3] or cleithra[4]) were removed and submitted to North Shore Environmental to determine the age of the fish. The fish flesh was then submitted to SRC for chemical analysis. The detailed data analyses are presented in Appendix B and are summarized below. The raw fish chemistry data are provided in Appendix C.

Saskatchewan consumption guidelines are only available for mercury (SE 2011). Although mercury is not associated with uranium mining and milling operations, it does occur naturally in the environment and can be associated with historic gold mining operations and hydro-electric reservoir developments. In northern Saskatchewan, the natural occurrence of mercury can be associated with lead, zinc, copper, silver, and gold deposits and are likely the cause of higher levels of mercury in fish in some lakes (SE 2011).

A total of 141 fish flesh samples were tested during the EARMP community program and 140 of them contained mercury levels below 0.5 µg/g, meaning that fish can be eaten in unlimited amounts. One lake trout from Stony Rapids had a slightly higher mercury level of 0.57 µg/g. According to the guidelines, fish containing between 0.5 µg/g and 1.0 µg/g should be eaten in limited amounts and should not be eaten by children or pregnant women (SE 2011). Mercury in fish tends to be higher in older fish and in fish that are

[3] Otoliths are calcified structures that fish use for balance and orientation. They can be used to age some species of fish.
[4] Cleithra are paired, flat bones located beside the clavicle in the pectoral arch of some fish. They can be used to age northern pike.

higher in the food chain, such as lake trout and northern pike. For more information on mercury in fish visit: Mercury in Saskatchewan Fish: Guidelines for Consumption.[5]

Chemical concentrations in the community fish samples were often so low that the laboratory could not measure the level. This was the case for aluminum, cadmium, lead, molybdenum, nickel, uranium, lead-210, radium-226, thorium-230, and vanadium in over half of the samples assessed in most communities.

Average arsenic and selenium concentrations at some communities were higher than the regional reference range. Selenium concentrations were higher in lake whitefish from Crackingstone Inlet as a result of one fish that contained higher concentrations as compared to the other nine fish. The nine other fish had selenium levels comparable to those found in the region. The HHRA concluded that fish consumption does not present health risks to the communities in the Eastern Athabasca region (Appendix D; H. Phillips, pers. comm. January 22nd, 2014). A summary of the EARMP community program fish chemistry results is presented in Table 3.

TABLE 3

Summary results of the 2011 and 2012 EARMP community fish chemistry program.

Community	Below Mercury Guideline	Within Regional Reference Range	Human Health Risk Assessment Completed	Safe to Eat
Black Lake	✓	✓	✓	Yes
Camsell Portage	✓	✓	✓	Yes
Fond du Lac	✓	✓,1 exception	✓	Yes
Stony Rapids	✓,1 exception	✓	✓	Yes
Uranium City	✓	✓, 2 exceptions	✓	Yes
Wollaston Lake/Hatchet Lake	✓	✓	✓	Yes

[5]www.environment.gov.sk.ca/adx/aspx/adxGetMedia.aspx?DocID=90437caa-287b-4fa1-9217-8f5e5de1ad34&MediaID=bd109399-a270-4cfa-8cbc-d67f273ef6bf&Filename=2011+Mercury+in+Fish+Guidelines.pdf&l=English

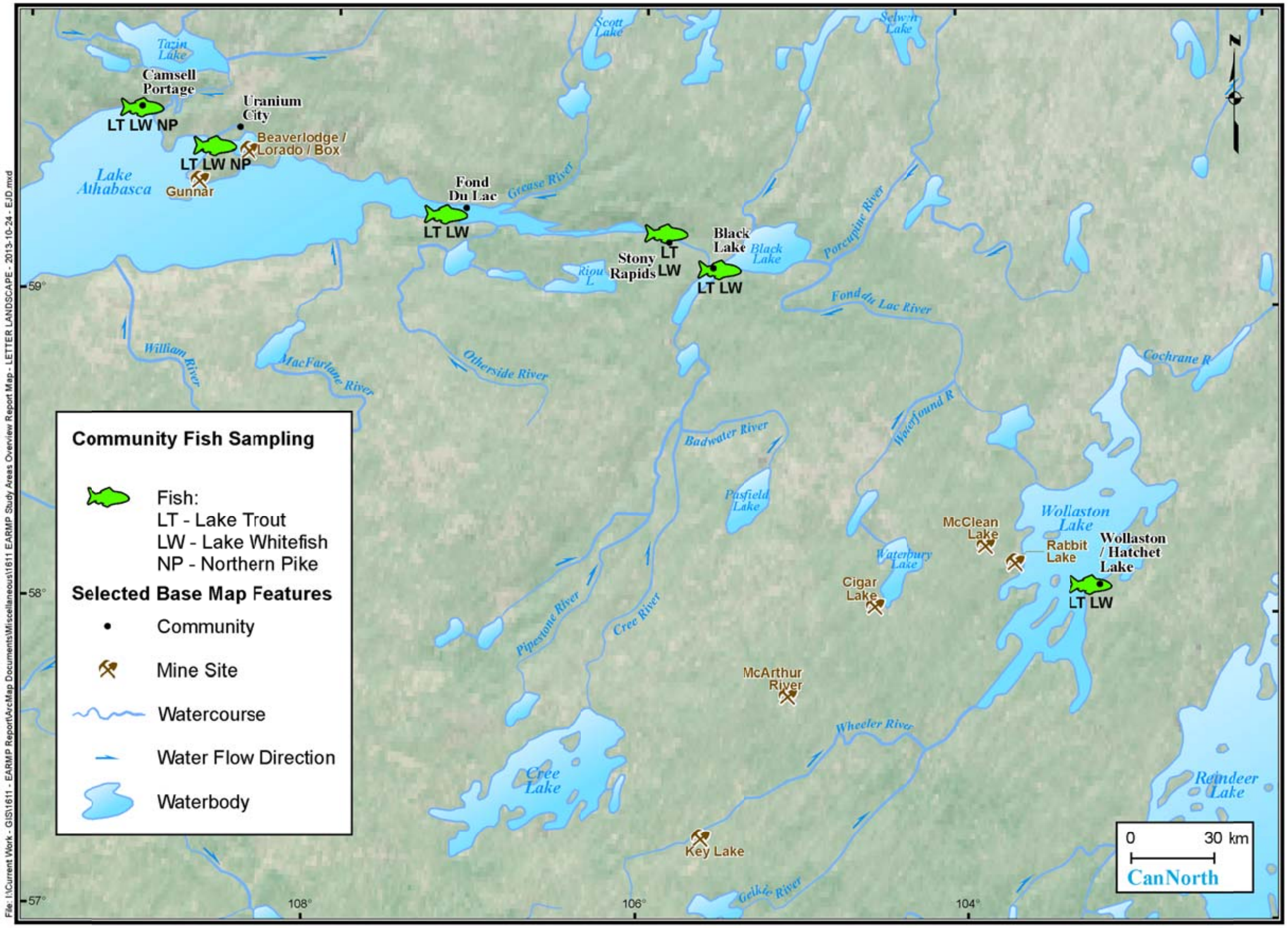


Figure 4
Fish chemistry sampling areas, 2011 and 2012.

4.0 BERRY CHEMISTRY

Near each study community, berry samples were hand collected by local community members independently or with the aid of CanNorth personnel. Sampling was completed at five locations typically used for berry collection by community members (Figure 5). Depending on accessibility and on current local abundance, berry species selected for collection were either blueberries (2011 and 2012) or bog cranberries (2011). All samples were double-bagged and frozen until submission to SRC for chemical analysis. The detailed data analyses are presented in Appendix B and are summarized below. The raw chemistry data for berries are provided in Appendix C. Since blueberries were sampled exclusively in 2012 and only a few bog cranberry samples were available, the focus of the discussion below is on blueberries.

Similar to the water and fish data, concentrations of chemicals in the berries were often too low for the laboratory to measure. This included concentrations of cadmium, selenium, uranium, thorium-230, arsenic, and vanadium which were below measurable levels in more than 50% of the samples from each community. Chemicals that could be measured were mostly similar to, or lower than, concentrations measured in the region (see Appendix B for further details).

A Human Health Risk Assessment was completed using all components of the diet, including the blueberry information collected in 2011 and 2012. This assessment determined the blueberries in each community sampling area are safe to eat (Appendix D).

TABLE 4

Summary results of the 2011 and 2012 EARMP community berry chemistry program.

Community	Within the Regional Reference Range	Human Health Risk Assessment Completed	Safe to Eat
Black Lake	✓	✓	Yes
Camsell Portage	✓, 1 exception	✓	Yes
Fond du Lac	✓	✓	Yes
Stony Rapids	✓	✓	Yes
Uranium City	✓, 2 exceptions	✓	Yes
Wollaston Lake/Hatchet Lake	✓	✓	Yes

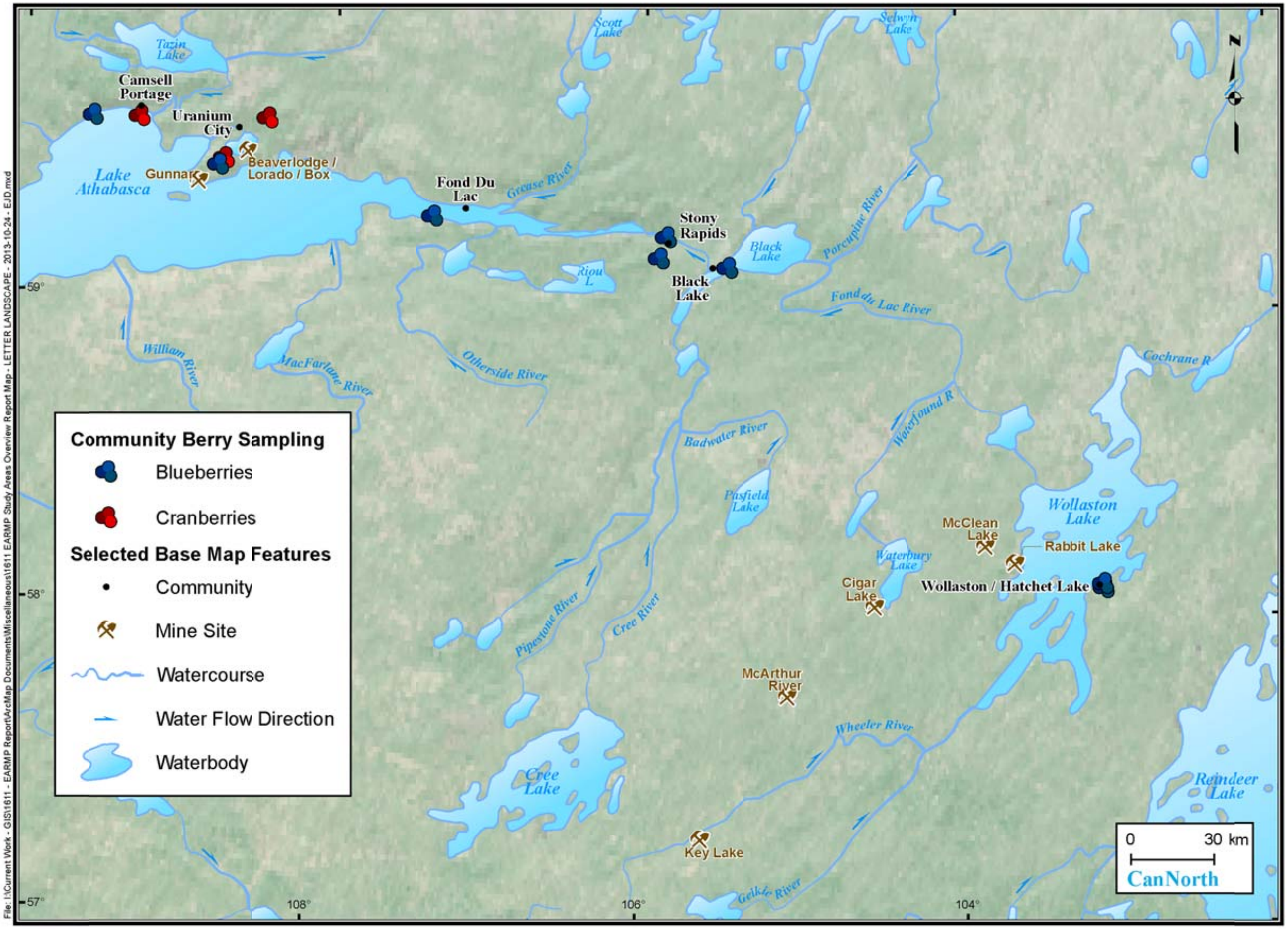


Figure 5

Berry chemistry sampling areas, 2011 and 2012.

5.0 MAMMAL CHEMISTRY

Mammal samples were collected by local community members during their routine hunting activities. Two main species commonly hunted and consumed in northern Saskatchewan were targeted; barren-ground caribou and moose. Moose samples were collected near the communities of Uranium City and Camsell Portage (Figure 6). Although barren-ground caribou samples were collected from most communities, several communities hunt in the same general area (Figure 6).

Five barren-ground caribou samples from each of Black Lake, Fond du Lac, and Wollaston Lake were collected by community members in 2011 and 2012. In Stony Rapids, no mammal samples were collected in 2011 and five barren-ground caribou samples were collected in 2012. In Camsell Portage, four moose samples were collected in 2011 and two barren-ground caribou samples were collected in 2012. For Uranium City, four moose samples were submitted from 2011 and three in 2012. All samples received from the communities by CanNorth were submitted to SRC for chemical analysis. The detailed data analyses are presented in Appendix B and are summarized below. The raw moose and caribou chemistry data are provided in Appendix C.

Concentrations of chemicals that were too low for the laboratory to measure varied slightly between the barren-ground caribou and moose meat samples. In barren-ground caribou meat, concentrations of aluminum, molybdenum, nickel, uranium, lead-210, radium-226, thorium-230, and vanadium were often too low for the laboratory to measure. In moose meat, these same chemicals as well as arsenic were often too low for the laboratory to measure, while aluminum was measurable in more than half the samples from Camsell Portage.

Only the average cadmium concentration in barren-ground caribou at Fond du Lac was higher than the regional reference range, due to one sample containing an elevated concentration. The remaining 10 samples had cadmium concentrations well within the expected range for the region. The results of the EARMP community mammal chemistry monitoring program are summarized in Table 5.

A Human Health Risk Assessment was completed using all components of the diet, including the community mammal chemistry information collected in 2011 and 2012.

This assessment determined the moose and barren-ground caribou in each community sampling area is safe to eat (Appendix D).

TABLE 5

Summary results of the 2011 and 2012 EARMP community mammal chemistry program.

Community	**Within the Regional Reference Range**	**Human Health Risk Assessment Completed**	**Safe to Eat**
Black Lake	✓	✓	Yes
Camsell Portage	✓	✓	Yes
Fond du Lac	✓, 1 exception	✓	Yes
Stony Rapids	✓	✓	Yes
Uranium City	✓	✓	Yes
Wollaston Lake/Hatchet Lake	✓	✓	Yes

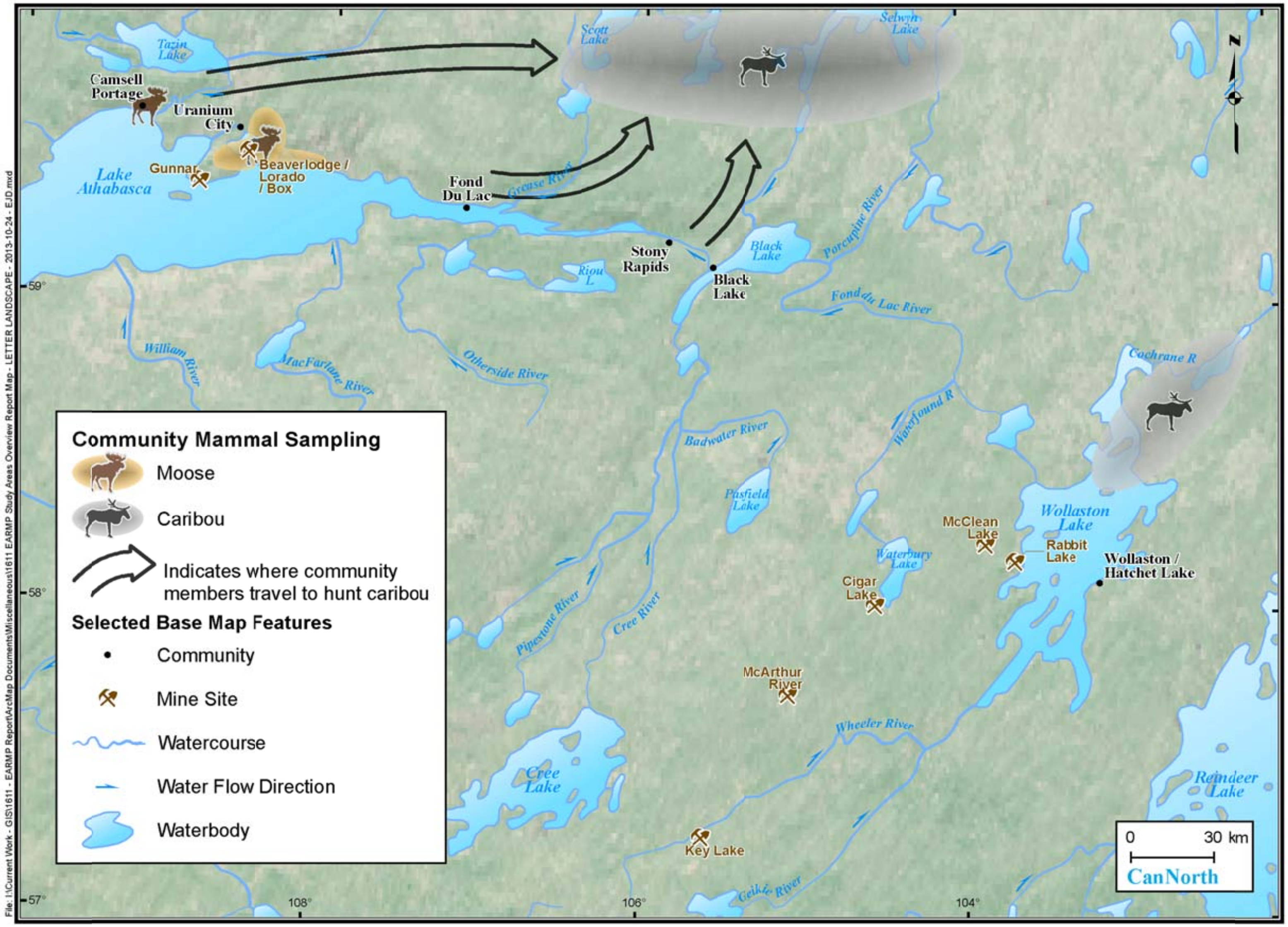


Figure 6

Mammal chemistry sampling areas, 2011 and 2012.

6.0 SUMMARY AND CONCLUSIONS

Seven communities in northern Saskatchewan are located downstream of uranium mining and milling operations in the Eastern Athabasca region. The EARMP community program was established in 2011 to monitor the safety of traditionally harvested country foods (water, berries, fish, moose, and barren-ground caribou) in Black Lake, Camsell Portage, Fond du Lac, Stony Rapids, Uranium City, and Wollaston Lake (assessed together with Hatchet Lake). This report presents the results of the 2011 and 2012 monitoring years, with the intent of establishing baseline/current conditions for future comparison.

The results of the evaluation of the country foods data shows that most chemical concentrations are below available guidelines and similar to concentrations expected for the region.

A Human Health Risk Assessment completed using the 2011/2012 EARMP community data concluded that the country foods assessed in the Eastern Athabasca region are safe to eat.

7.0 LITERATURE CITED

AREVA Resources Canada Inc. (AREVA). 2012. McClean Lake Operation Technical Information Document Environmental Performance.

Canadian Council of Ministers of the Environment (CCME). 2013. Canadian Environmental Quality Guidelines summary table. Website: http://st-ts.ccme.ca/. Accessed November 2013.

Canada North Environmental Services (CanNorth). 1999. Hatchet Lake dietary study. Prepared for the Atomic Energy Control Board, Ottawa, Ontario.

Canada North Environmental Services (CanNorth). 2011. Country foods study Uranium City, Saskatchewan. Year 1. Prepared for Cameco Corporation, Saskatoon, Saskatchewan.

EcoMetrix Incorporated (EcoMetrix). 2010a. Key Lake Operation – Status of the Environment Report 2005 to 2009. Prepared for Cameco Corporation, Saskatoon, Saskatchewan.

EcoMetrix Incorporated (EcoMetrix). 2010b. McArthur River Operation: Status of the Environment Report 2005 to 2009. Prepared for Cameco Corporation, Saskatoon, Saskatchewan

Health Canada (HC). 2012. Guidelines for Canadian drinking water quality. Health Canada, Ottawa, Canada. Website: http://www.hc-sc.gc.ca/ewh-semt/water-eau/index-eng.php. Accessed June 25th, 2013.

Joint Panel. 1992. Assessing cumulative effects of Saskatchewan uranium mines development. Prepared for Joint Federal/Provincial Panel on uranium mining in northern Saskatchewan.

Peace Athabasca Delta Project Group. 1972. The Peace-Athabasca Delta - A Canadian resource, summary report. Edmonton: Queen's Printer, Province of Alberta.

Saskatchewan Ministry of the Environment (SE). 2011. Mercury in Saskatchewan fish: guidelines for consumption. Website: http://www.environment.gov.sk.ca/adx/aspx/adxGetMedia.aspx?DocID=2a256b90-19c2-4865-9e89-a5723f5b990c&MediaID=5066&Filename=Mercury+in+Fish+Guide+June+2011.pdf&l=English. Accessed July 24th, 2013.

SENES Consultants Limited (SENES). 2010. Rabbit Lake Operation integrated environmental risk assessment and state of the environment report 2005 to 2009. Prepared for Cameco Corporation, Saskatoon, Saskatchewan.

SENES Consultants Limited (SENES). 2012. Status of the environment report for the Cigar Lake Project 1998 – 2010. Prepared for Cameco Corporation, Saskatoon, Saskatchewan.

APPENDICES

LIST OF APPENDICES

APPENDIX A

EARMP COMMUNITY PROGRAM FRAMEWORK

APPENDIX A: COMMUNITY MONITORING PROGRAM FRAMEWORK

1.0 INTRODUCTION

The Eastern Athabasca Regional Monitoring Program (EARMP) is a joint, long-term environmental monitoring program established in 2011 under the Province of Saskatchewan's Boreal Watershed Initiative. The EARMP was designed to identify potential cumulative effects downstream of uranium mining and milling operations in the Eastern Athabasca region of northern Saskatchewan. It consists of two programs: a technical monitoring program and a community monitoring program. The technical program was established to monitor long-term changes in the aquatic environment far downstream of uranium mining and milling operations in the Eastern Athabasca region. The community program was established to monitor the safety of traditionally harvested country foods from the communities located in the Eastern Athabasca region.

The following document focuses entirely on the EARMP community program. The objective of the EARMP community program framework document is to provide detailed information related to the communities and mine sites located in the Eastern Athabasca region of northern Saskatchewan, the rationale for studying country foods, detailed information and rationale on the EARMP community program study design, and details of the data analyses and communication of the results.

2.0 STUDY AREA

2.1 Communities

There are seven communities in the region including Black Lake, Camsell Portage, Fond du Lac Denesuline First Nation, Hatchet Lake Denesuline First Nation/Wollaston Lake, Stony Rapids, and Uranium City. For the EARMP community program, the communities of Wollaston Lake and Hatchet Lake Denesuline First Nation were assessed together due to their close proximity to each other, creating a total of six community study areas. Provided below are brief descriptions of each community.

2.1.1 Black Lake

The community of Black Lake is situated in northern Saskatchewan's Athabasca region approximately 1,180 km northwest of Prince Albert. Access to the community is by air to Stony Rapids and then by all-weather road approximately 20 km to Black Lake. Access to the Athabasca Seasonal Road (provincial highway 905) also lies between the two communities. The community currently maintains a total registered membership of 2,035 members, with 1,586 of those members residing on reserve and 442 members residing at locations off reserve (AANDC 2012).

The people of Black Lake initially settled at Stony Lake prior to relocating to the area currently occupied by the fishing camp on the banks of the Black Lake River. The current community of Black Lake was settled in the early 1950s after a new Roman Catholic church was constructed. The Dene language is still very strong and continues to be taught by the Elders to children and youth, both at home and within the school system. The people continue to maintain their traditional lifestyle: with hunting, fishing, and trapping very evident on a year-round basis as both commercial and private pursuits (PAGC 2008, 2012).

2.1.2 Camsell Portage

Camsell Portage is a small community located on the northern shoreline of Lake Athabasca, approximately 35 km from the community of Uranium City. It remains the most northern and isolated community in the province and is only accessible by boat in the open water season and by air year round.

Camsell Portage was settled by trappers who arrived during the 1900s from Lac La Biche, the Northwest Territories and Fort Fitzgerald, Alberta and who used it as a historical portage route to the north. During peak activities near Uranium City, Camsell Portage had a population of over 300 people (pers. comm. Philippe Steene). The population of Camsell Portage is currently 37 people. No mining activity has taken place in the area; however, currently there are operating hydroelectricity generating stations nearby the community of Camsell Portage on the Waterloo, Wellington, and Charlot River systems.

2.1.3 Fond du Lac

The community of Fond du Lac is situated on the northeast shore of Lake Athabasca in the Athabasca region of northern Saskatchewan, approximately 60 km south of the Northwest Territories border and 1,275 km northwest of Prince Albert. It currently maintains a total registered membership of 1,842 members, with 1,045 members residing on reserve and 796 members residing at locations off reserve (AANDC 2012). Members are primarily of Dene and Cree decent. Access to the community is by seasonal ice road in the winter and by boat during the summer. Two airline companies also provide year-round access to the community.

Founded over 150 years ago, Fond du Lac is one of the oldest and most remote northern communities in Saskatchewan. During Cultural Camp, the Elders share their cultural and traditional knowledge with the youth, including demonstrations in setting traps, tent raising, fire building, snow shoe racing, and preparing and smoking dry meat (PAGC 2008, 2012).

2.1.4 Hatchet Lake/Wollaston Lake

The Hatchet Lake Denesuline First Nation and the community of Wollaston Lake are situated on the south-eastern shoreline of Wollaston Lake (known in Dene as "Axe" Lake) in the Athabasca region of northern Saskatchewan, approximately 724 km northwest of Prince Albert (PAGC 2008). The Hatchet Lake Denesuline First Nation has total of 1,659 registered members, with 1,276 residing on the reserve and 377 members residing at locations off reserve (AANDC 2012). The northern settlement of Wollaston Lake has a population of 129 (SMMA 2012). Access to Hatchet Lake and Wollaston Lake is by ice road in the winter and by barge during the open water season. Year-round access is provided by two airline companies that operate scheduled flights to and from the surrounding communities and southern Saskatchewan.

Traditionally, the people lived as a hunting and gathering society, primarily barren-ground caribou. They still follow the seasonal caribou hunting patterns today. The majority of residents are Dene; however, during the 1950s some people of Cree-Metis ancestry moved to the northern settlement of Wollaston Lake (PAGC 2012).

2.1.5 Stony Rapids

Stony Rapids is a northern hamlet in Saskatchewan with a total population of 243 residents (SC 2012). The community is located on the shoreline of the Fond du Lac River, approximately 80 km south of the border to the Northwest Territories. The Fond du Lac River connects the community of Stony Rapids to the Fond du Lac Denesuline

First Nation, Uranium City, and Camsell Portage. An all-weather road also connects the community to the Black Lake Denesuline First Nation.

2.1.6 Uranium City

The history of Uranium City area dates back to the late 1930s when uranium ore was first discovered in the area. It was not until 1952 that the town of Uranium City was established as a base for uranium mining in the Beaverlodge area. Operations at Saskatchewan's first uranium mine began in May of 1953 and continued until June of 1982, by which time rising costs and failing ore grade made it unprofitable. Within a year following the closure of the mine, Uranium City changed from a resource town of almost 2,500 inhabitants to a northern settlement with approximately 150 residents (Bone 1998). Uranium City continued to serve as the regional base for a number of services including education, health care, and the RCMP headquarters for a number of years following the mine closure. Many public institutions closed in 1983 and the hospital closed in 2003. The current population is approximately 201 residents.

2.2 Uranium Operations

There are currently five active uranium mines in the Eastern Athabasca region. These include Key Lake, McArthur River, McClean Lake, Rabbit Lake, and Cigar Lake. In addition, the decommissioned Beaverlodge uranium mine and mill site is located within the region and nearby the community of Uranium City.

2.2.1 Key Lake

Cameco Corporation's (Cameco) Key Lake Operation is located in north-central Saskatchewan approximately 570 km north of Saskatoon. Mining at the Key Lake Operation began in 1982 with open pit mining of the Gaertner orebody followed by open pit mining of the Deilmann orebody beginning in 1986. Once stockpiles from the Deilmann orebody were consumed in late 1999, the mill began processing ore from the McArthur River Operation.

2.2.2 McArthur River

The McArthur River Operation is located approximately 270 km north of La Ronge and 80 km north of the Key Lake Operation. It is currently the world's largest, high-grade uranium deposit. McArthur River has been operational since 1999 and is managed and operated by Cameco. The operation includes underground mining, processing systems, an ore handling system, and camp infrastructure. Specialized mining equipment is used to extract the high-grade uranium ore and mineralized wastes are blended with high-grade ore to produce a slurry, which is trucked to the Key Lake Operation for processing.

2.2.3 McClean Lake

The McClean Lake Operation is located approximately 15 km west of Wollaston Lake in northern Saskatchewan. AREVA Resources Canada Inc. (AREVA) is the majority owner (70%) and operator of the McClean Lake Operation. Exploration activities started in the late 1970s, environmental assessment in the early 1990s, and the initiation of mining and mill operations in 1996 and 1999, respectively. The McClean Lake Operation currently comprises of three main areas: the JEB area, which includes the permanent camp and the JEB mill and tailing management facility; the Sue mining area, which includes the mined out Sue A/C, Sue B, and Sue E pits; and the Sink/Vulture Treated Effluent Management System (S/V TEMS).

2.2.4 Rabbit Lake

The Rabbit Lake Operation, owned and operated by Cameco, is the longest-operating uranium production facility in Saskatchewan (since 1975). It is located in northeastern Saskatchewan, on the west side of Wollaston Lake approximately 350 km north of La Ronge. The Rabbit Lake Operation includes the Eagle Point underground mine, Rabbit Lake mill, four mined-out open pit mines, of which the original Rabbit Lake pit is being used as the Rabbit Lake In-Pit Tailings Management Facility (RLTMF), the Rabbit Lake Above Ground Tailings Management Facility (AGTMF), overburden stockpiles, waste rock stockpiles, effluent treatment facilities, and camp infrastructure. Currently, uranium ore is sourced from the Eagle Point underground mine and hauled to the mill for processing.

2.2.5 Cigar Lake

The Cigar Lake Project is located approximately 80 km west of Wollaston Lake and 40 km inside the eastern margin of the Athabasca Basin region of northern Saskatchewan. The project involves the construction, mining operation, and eventual decommissioning of what is currently the world's second largest known high-grade uranium deposit. The project is currently managed and operated by Cameco. The initial discovery of the Cigar Lake uranium deposit occurred in May 1981. Following the acquisition of the construction license in December 2004, underground construction activities commenced. Site construction activities were expected to take 24 months to 36 months; however, in 2006 and 2008 the mine experienced two inflow events that caused flooding of all underground workings of the Cigar Lake Project.

2.2.6 Other Properties

The decommissioned Eldorado uranium mining and milling operation is located approximately 8 km east of Uranium City north-east of Beaverlodge Lake in northern Saskatchewan. The mine operated for almost 30 years between 1953 and 1982. Decommissioning of the site occurred from 1983 to 1985 and transition phase monitoring continues today. Upon its inception as a publicly traded company, Cameco was assigned responsibility for the management and reclamation of the decommissioned site. Post-decommissioning activities include the ongoing monitoring and maintenance of the site, regular water quality monitoring at stations within the area, and a variety of special investigations to assess specific environmental concerns.

In addition, Beaverlodge Lake is the receiving environment for the discharges from at least nine other abandoned uranium mine sites and one former uranium mill tailings area (the Lorado Uranium Mining Ltd. mill site), which are managed by the Saskatchewan Research Council (SRC). SRC is managing Project Cleans, which is also responsible for the assessment and reclamation of the Gunnar uranium mine and mill site and over 30 abandoned satellite mines in the Uranium City area.

3.0 RATIONALE FOR STUDYING COUNTRY FOODS

The uranium mining and milling operations in northern Saskatchewan complete extensive environmental monitoring that routinely test the air, soil, vegetation, water, sediment, benthic invertebrates, and fish in their local study areas. However, these monitoring programs do not answer the question of whether country foods that are fished, hunted, or gathered near communities located downstream of multiple uranium operations are safe to eat. Since country foods, such as fish, berries, and wild game are important food sources in northern communities, the EARMP community program was developed to conduct an extensive and long-term regional sampling program testing country foods. The following section further discusses some of the uses and benefits of traditional country foods by northern residents.

3.1 Traditional Use of Country Foods

Studies conducted across Canada have documented that harvesting, sharing, and preparing traditional country foods is an important part of the Aboriginal lifestyle (Wein et al. 1991; Wein and Freeman 1995; Kuhnlein and Receveur 1996; Receveur et al. 1997; AFN 2007). Traditional country food studies conducted in Hatchet Lake and Uranium City established that fish, berries, and wild game are important food sources for communities located in northern Saskatchewan (CanNorth 1999, 2011).

Studies in northern Saskatchewan have indicated that Hatchet Lake residents have a strong dependence on barren-ground caribou meat (especially during the winter months) whereas Uranium City residents rely more on moose and birds (CanNorth 1999, 2011). Uranium City residents have comparable meat/bird (grams per day) consumption values to the residents from similar regions such as Fort Smith, Northwest Territories and Fort Chipewyan, Alberta (CanNorth 2011). The more frequent caribou meat consumption in Hatchet Lake may be explained by availability, cultural differences, and/or preference of Hatchet Lake residents for caribou. A number of factors play a role in the differences in consumption patterns such as population size, road access, proximity to animal migration routes, presence of hunters, trappers, or fishermen, age and gender, costs and availability of market foods, and access to transportation with the south (Wein et al. 1991; Blanchet et al. 2000; Batal et al. 2005).

3.2 Health Benefits of Traditional Country Foods

Harvesting and consuming traditional foods are integral components of good health among Aboriginal people, influencing both physical health and social well-being. The act of hunting and gathering traditional foods is an important aspect of physical activity. Hunting, fishing, and berry picking also provides socio-cultural benefits to community members including mental health, cultural identity, and morale (AFN 2007). Gathering and eating traditional country foods can help reduce the risk of diabetes, heart disease, and obesity, especially when the foods are cooked in traditional ways (PHU AHA 2005).

Several health benefits of consuming traditional country foods have been documented across northern Canada. Fish are an important part of a healthy diet containing high-quality protein, Vitamin B, omega-3 fatty acids, other essential nutrients, and low amounts of saturated fats (NWT 2011). Fatty fish, such as lake trout, are especially high in omega 3 fatty acids and are considered important for heart health and brain and eye development. Additionally, fish eggs are an excellent source of protein, Vitamin C, B vitamins, and iron (NWT 2002; NWT 2011). The skin of the fish and soups cooked with fish head and bones are good sources of calcium (Receveur et al. 1997; NWT 2011).

Wild game such as moose and caribou are an important source of vitamins, minerals, and protein and have less saturated fats than store bought meats (PHU AHA 2005). The fat content of barren-ground caribou meat is very low (1%) compared to beef, pork, or poultry (12% to 40%) (NWT 2002). Wild game are also high in essential nutrients such as iron, zinc, copper, magnesium, and phosphorous (Kuhnlein et al 1995; Receveur et al. 1997). Soups and/or stews cooked with bones for broth are high in calcium (Receveur et al. 1997), while many organ meats including liver contain high levels of iron needed for healthy blood and Vitamin A needed for healthy bones, skin, and teeth (HWC 1987; NWT 2002).

Traditional plants such as cranberries, blueberries, and Labrador tea are often used in both food and medicine (CanNorth 1999, 2011) and may potentially offer benefits through diet. Wild plants are excellent sources of Vitamin C, fibre, and carbohydrates (Johnson et al. 1995; NWT 2002). For example, rose hips, consumed by many First Nations in a variety of medicinal and food preparations, are high in Vitamin C and demonstrate antibacterial and antioxidant properties (Yi et al. 2007).

3.3 Canada Food Guide – First Nations, Inuit, and Métis

In 2007, Health Canada introduced a newly tailored Canada Food Guide *"Eating Well with Canada's Food Guide - First Nations, Inuit and Métis"* (HC 2007) that includes both traditional country foods and store-bought foods that are generally available and accessible across Canada. This tailored food guide has recommendations for healthy eating based on science and recognizes the importance of traditional/country and store-bought foods for First Nations, Inuit, and Métis today. In addition, the government of Northwest Territories (NWT 2005) has also established a food guide that is tailored towards traditional country foods. Both the Canada Food Guide and the Northwest Territories Food Guide contain recommendations on the number of servings[1] (grams per day) of wild meats, birds, plants, fish, and other staples such as bannock, wild rice, and traditional fats.

Choosing the amount and type of food recommended in Canada's Food Guide will help:

- children and teens grow and thrive;
- meet needs for vitamins, minerals, and other nutrients; and,
- lower risk of obesity, type 2 diabetes, heart disease, certain types of cancer, and, osteoporosis (weak and brittle bones).

For more information on Canada's Food Guide please visit www.healthcanada.gc.ca/foodguide or "Eating Well with Canada's Food Guide - First Nations, Inuit and Métis" http://www.hc-sc.gc.ca/fn-an/pubs/fnim-pnim/index-eng.php. For more information on the Northwest Territories Food guide please visit http://www.hss.gov.nt.ca/publications/posters-flyers/nwt-food-guide.

4.0 STUDY DESIGN AND OBJECTIVES

The EARMP community monitoring program objectives are to:

1. determine the safety of traditionally harvested food for local consumption;
2. establish long-term monitoring at community sampling areas to assess variability and potential changes over time;
3. build mutually beneficial relationships and engage and involve community members in the gathering of information for the program; and,
4. communicate monitoring results to community members and other stakeholders through reporting, public media, and meetings.

[1] It should be noted that the food guide serving size for meat and alternatives has decreased over time and each serving size recommended is 75 g, which is likely less than what most people consider a serving size. For this study, actual intake amounts were used from the area to complete the Human Health Risk Assessment.

The 2011/2012 data are being used to establish baseline/current conditions for each species sampled in each community area. During future monitoring programs, data will be compared to this baseline in order to assess potential changes over time or temporal trends in chemical concentrations of country foods routinely eaten by residents of the Eastern Athabasca region.

The study design for the EARMP community program will remain consistent over time, to the extent possible, in order to collect a consistent long-term data set. However, the program is also adaptive and may be refined in response to new information or changes associated with the development in the region. Some things to consider moving forward include:

- Community Concerns: The EARMP community program monitors endpoints of highest concern to the communities. Sampling components may be refined or expanded based on the needs of the community members.
- Regional Development: The development of additional uranium mining and milling operations in the region may also influence the overall design of the program.
- EARMP Community Program Results: Changes to the design of the EARMP community program may occur based on results and conclusions from each monitoring year.

A key aspect of a successful community monitoring program is that the sampling locations and media are selected based on their importance to the communities and the sampling is completed by, or with, local residents. It also helps to build trust between the residents of communities and industrial operators in the region. Traditional Ecological Knowledge (TEK) is an essential part of the program. The approach of the EARMP community program is summarized below in Figure 1.

In addition to community input, chemicals of interest are selected based on those identified through the environmental assessment process and monitoring requirements in the region. Uranium mining and milling operations are subject to the *Canadian Environmental Assessment Act* and regulated by the Canadian Nuclear Safety Commission, the Saskatchewan Ministry of Environment, and Environment Canada.

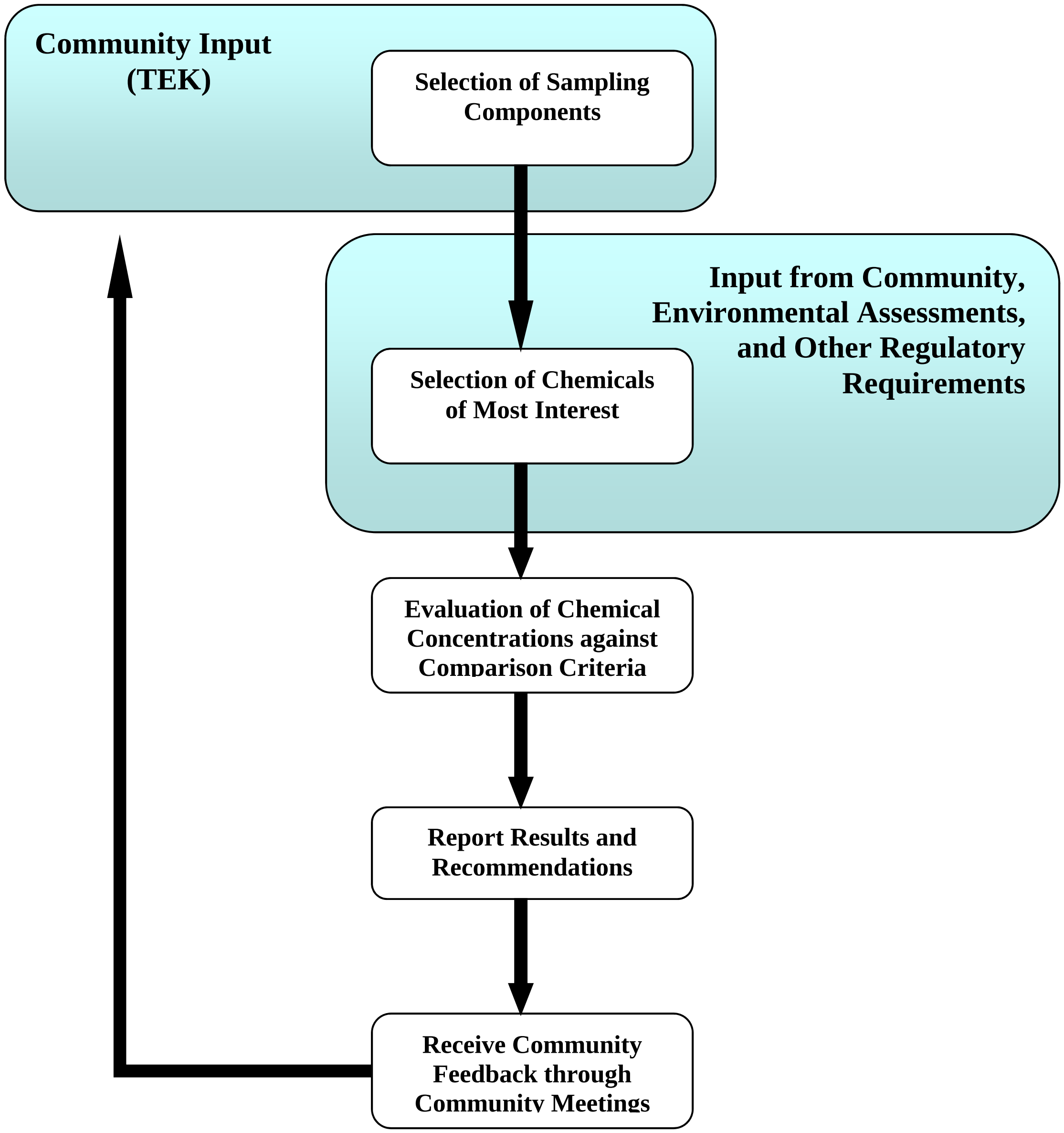


Figure 1
Summary of the EARMP community monitoring program approach.

4.1 Sampling Components

Country foods were selected in consultation with community members and currently include water, fish (lake trout, lake whitefish, and northern pike), berries (blueberry and bog cranberry), and mammals (moose and barren-ground caribou). However, sampling components are meant to be representative of what community members are consuming; therefore, they will likely vary from time to time throughout the long-term monitoring program to include other components (e.g., game birds).

Two dietary surveys have been completed for communities within the region: The Hatchet Lake Dietary Survey (CanNorth 1999) and the Uranium City Country Foods Study (CanNorth 2011). Country foods currently selected for the EARMP community program formed a large percentage of foods identified in these surveys.

4.2 Sampling Locations

Near each community, one station was established from which a water quality sample was obtained. The station locations were decided upon by the CanNorth staff member and the community members conducting the sampling and were determined by accessibility, water depth, and proximity to the community. Fish, berry, and mammal samples were obtained from locations that community members routinely fish, gather, and hunt their traditional country foods. This ensures the sampling program is testing the study areas most relevant to the communities.

4.3 Sampling Frequency

The EARMP community program is intended to be an annual sampling campaign (every fall) for the first five years, after which the sampling frequency will be re-evaluated. Yearly sampling keeps the community program fresh in the mind of community members and allows for thorough training of community members for sample collection.

The target sample size is five samples from each community of each media type. However, some sampling components are harder to obtain, such as moose and barren-ground caribou; thus sample sizes may be lower at some communities in some years. Completing yearly sampling for at least the first five years will allow for a greater number of samples to be collected during the early years of the program. This will allow for a comprehensive data set to be established to which future monitoring data can be compared.

4.4 Laboratory Analysis

All samples are analyzed by the Saskatchewan Research Council (SRC) in Saskatoon. The SRC Analytical Laboratories are certified and accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA). Accreditation ensures that procedures, facilities, and methods conform to ISO/IEC 17025, which is an internationally recognized standard. SRC has an extensive Quality Assurance/Quality Control (QA/QC) program to ensure reliable analytical results. With each set of samples run, SRC tests reference materials, duplicates, and spiked samples. Data results provided by SRC include full QA/QC reports for each sample submission.

Sample analyses completed by SRC included a full suite of parameters for each media type and are described Table 1.

TABLE 1

List of chemicals assessed in country foods for the EARMP community program.

Parameter		Water	Berries	Fish	Mammals
Inorganic Ions	Bicarbonate, Calcium, Carbonate, Chloride, Magnesium, Potassium, Sodium, Sulphate, Hydroxide	✓			
Metals and Trace Elements	Aluminum, Antimony, Arsenic, Barium, Beryllium, Boron, Cadmium, Chromium, Cobalt, Copper, Fluoride Iron, Lead, Manganese, Mercury*, Molybdenum, Nickel, Selenium, Silver, Strontium, Thallium, Tin, Titanium, Uranium, Vanadium, Zinc	✓	✓	✓	✓
Nutrients	Ammonia, Nitrate, Total Nitrogen, Total Kjeldahl Nitrogen, Total Organic Carbon, Phosphorus	✓			
Radionuclides	Lead-210, Polonium-210, Throium-230, Radium-226	✓	✓	✓	✓
Physical Properties	pH, Specific Conductance, Sum of Ions, Total Alkalinity, Total Dissolved Solids, Total Hardness, Total Suspended Solids, Turbidity	✓			
Physical Properties	% Moisture		✓	✓	✓

*Water and fish only.

Metals and trace elements analysis are completed by ICP-MS because it is a fast, multi-elemental technique similar to ICP-AES, but with better detection limits. For most elements, ICP-MS is able to achieve detection limits similar to or lower than Graphite Furnace AAS (Wolf 2005). The analysis of metals and trace elements with ICP-MS also meets MMER requirements (EC 2012). However, it should be noted that even with the use of ICP-MS, concentrations of many metals and trace elements in the EARMP sampling media are at levels below the Method Detection Limit (MDL). In addition, MDL for radionuclides tend to vary based on the mass of the sample. For values that were below the MDL, it is not possible to determine the actual concentration; therefore, all values were set equal to the MDL for computing averages and standard deviations. This is a conservative approach as the actual concentrations could be substantially lower than the MDL.

4.5 Data Assessment Approach

4.5.1 Endpoints

Although a full suite of chemical parameters were measured for each sample, this report focuses on a smaller list of chemicals, which have been identified as the chemicals of most interest for uranium operations by regulatory agencies, environmental assessments, as well as other monitoring programs. Table 2 summarizes the endpoints assessed for the EARMP Community Program.

TABLE 2

Chemical endpoints selected for the EARMP.

Reduced List of Chemicals	
Aluminum	Molybdenum
Ammonia*	Nickel
Arsenic	Polonium-210
Cadmium	Radium-226
Cobalt	Selenium
Copper	Thorium-230
Iron	Uranium
Lead	Vanadium
Lead-210	Zinc
Mercury**	

*For water only.
**Mercury is not associated with the uranium mining and milling process.

Supporting endpoints for the water quality assessment also included organic carbon, specific conductivity, total hardness, and pH.

While mercury is included in Table 2, it is not associated with uranium mining and milling operations. Monitoring programs completed in each mine site's local study area have repeatedly shown that mercury concentrations in the treated effluent are below the Metal Mining Effluent Regulations (MMER) criteria for monitoring[2] (EcoMetrix 2010a, 2010b; SENES 2010, 2012; AREVA 2012). Mercury occurs naturally in the environment and can be found at low levels in most soils and rocks. In northern Saskatchewan, natural deposits associated with lead, zinc, copper, silver, and gold are likely the cause of higher levels of mercury in fish in some lakes (SE 2011). Since

[2] If the concentrations of total mercury is less than 0.1 µg/L in 12 consecutive treated effluent samples, monitoring is not required (MMER, Schedule 5, subsection 4(3))

mercury has been identified as a concern to community members in the Athabasca Region, it has been included in the assessment.

4.5.2 Comparison Criteria

To evaluate the community data, concentrations of the reduced list of chemicals are compared to:

- available guidelines;
- available regional reference data; and,
- available literature and/or Human Health Risk Assessments.

The above comparison criteria is used for each media type to establish if the country foods sampled in each community are within the expected background concentrations for the region, are below guidelines, and are considered safe to eat based on a Human Health Risk Assessment. As additional monitoring phases are completed, assessing changes in potential chemical concentrations over time will be an important component of the program. Data sources for the information used are described below.

4.5.3 Data Sources

4.5.3.1 Guidelines

Federal and provincial guidelines are available for some media types assessed in the EARMP community program. These include the Canadian Drinking Water Quality Guidelines (CDWQGs; HC 2012), the Canadian Water Quality Guidelines (CWQGs) for the protection of freshwater aquatic life (CCME 2013), the Saskatchewan Surface Water Quality Objectives (SSWQO, SE 2006), and the mercury fish consumption guidelines (SE 2011). Since the SSWQO are a direct adoption of the CWQGs, the CWQGs were taken as the primary source of information. For those chemicals where the values depend on hardness, the hardness concentration from each location was used to establish the guideline. Table 3 summarizes the guidelines used for comparison to the EARMP community data.

TABLE 3

Chemistry guidelines used for comparison to EARMP community data.

Chemical	Guideline		
	Water		Fish
	CDWQG (Drinking Water)	CWQG (Environmental)	Consumption
Aluminum	0.2 mg/L	0.1[1] mg/L	-
Ammonia as nitrogen	-	1.04 to 10.3[2] mg/L	-
Arsenic	10 µg/L	5 µg/L	-
Cadmium	0.005 mg/L	Under Review	-
Copper	1.0 mg/L	0.002[3] mg/L	-
Iron	0.3 mg/L	0.3 mg/L	-
Lead	0.01 mg/L	0.001[3] mg/L	-
Lead-210	0.2 Bq/L	-	-
Mercury	1 µg/L	0.026 µg/L	0.5[4] µg/g
Molybdenum	-	0.073 mg/L	-
Nickel	-	0.025[3] mg/L	-
pH	6.5 to 8.5	6.5 to 9.0	-
Radium-226	0.5 Bq/L	-	-
Selenium	0.01 mg/L	0.001 mg/L	-
Uranium	20 µg/L	15 µg/L	-
Zinc	5.0 mg/L	0.03 mg/L	-

[1]Adjusted to a pH > 6.5.
[2]Adjusted according to water temperature and pH of each waterbody.
[3]Adjusted to water hardness in each waterbody.
[4]Some consumption restrictions apply when mercury concentrations are above 0.5 µg/g, therefore, the lower guideline was used for screening the EARMP data.

The cadmium water quality objective is currently under review; therefore, comparisons will not be completed at this time.

4.5.3.2 Regional Reference Data

Regional reference data are available from a number of sources. Reference water and fish chemistry data are available from CanNorth's database. Water and fish chemistry data from 28 reference lakes[3] north of Point's North sampled between 2006 and 2012 were utilized to generate the regional reference values. This included 193 water samples, 166 northern pike samples, 58 lake whitefish samples, and 30 lake trout samples. Water

[3] Reference lakes selected were not influenced by upstream uranium mining and milling operations and included Alsask Lake, Bobby's Lake, Colette Lake, Cree Lake, David Lake, East Spur Lake, Fredette Lake, Henday Lake, Kazz Lake, Konner Lake, Lac Philip, Lake 2, Lake 8, Lake A, Lake B, Lake C, Lower Read Lake, Mallen Lake, Martin Lake, Milliken Lake, Moon Lake, Pasfield Lake, Read Lake, Riou Lake, Ryan Lake, Slush Lake, Wapata Lake, West Spur Lake, and White Lake.

samples were only included for those lakes where fish tissue chemistry data were also available, for a total of 24 lakes. Northern pike data were available from 27 lakes, lake whitefish data were available from 11 lakes, and lake trout were available from 3 lakes. As more data become available, the regional reference data set will become more robust, particularly for the lake trout data set.

Historical data (2008 to 2011) available from the Athabasca Working Group (AWG) Environment Monitoring Program and the Uranium City Country Foods Program (CanNorth and SENES 2012) were utilized to generate the regional reference values for the berry data. Data from the AWG program were also used to establish regional reference ranges for the moose and barren-ground caribou data. In most cases, data from 2000 to 2010 were included in order to have adequate samples sizes; however, there were some situations where obvious and consistent changes in MDLs precluded earlier data from being included. Finally, moose data available from a study completed by Thomas et al. (2005) was used to develop a regional reference range for polonium-210 since AWG data are not available for this parameter. Only those moose samples collected outside uranium mining and milling areas were used from this data set; this included 19 moose samples collected from Meadow Lake, Saskatchewan and 2 moose samples collected near Edmonton, Alberta. Detailed information on the data used to generate the reference ranges, including the sample sizes, is provided in the Appendix B tables.

4.5.3.4 Human Health Risk Assessment

Human Health Risk Assessment is a scientific procedure that is used to assess the potential for adverse health effects to humans caused by a selected group of chemicals that are a concern. Risk assessments involve the application of a staged, formal, and reproducible process that incorporates procedures accepted by regulatory authorities. Through the completion of a Human Health Risk Assessment, it is possible to answer one of the primary questions of the EARMP community program: are country foods safe to eat?

A Human Health Risk Assessment was completed by SENES Consultants Ltd. using the 2011 and 2012 EARMP data and is presented in Appendix D of this report. During future monitoring phases, if the levels of chemicals remain within the range of those measured during the baseline conditions established in 2011/2012, the Human Health Risk Assessment can be used as a basis for concluding if the country foods remain safe to eat. It should be noted that the Human Health Risk Assessment was completed using chemical endpoints typically used for assessments associated with uranium mining. Aluminum, cadmium, iron, vanadium, and zinc, which are chemical endpoints identified for the EARMP community program, were not included in the assessment. As more data become available, and potentially new types of country foods assessed, it may be necessary to complete a new Human Health Risk Assessment.

4.5.4 Data Presentation

The EARMP community data is presented using both summary tables and figures. Descriptive statistics (average, standard deviation, number of samples, and number of values below the MDL) are calculated and reported for each chemical, media, and study area. A graphical presentation of the data is used to compare chemical concentrations to guidelines and/or supermarket concentrations and the regional reference range. Data are only graphed if >50% of the values are above the MDL. During future monitoring campaigns, these graphs will also be used to assess for temporal differences.

The regional reference range is defined as within two standard deviations of the average. Assuming a normal distribution, 95% of the data from the regional reference areas would be expected to fall within this range. Thus, this provides a good reference to determine if the EARMP community data falls within the expected concentrations for the region.

Figure 2 shows a hypothetical figure that will be used during future monitoring programs. This figure provides information on guidelines and/or supermarket values, the regional reference range, and temporal changes in a single image for each chemical in each sampling component.

The blue line represents a guideline concentration (e.g., drinking water guidelines). The shaded area represents the regional reference range (i.e., reference average ± 2 standard deviations). The average concentration in the EARMP community sample is shown as a circle for the baseline year and a triangle for those sampling years following the baseline data collection. The error bars represent one standard deviation. The graph will be a very useful visual tool for assessing the EARMP community data against the comparison criteria at a glance. It will also allow for a qualitative assessment of increasing or decreasing concentrations of individual chemicals over time in each community.

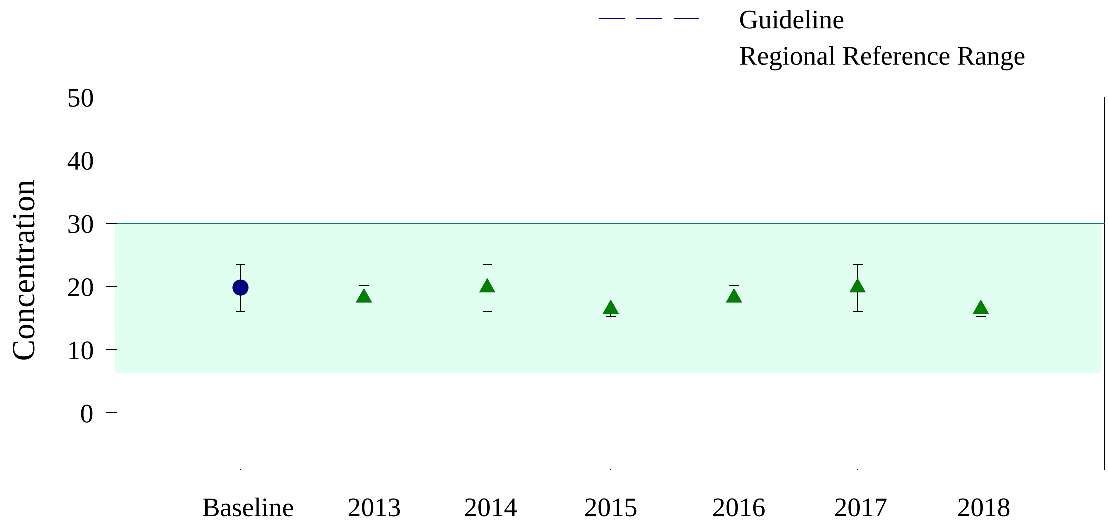


Figure 2
Example of how the EARMP community program results will be presented graphically during future monitoring campaigns.

5.0 REPORTING AND COMMUNICATION PLAN

A report will be completed to assess the EARMP community data following each monitoring year. The report will be structured so that the most relevant information is presented in the main document, with the detailed analysis presented in appendices. This will allow all potential audiences access to the information most relevant to them. The report, along with the raw data, will be available for download from the EARMP website: www.earmp.ca

In addition to the report, community visits will be completed to present the results of the monitoring program. Community visits may include presentations, distribution of summary brochures, school visits, and/or radio ads. The community visits will be an opportunity to receive feedback on the program and encourage to further involvement from community members. Feedback on the program can also be provided through the EARMP website. In 2012 and 2013, the EARMP has taken the opportunity to engage communities about their environment while also distributing information about the new project.

6.0 LITERATURE CITED

Aboriginal Affairs and Northern Development Canada (AANDC). 2012. Website: http://www.aadnc-aandc.gc.ca/. Accessed October 2012.

AREVA Resources Canada Inc. (AREVA). 2012. McClean Lake Operation Technical Information Document Environmental Performance.

Assembly of First Nations Environmental Stewardship Unit (AFN). 2007. Traditional Foods are they safe for consumption? Website: http://www.afn.ca/index.php/en/honoring-earth#6. Accessed November 16th, 2013.

Batal M., K. Gray-Donald, and H.V. Kuhnlein. 2005. Estimation of traditional food intake in indigenous communities in Denendeh and the Yukon. International Journal of Circumpolar Health. 64:46-54.

Blanchet, C., E. Dewailly, R. Ayotte, S. Bruneau, O. Receveur, and B. Holub. 2000. Contribution of selected traditional and market foods to the diet of Nunavik Inuit women. Canadian Journal of Dietetic Practice and Research. 61(2):50-59.

Canadian Council of Ministers of the Environment (CCME). 2013. Canadian Environmental Quality Guidelines summary table. Website: http://st-ts.ccme.ca/. Accessed November 2013.

Canada North Environmental Services (CanNorth). 1999. Hatchet Lake dietary survey. Prepared for the Atomic Energy Control Board, Ottawa, Ontario.

Canada North Environmental Services (CanNorth). 2011. Country foods study Uranium City, Saskatchewan. Year 1. Prepared for Cameco Corporation, Saskatoon, Saskatchewan.

Canada North Environmental Services and SENES Consultants Ltd. (CanNorth and SENES). 2012. Uranium City country foods study year 2. Prepared for Cameco Corporation, Saskatoon, Saskatchewan.

EcoMetrix Incorporated (EcoMetrix). 2010a. Key Lake Operation – Status of the Environment Report 2005 to 2009. Prepared for Cameco Corporation, Saskatoon, Saskatchewan.

EcoMetrix Incorporated (EcoMetrix). 2010b. McArthur River Operation: Status of the Environment Report 2005 to 2009. Prepared for Cameco Corporation, Saskatoon, Saskatchewan

Health Canada (HC). 2007. Canada food guide "Eating Well with Canada's Food Guide - First Nations, Inuit and Métis". Publications Health Canada. Ottawa, Ontario.

Health Canada (HC). 2012. Guidelines for Canadian drinking water quality. Health Canada, Ottawa, Canada. Website: http://www.hc-sc.gc.ca/ewh-semt/water-eau/index-eng.php. Accessed June 25th, 2013.

Health and Welfare Canada (HWC). 1987. Condensed Canadian nutrient file rev 1987. Health Protection Branch, Ottawa, Ontario.

Johnson, D., L. Kershaw, A. MacKinnon, and J. Pojar (eds.). 1995. Plants of the Western Boreal Forest and Aspen Parkland. Lone Pine Publishing and the Canadian Forest Service. Canada.

Kuhnlein H.V., O. Receveur, N.E. Morrison, D.M. Appavoo, R. Soueida, and P. Pierrot. 1995. Dietary nutrients of Sahtú Dene/Métis vary by food source, season and age. Ecol. of Food and Nutr. 34(3): 183-95.

Kuhnlein, H.V. and O. Receveur. 1996. Dietary change and traditional food systems of Indigenous Peoples. Annu. Rev. Nutr. 16: 417–442.

North West Territories Health and Social Services (NWT). 2002. Northwest Territories Food Guide Traditional Foods. Website: http://www.hss.gov.nt.ca/publications/reports/northwest-territories-traditional-food-fact-sheets-series. Accessed November 13th, 2013.

North West Territories Health and Social Services (NWT). 2005. Northwest Territories Food Guide. Website: http://www.hss.gov.nt.ca/publications/posters-flyers/nwt-food-guide. Accessed November 13th, 2013.

North West Territories Health and Social Services (NWT). 2011. Health benefits of fish. Website: http://www.hss.gov.nt.ca/publications/brochures-fact-sheets/health-benefits-fish. Accessed November 13th, 2013.

Population Health Unit-Athabasca Health Authority (PHU AHA). 2005. Moose and safe choice in traditional food. Special supplement to Opportunity North, Spring, 2005.

Prince Albert Grand Council (PAGC). 2008. Website: E-culture: http://eculture.pagc.sk.ca/eculture.php?pid=COMMUNITIES&tp=lnk&language=&ver=. Accessed December 5th, 2012.

Prince Albert Grand Council (PAGC). 2012. Website: http://www.pagc.sk.ca/. Accessed December 2012.

Receveur O., M. Boulay, H.V. Kuhnlein. 1997. Decreasing traditional food use affects diet quality for adult Dene/Metis in 16 communities of the Canadian Northwest Territories. Journal of Nutrition. 127:2179–2186.

Saskatchewan Environment (SE). 2006. Surface water quality objectives (SSWQO). Environmental Protection Branch, Regina, Saskatchewan.

Saskatchewan Ministry of the Environment (SE). 2011. Mercury in Saskatchewan fish: guidelines for consumption. Website: http://www.environment.gov.sk.ca/ Default.aspx?DN=9979e82e-94b6-405a-a896-2bcb3b9ea442. Accessed July 24th, 2013.

Saskatchewan Ministry of Municipal Affairs. (SMMA). 2012. Website: http://www.municipal.gov.sk.ca/Programs-Services/Municipal-Directory. Accessed November 25th, 2012.

SENES Consultants Limited (SENES). 2010. Rabbit Lake Operation integrated environmental risk assessment and state of the environment report 2005 to 2009. Prepared for Cameco Corporation, Saskatoon, Saskatchewan.

SENES Consultants Limited (SENES). 2012. Risk evaluation for Uranium City country foods study. Prepared for Cameco Corporation, Saskatoon, Saskatchewan.

Statistics Canada. (SC) 2012. Census profile: Stony Rapids. Website: http://www12.statcan.gc.ca/censusrecensement/2011/dppd/prof/details/page.cfm?Lang=E&Geo1=CSD&Code1=4718100&Geo2=PR&Code2=47&Data=Count&SearchText=Stony%20Rapids&SearchType=Begins&SearchPR=01&B1=All&GeoLevel=PR&GeoCode=4718100&TABID=1. Accessed December 2012.

Thomas, P., Irvine, J., Lyster, J., and R. Beaulieu. 2005. Radionuclides and trace metals in Canadian moose near uranium mines: comparison of radiation doses and food chain transfer with cattle and caribou. Health Physics. 88 (5): 423-438.

Wein, E.E., J.H. Sabry, and F.T. Evers. 1991. Food consumption patterns and use of country foods by native Canadians near Wood Buffalo National Park, Canada. Arctic. 44:196–205.

Wein, E.E., and M.M.R. Freeman. 1995. Frequency of traditional food use by three Yukon First Nations living in four communities. Arctic. 48:161-171.

Wolf, R.E. 2005. Introduction to ICP-MS. United States Geological Survey/Central-Region/Crustal Imaging & Characterization Team, March 2005.

Yi, O., E.M. Jovel, G.H. Towers, T.R. Wahbe, and D. Cho. 2007. Antioxidant and antimicrobial activities of Native Rosa Sp. from British Columbia, Canada. International Journal of Food Sciences and Nutrition. 58(3): 178-189.

APPENDIX B

DETAILED DATA ANALYSIS

APPENDIX B: DETAILED DATA ANALYSIS

1.0 WATER QUALITY

To evaluate the EARMP community water quality data, concentrations of the reduced chemical list were compared to/used in:

1. Canadian Drinking Water Quality Guidelines (CDWQG; HC 2012) and the Canadian Water Quality Guidelines (CWQG) for the protection of freshwater aquatic life (CCME 2013);
2. regional reference data from CanNorth's database; and,
3. a Human Health Risk Assessment (HHRA).

Summaries of available guidelines, regional reference data, and the 2011 and 2012 EARMP community data are presented in Appendix B, Figure 1 and Table 1. Data were graphed if >50% of concentrations for a certain chemical were above the MDL in at least one community. If available, the CDWQG are presented on the graphs since the EARMP community program is most concerned with human health. If CDWQG are not available for a certain chemical, then the CWQG were included on the graph. The raw water chemistry results are presented in Appendix C, Tables 1 and 2.

Concentrations of most chemicals were very low and in the case of copper, lead, mercury, selenium, zinc, lead-210, polonium-210, thorium-230, cobalt, and vanadium, the concentrations were too low for the laboratory to measure in nearly all of the samples (i.e., below the method detection limit (MDL)). In both 2011 and 2012, all chemical concentrations measured near the communities were below available CDWQG or CWQG (Figure 1 and Table 1). In addition, most chemicals were within the expected range for the region, except uranium concentrations measured in water samples collected from the Fredette River near Uranium City in 2011 and 2012. Uranium concentrations in water collected near Uranium City (3.5 µg/L in 2011 and 1.3 µg/L in 2012) were higher than the regional reference range (0.2 µg/L ± 0.31), but were well below the CDWQG (20 µg/L) and the CWQG (15 µg/L).

The HHRA completed using water quality data collected during the 2011 and 2012 EARMP studies found that the water chemistry does not pose a risk to human health in any of the communities. The HHRA is presented in detail in Appendix D.

2.0 FISH CHEMISTRY

To evaluate the EARMP community fish chemistry data, concentrations of the reduced chemical list were compared to/used in:

1. the mercury in fish guidelines (SE 2011);
2. regional reference data from CanNorth's database; and,
3. a HHRA.

Summaries of available chemical concentrations measured in supermarket fish, regional reference data, and the 2011 and 2012 EARMP community data are presented in Appendix B, Figures 2 to 4 and Table 2. Data were graphed if >50% of concentrations for a certain chemical were above the MDL in at least one community. The raw fish chemistry results are presented in Appendix C, Tables 3 to 12.

The only available guideline is for mercury and the guideline states that fish containing less than 0.5 µg/g mercury can be eaten in unlimited amounts (SE 2011). One lake trout sample collected from Stony Rapids had a slightly higher mercury concentration of 0.57 µg/g (Appendix C, Table 11). According to the guidelines, fish containing mercury concentrations between 0.5 µg/g and 1.0 µg/g should be eaten in limited amounts and should not be eaten by children or pregnant women (SE 2011). In general, mercury concentrations tend to accumulate in older fish as well as fish higher in the food chain, such as northern pike and lake trout. The remainder of the fish sampled during the 2011 and 2012 EARMP community program contained mercury levels below 0.5 µg/g and are safe to eat in unlimited quantities.

Chemical concentrations in the community fish samples were often so low that the laboratory could not measure the level. This was the case for aluminum, cadmium, lead, molybdenum, nickel, uranium, lead-210, radium-226, thorium-230, and vanadium in over half of the samples assessed in most communities.

Average arsenic and selenium concentrations at some communities were higher than the regional reference range (Appendix B, Figures 2 to 4). Average arsenic concentrations were slightly higher in all three fish species sampled in Camsell Portage as compared to the regional reference range as well as in lake whitefish from Fond du Lac. In Camsell Portage, average arsenic concentrations measured 0.11 ± 0.025 µg/g in northern pike, 0.11 ± 0.071 µg/g in lake trout, and 0.30 ± 0.081 µg/g in lake whitefish (Appendix B, Table 2). In the Fond du Lac, average arsenic concentrations measured 0.24 ± 0.136 µg/g in lake whitefish. The upper reference range bound for lake trout, northern pike, and lake whitefish was 0.086 µg/g, 0.098 µg/g, and 0.176, respectively.

Average selenium concentrations were slightly higher in lake whitefish (0.63 ± 0.722 µg/g) and northern pike (0.46 ± 0.128 µg/g) from Uranium City (Crackingstone Inlet) than the regional references (0.30 ± 0.156 µg/g for lake whitefish and 0.21 ± 0.104 µg/g for northern pike). The elevated average selenium concentration in lake whitefish is largely due to one fish collected in 2011 from Crackingstone Inlet with a concentration of 2.6 µg/g. When this fish is removed from the assessment, the average selenium concentration in lake whitefish falls to 0.41 ± 0.214 µg/g, which is comparable to regional reference values.

A HHRA was completed using all components of the diet, including the community fish chemistry information, and determined that the fish in each community sampling area are safe to eat (Appendix D). The assessment did not include the lake whitefish with the highest level of selenium as it was considered to be unusually high in comparison to the remaining dataset (three times higher than the next highest selenium concentration in fish from the area; Appendix D). However, using the highest concentration of chemicals is likely an overestimation of exposure as it is unlikely that residents would be eating fish with the highest concentration of selenium in all of their foods. Upon a follow-up evaluation using the 95% upper confidence limits of the complete dataset (i.e., even the high fish) and the Uranium City fish consumption rates, the estimated daily intake of selenium remains below the Toxicity Reference Value for both adults and children (SENES 2014).

3.0 BERRY CHEMISTRY

To evaluate the EARMP community berry chemistry data, concentrations of the reduced chemical list were compared to/used in:

1. Regional reference data; and,
2. a HHRA.

Summaries of available chemical concentrations measured in supermarket berries, regional reference data, and the 2011 and 2012 EARMP community data are presented in Appendix B, Figures 5 and 6 and Tables 3 and 4. Data were graphed if >50% of concentrations for a certain chemical were above the MDL in at least one community. The raw berry chemistry results are presented in Appendix C, Tables 13 and 14.

Similar to the water and fish data, concentrations of chemicals in the berries were often too low for the laboratory to measure. This included concentrations of cadmium, selenium, uranium, thorium-230, arsenic, and vanadium which were below measurable levels in more than half of the samples from most communities.

Lead-210 activity levels in the bog cranberry samples from Camsell Portage and Uranium City were variable and were higher than regional reference levels (Appendix B, Table 4). In addition, there was a large amount of variation in radium-226 activity levels measured in blueberry samples collected near Uranium City and the average of 0.022 ± 0.044 Bq/g was higher than the average regional reference of 0.003 ± 0.0023 Bq/g. The average concentrations of all other chemicals were within the regional reference ranges in both blueberries and bog cranberries.

The HHRA completed for the Eastern Athabasca Region included the blueberry and bog cranberry chemistry information and concluded that the berries are safe to eat (Appendix D).

4.0 MAMMAL CHEMISTRY

To evaluate the EARMP community moose and barren-ground caribou chemistry data, concentrations of the chemical list were compared to/used in:

1. Regional reference data; and,
2. a HHRA.

Summaries of available chemical concentrations measured in regional reference data and the 2011 and 2012 EARMP community data are presented in Appendix B, Figures 7 and 8, and Tables 5 and 6. Data were graphed if >50% of concentrations for a certain chemical were above the MDL in at least one community. The raw mammal chemistry results are presented in Appendix C, Tables 15 and 16.

Concentrations of chemicals that were too low for the laboratory to measure varied slightly between the barren-ground caribou and moose meat samples. In barren-ground caribou meat, concentrations of aluminum, molybdenum, nickel, uranium, lead-210, radium-226, thorium-230, and vanadium were below MDLs in more than half of the samples. In moose meat, these same chemicals as well as arsenic were often too low for the laboratory to measure, while aluminum was measurable in more than half the samples from Camsell Portage.

Although within the regional reference range, average lead concentrations were higher in Black Lake as compared to the other communities (Appendix B, Figure 7). In particular, two lead measurements (0.31 µg/g and 0.48 µg/g) were much higher than other samples (range from <0.002 µg/g to 0.013 µg/g), which could potentially be from contamination due to lead shot used in hunting (Tsuji et al. 2009).

Average radium-226 activity levels at Black Lake and Stony Rapids appear higher than the regional reference range, but the majority of values in both 2011 and 2012 were lower than the MDL. The results are skewed because of differences in MDLs between years (Appendix C, Table 15). The average cadmium concentration in barren-ground caribou from Fond du Lac (0.015 ± 0.0414 µg/g) was slightly higher than the regional reference range (upper limit of 0.011 µg/g). However, this was the result of 1 of the 11 samples having a higher concentration (Appendix C, Table 15). Cadmium was not included as a constituent of potential concern in the HHRA, but a risk assessment conducted on moose residing in northern British Columbia concluded that consumption of moose muscle should be not be restricted at any age based on cadmium concentrations of 0.03 µg/g (Jinn and Joseph-Quinn 2003). Special attention will be paid to cadmium concentrations measured in barren-ground caribou tissue from this location during future monitoring.

The HHRA completed for the Eastern Athabasca region included the moose and barren-ground chemistry information collected from each community and concluded that both of these species are safe to eat (Appendix D).

5.0 LITERATURE CITED

Canadian Council of Ministers of the Environment (CCME). 2013. Canadian Environmental Quality Guidelines summary table. Website: http://st-ts.ccme.ca/. Accessed November 2013.

Health Canada (HC). 2012 Guidelines for Canadian Drinking Water Quality. Health Canada, Ottawa, Canada. Website: http://www.hc-sc.gc.ca/ewh-semt/water-eau/index-eng.php. Accessed June 25th, 2013.

Jinn, A. and K.M. Joseph-Quinn. 2003. Consumption guideline for cadmium in moose meat in northern British Columbia, Canada. Circumpolar Health. 169-173.

Thomas, P., Irvine, J., Lyster, J., and R. Beaulieu. 2005. Radionuclides and trace metals in Canadian moose near uranium mines: comparison of radiation doses and food chain transfer with cattle and caribou. Health Physics. 88 (5): 423-438.

Tsuji, L.J.S., Wainman, R.K., Jayasinghe, E.P., VanSpronsen, E.P., and E.N. Liverda. 2009. Determining tissue-lead levels in large game mammals harvested with lead bullets: human health concerns. Bull. Environ. Contam. Toxicol. 82: 435-439.

Saskatchewan Ministry of the Environment (SE). 2011. Mercury in Saskatchewan fish: guidelines for consumption. Website: http://www.environment.gov.sk.ca/adx/aspx/adxGetMedia.aspx?DocID=2a256b90-19c2-4865-9e89-a5723f5b990c&MediaID=5066&Filename=Mercury+in+Fish+Guide+June+2011.pdf&l=English. Accessed July 24th, 2013.

SENES Consultants (SENES). 2014. Selenium in fish tissue associated with the Eastern Athabasca Monitoring Program. Technical Memorandum. Prepared for Canada North Environmental Services, Saskatoon, Saskatchewan.

LIST OF FIGURES

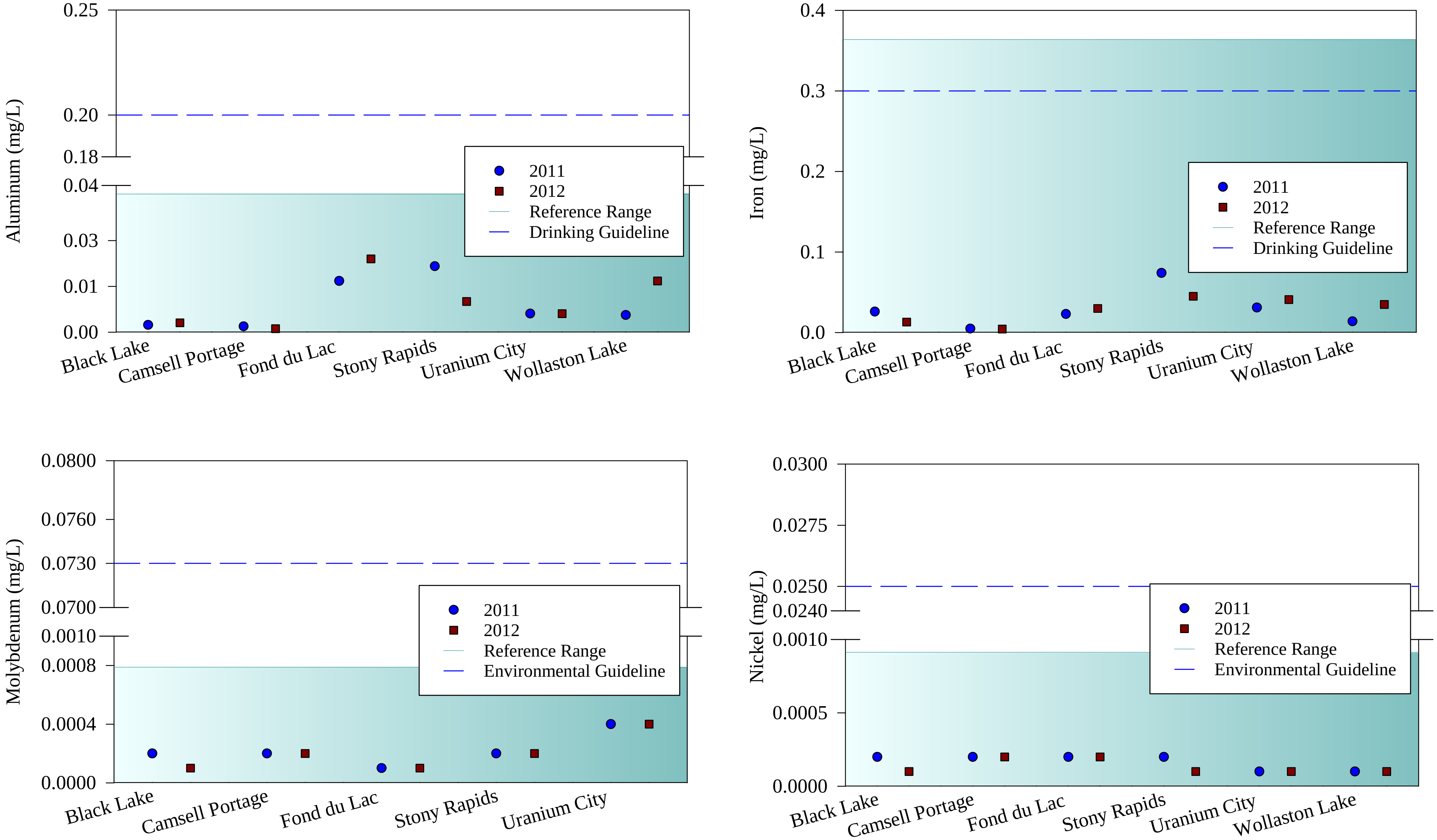


Figure 1
Chemicals in water from the EARMP community study areas collected in 2011 and 2012.

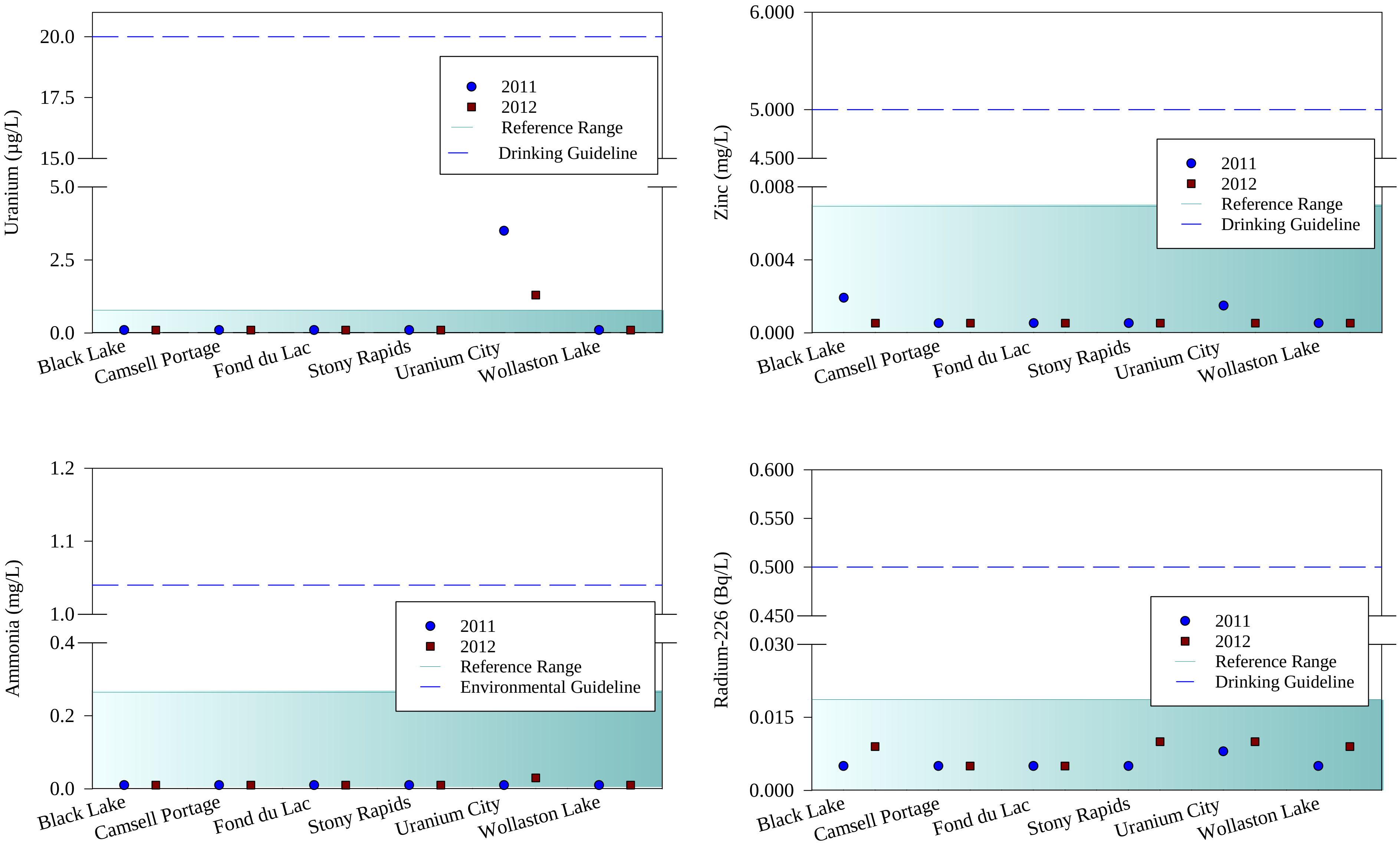
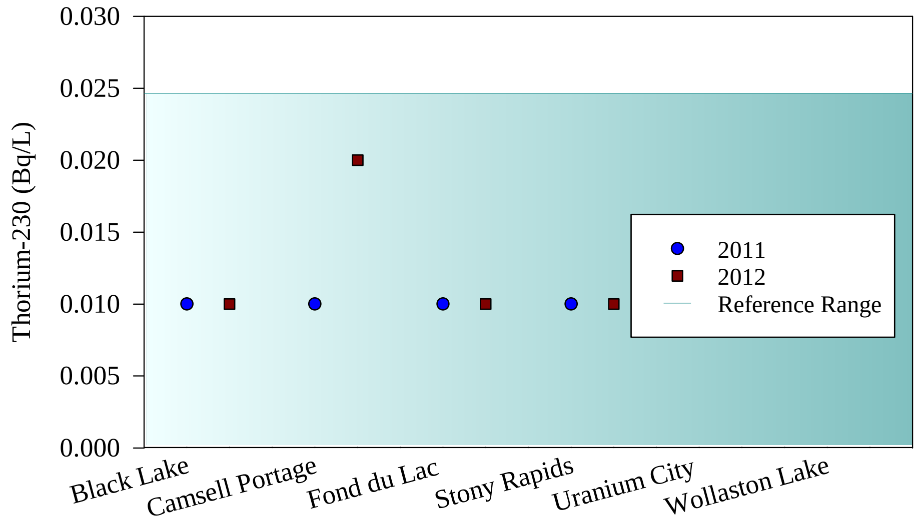


Figure 1

Chemicals in water from the EARMP community study areas collected in 2011 and 2012.



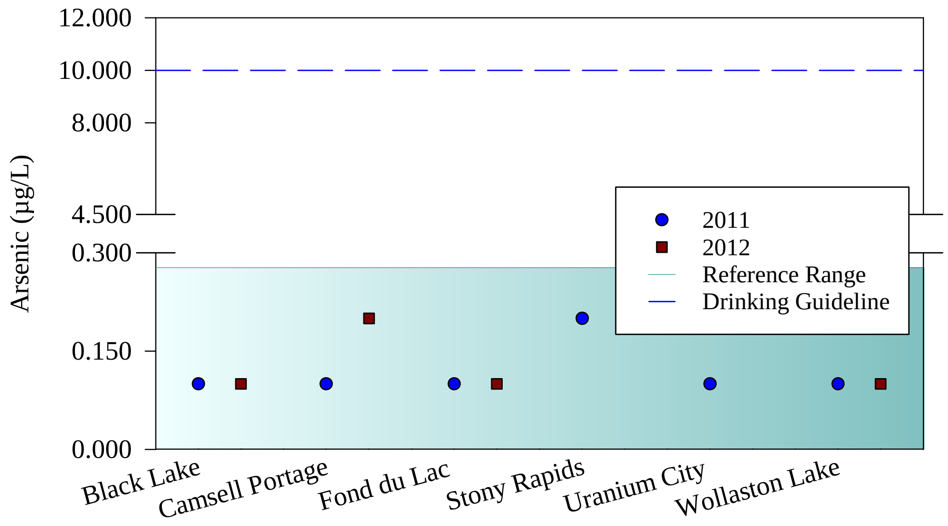


Figure 1
Chemicals in water from the EARMP community study areas collected in 2011 and 2012.

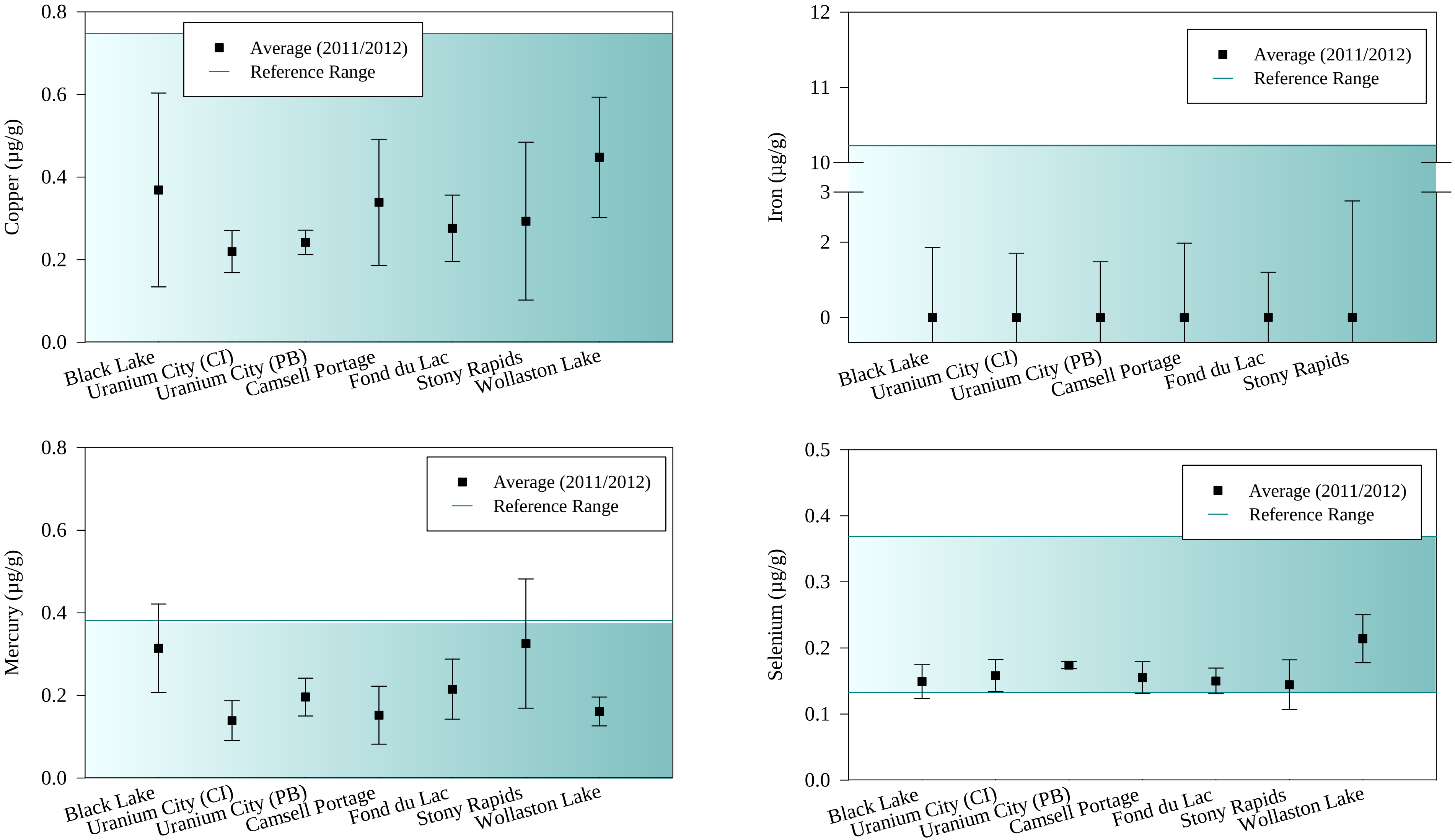


Figure 2
Chemicals in lake trout from the EARMP community study areas collected in 2011 and 2012.

Notes: Error bars are standard deviations.
CI = Crackingstone Inlet
PB = Prospector's Bay

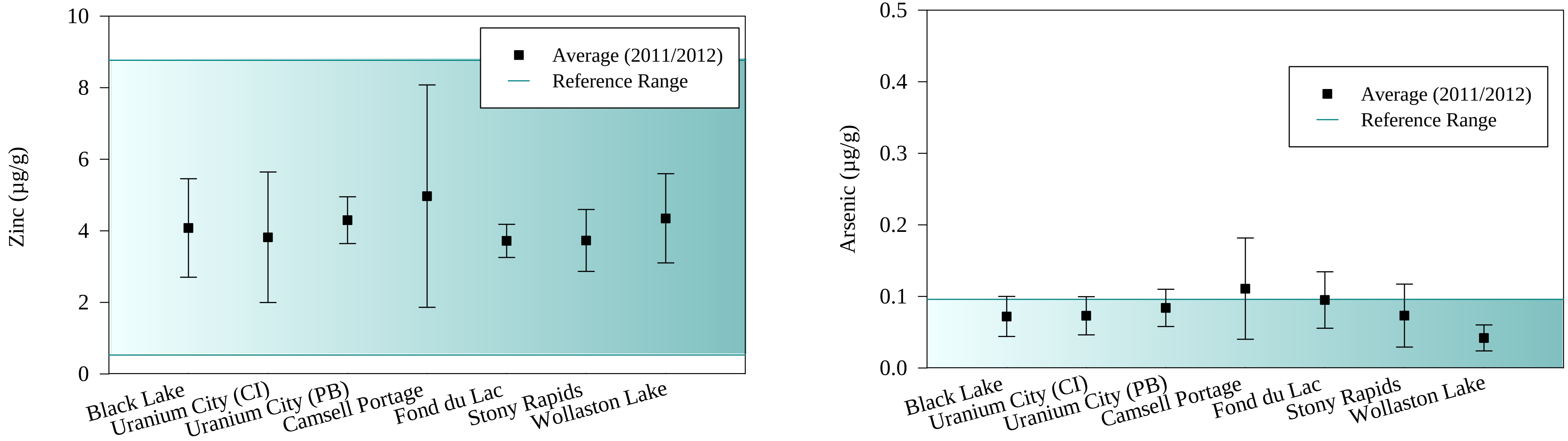


Figure 2
Chemicals in lake trout from the EARMP community study areas collected in 2011 and 2012.

Notes: Error bars are standard deviations.
CI = Crackingstone Inlet
PB = Prospector's Bay

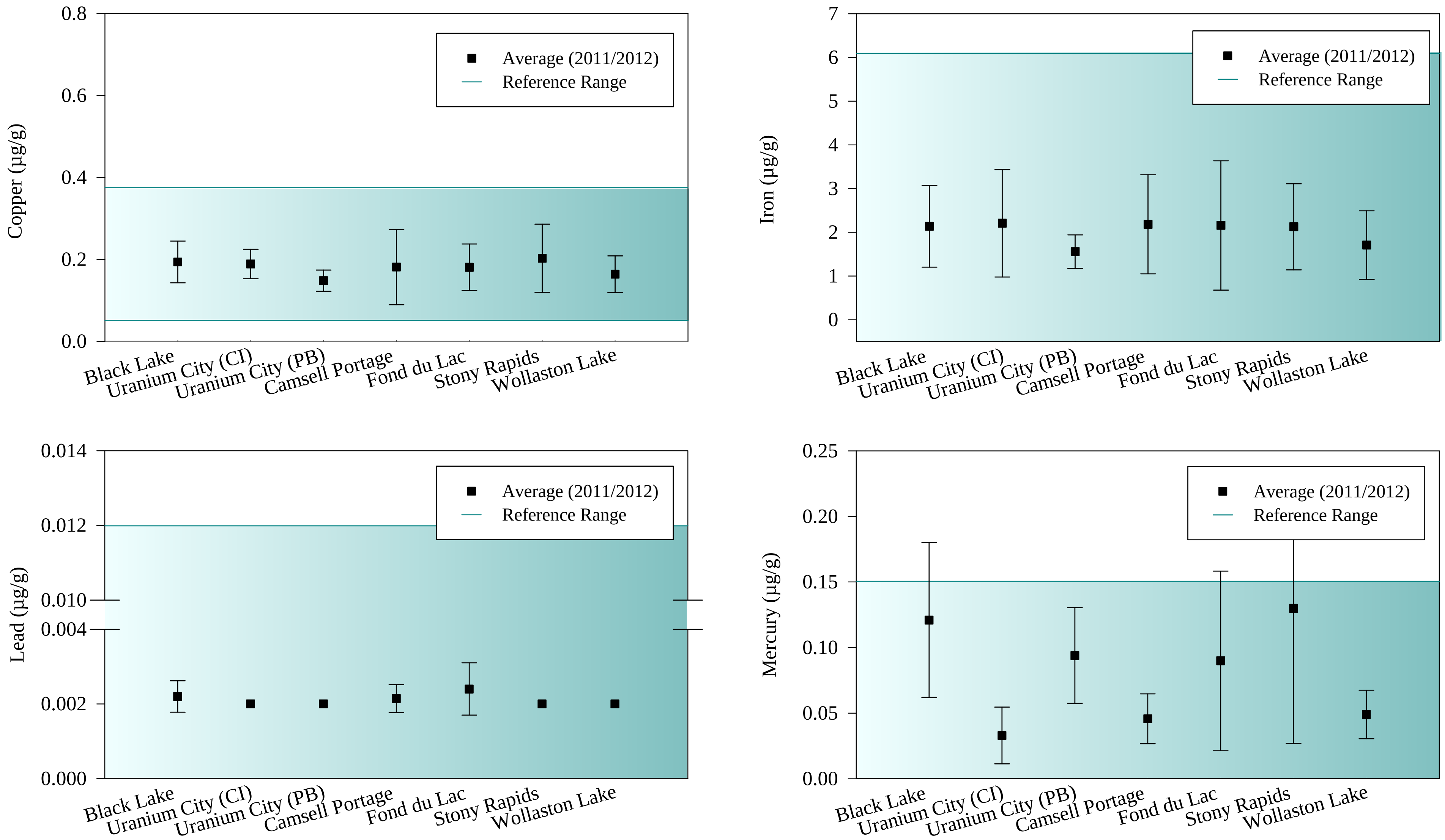


Figure 3
Chemicals in lake whitefish from the EARMP community study areas collected in 2011 and 2012.

Notes: Error bars are standard deviations.
CI = Crackingstone Inlet
PB = Prospector's Bay

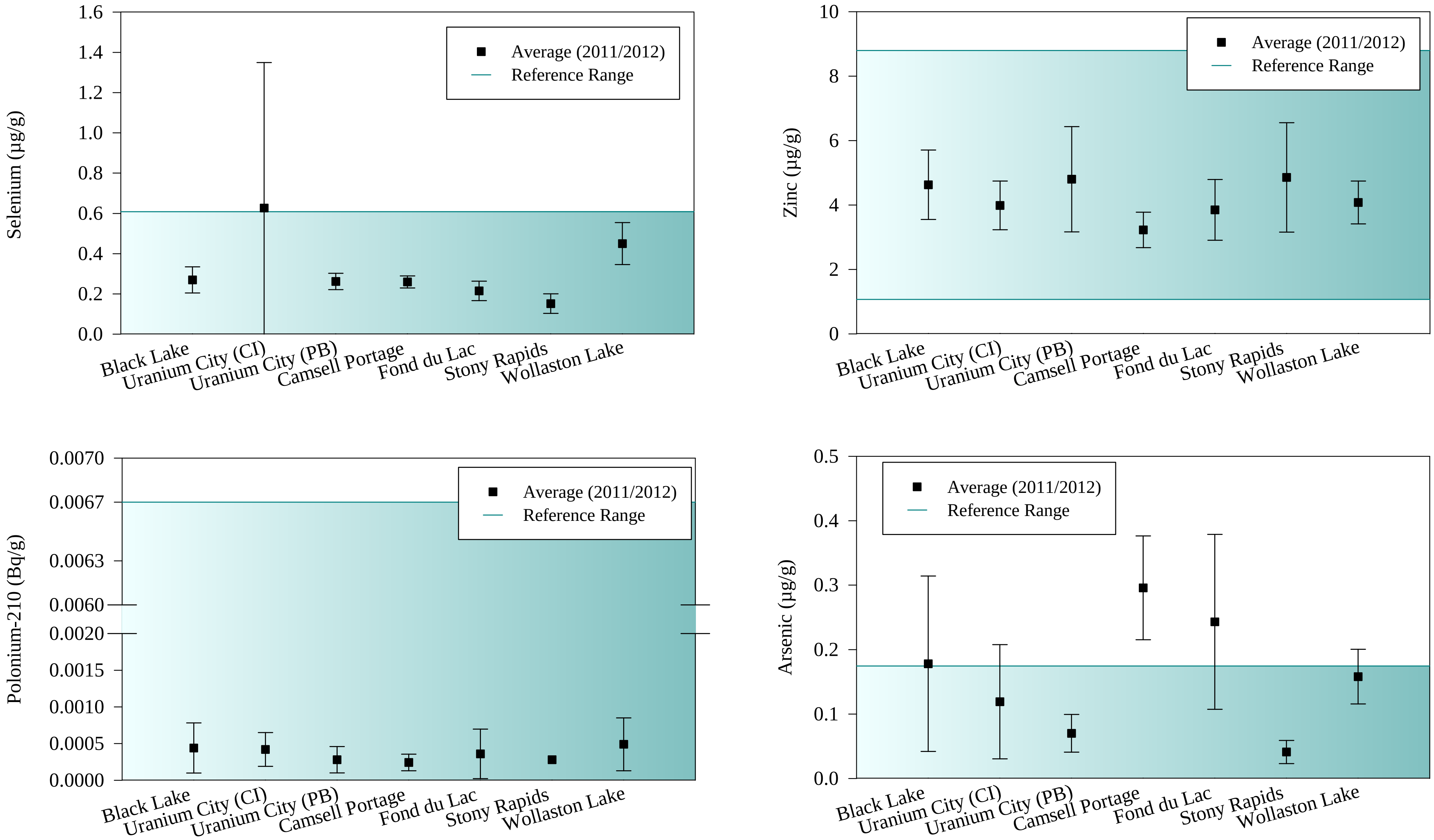


Figure 3
Chemicals in lake whitefish from the EARMP community study areas collected in 2011 and 2012.

Notes: Error bars are standard deviations.
CI = Crackingstone Inlet
PB = Prospector's Bay

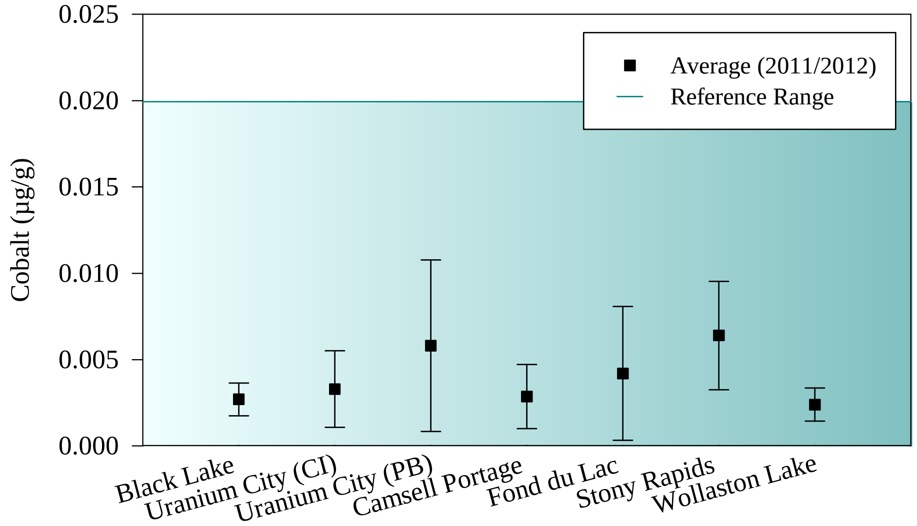


Figure 3
Chemicals in lake whitefish from the EARMP community study areas collected in 2011 and 2012.

Notes: Error bars are standard deviations.
CI = Crackingstone Inlet
PB = Prospector's Bay

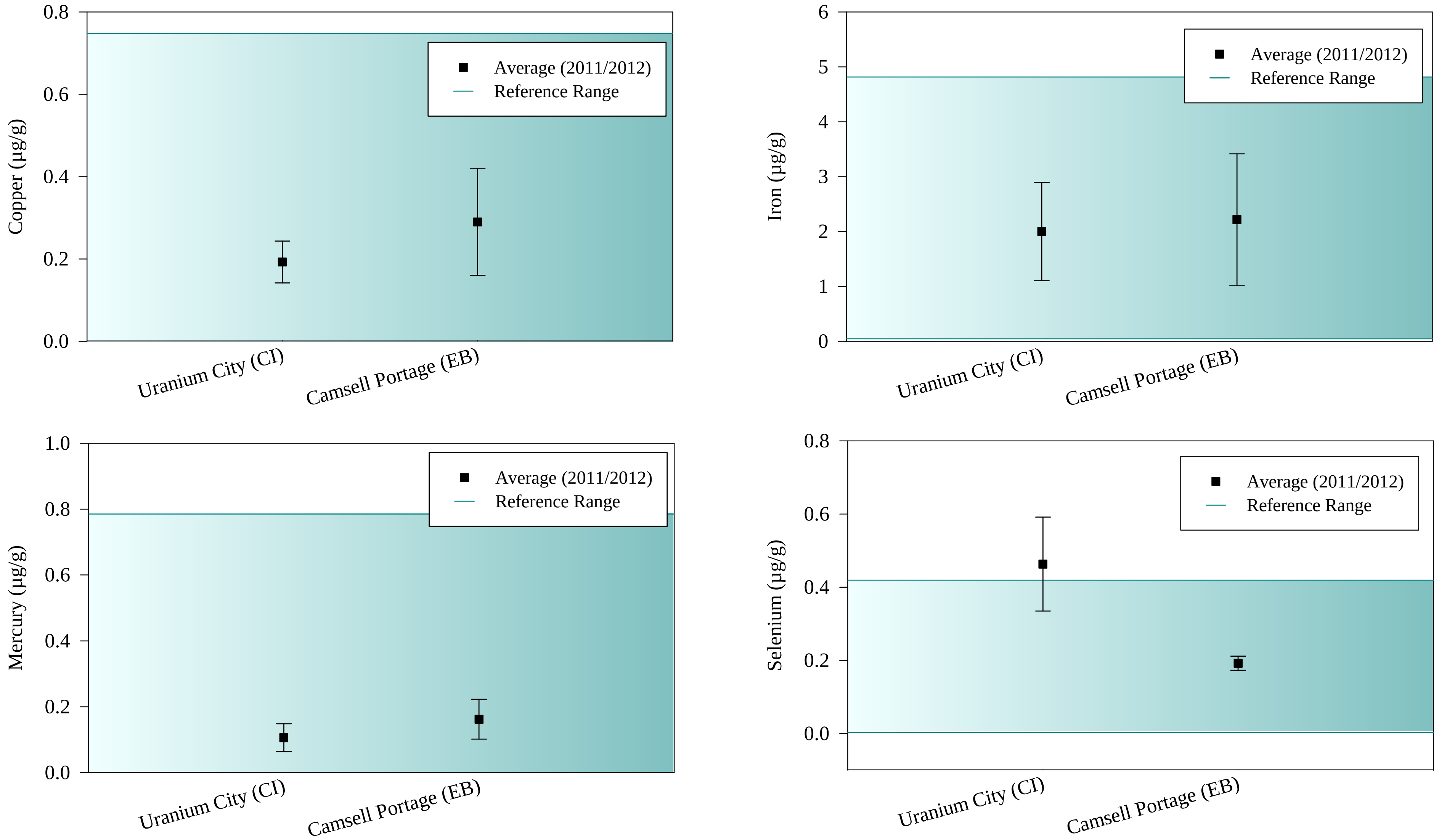


Figure 4
Chemicals in northern pike from the EARMP community study areas collected in 2011 and 2012.

Notes: Error bars are standard deviations.
CI = Crackingstone Inlet
EB = Ellis Bay

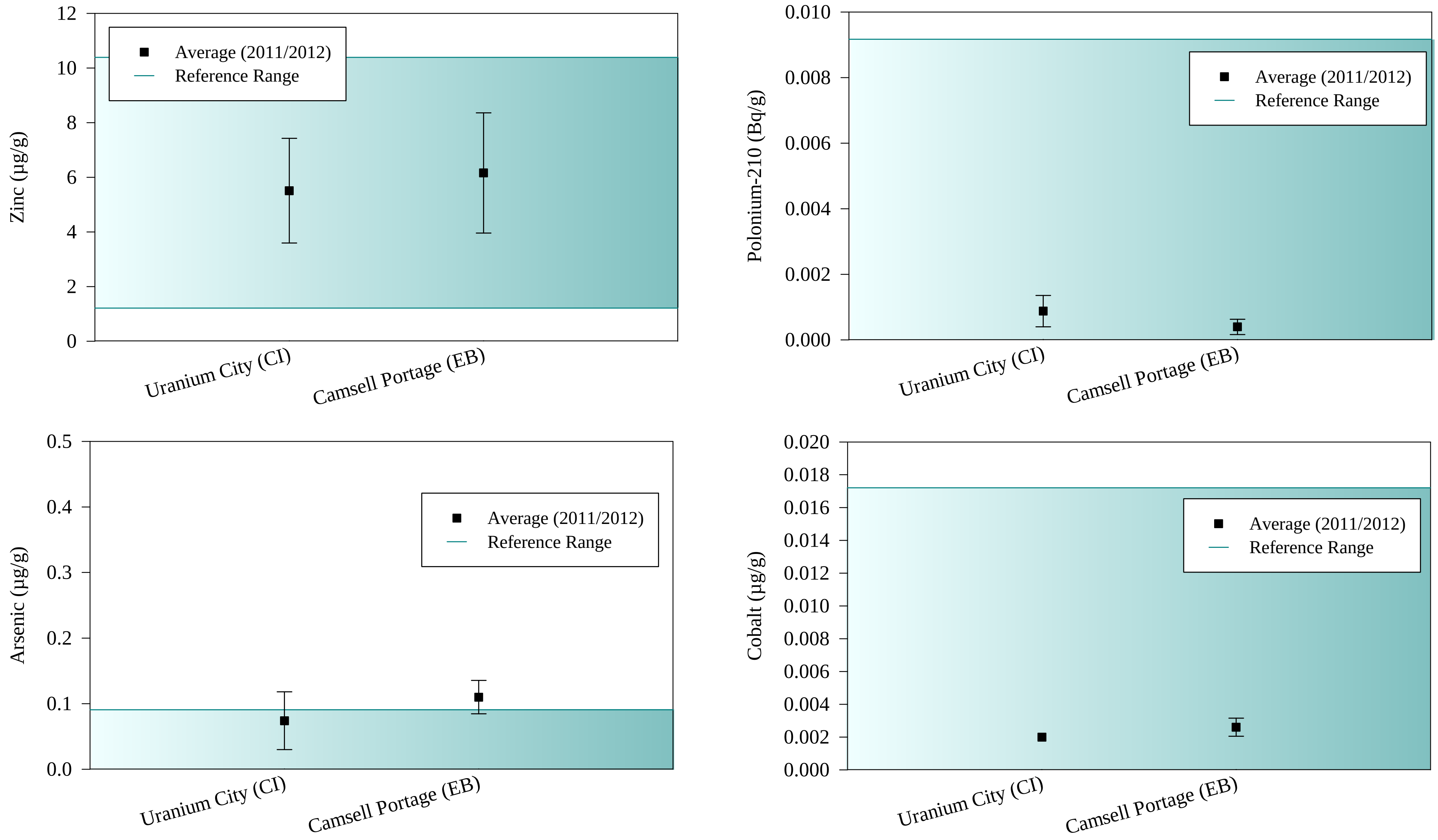


Figure 4
Chemicals in northern pike from the EARMP community study areas collected in 2011 and 2012.

Notes: Error bars are standard deviations.
CI = Crackingstone Inlet
EB = Ellis Bay

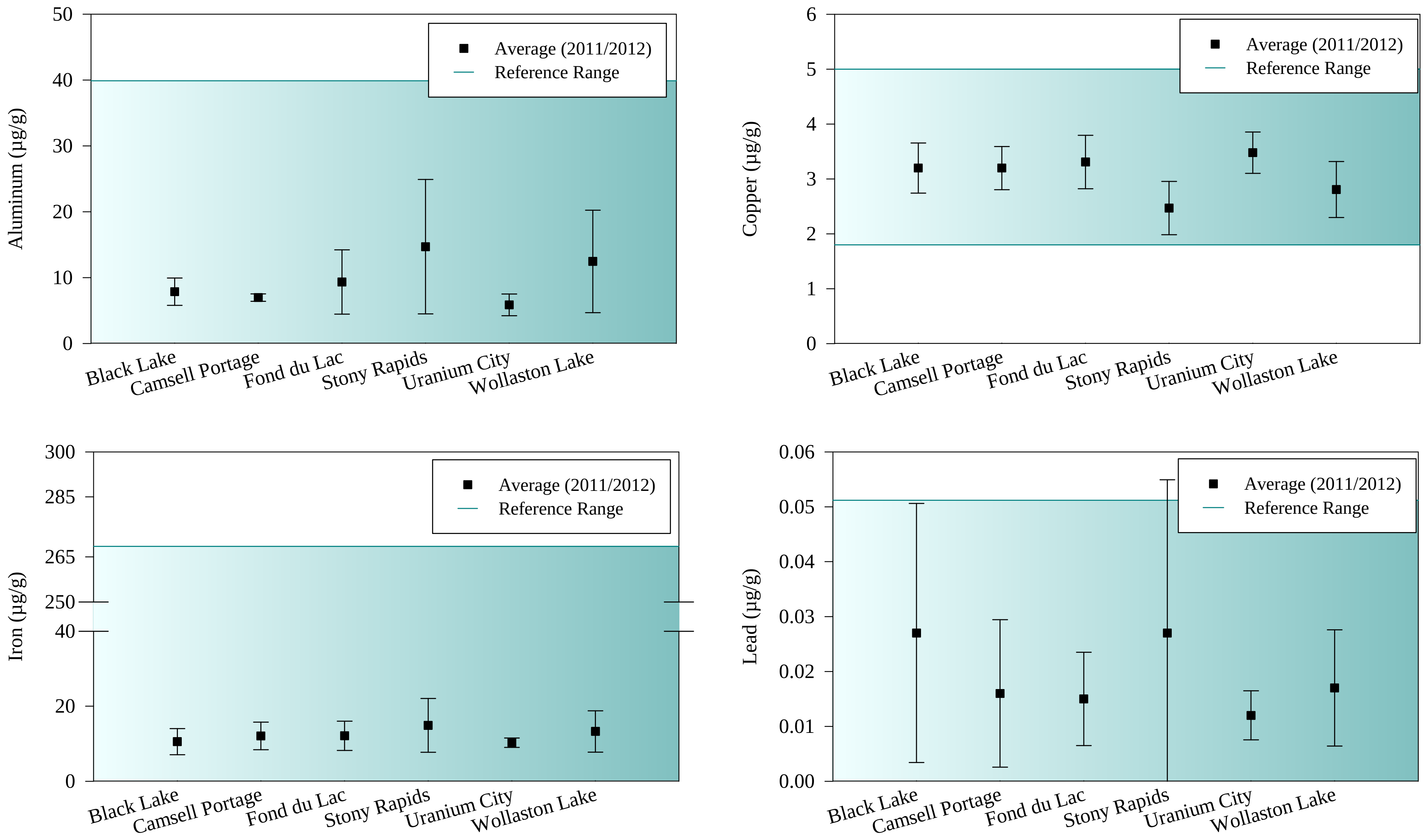


Figure 5
Chemicals in blueberries from the EARMP community study areas collected in 2011 and 2012.

Note: Error bars are standard deviations.

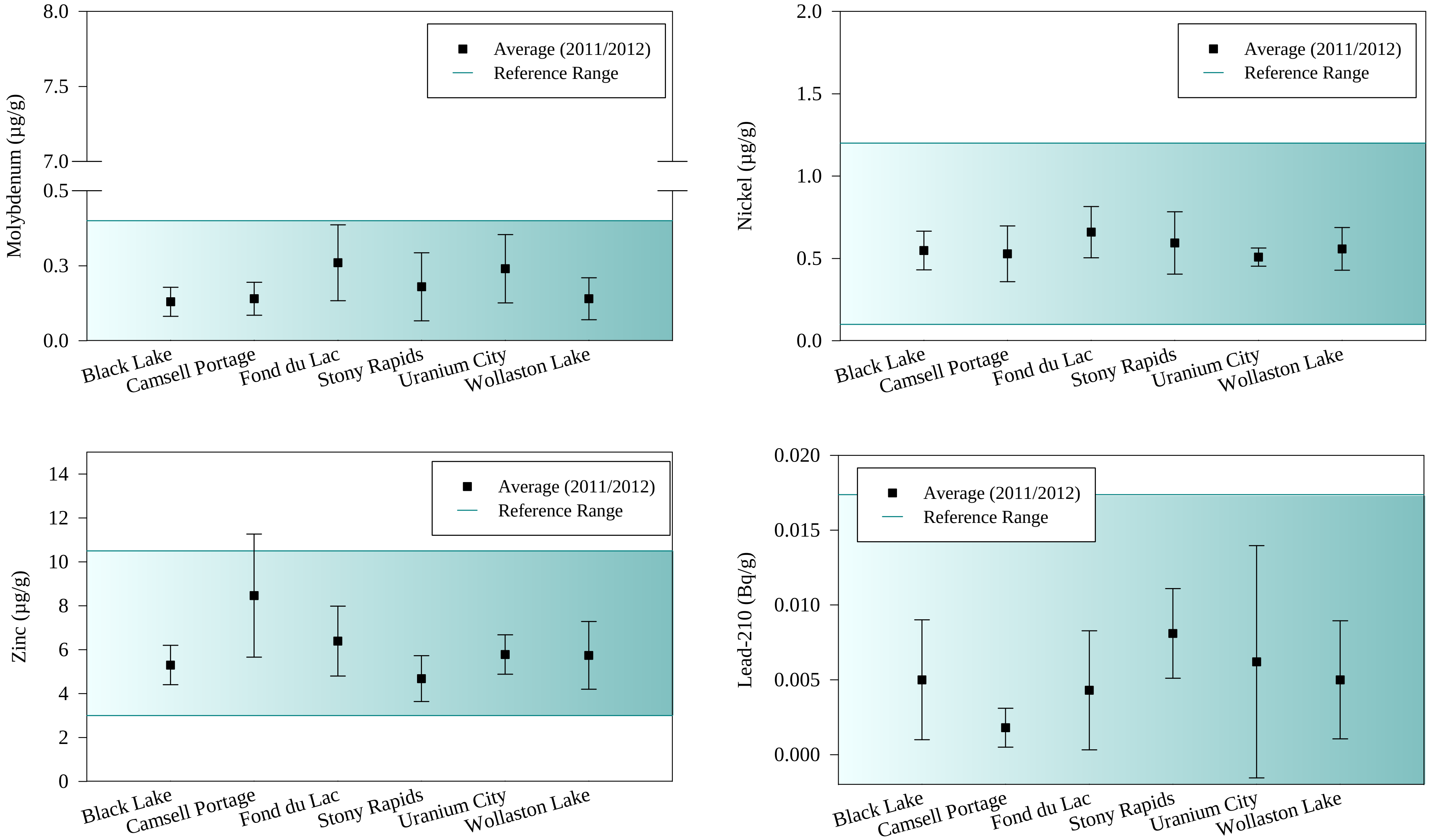


Figure 5
Chemicals in blueberries from the EARMP community study areas collected in 2011 and 2012.

Note: Error bars are standard deviations.

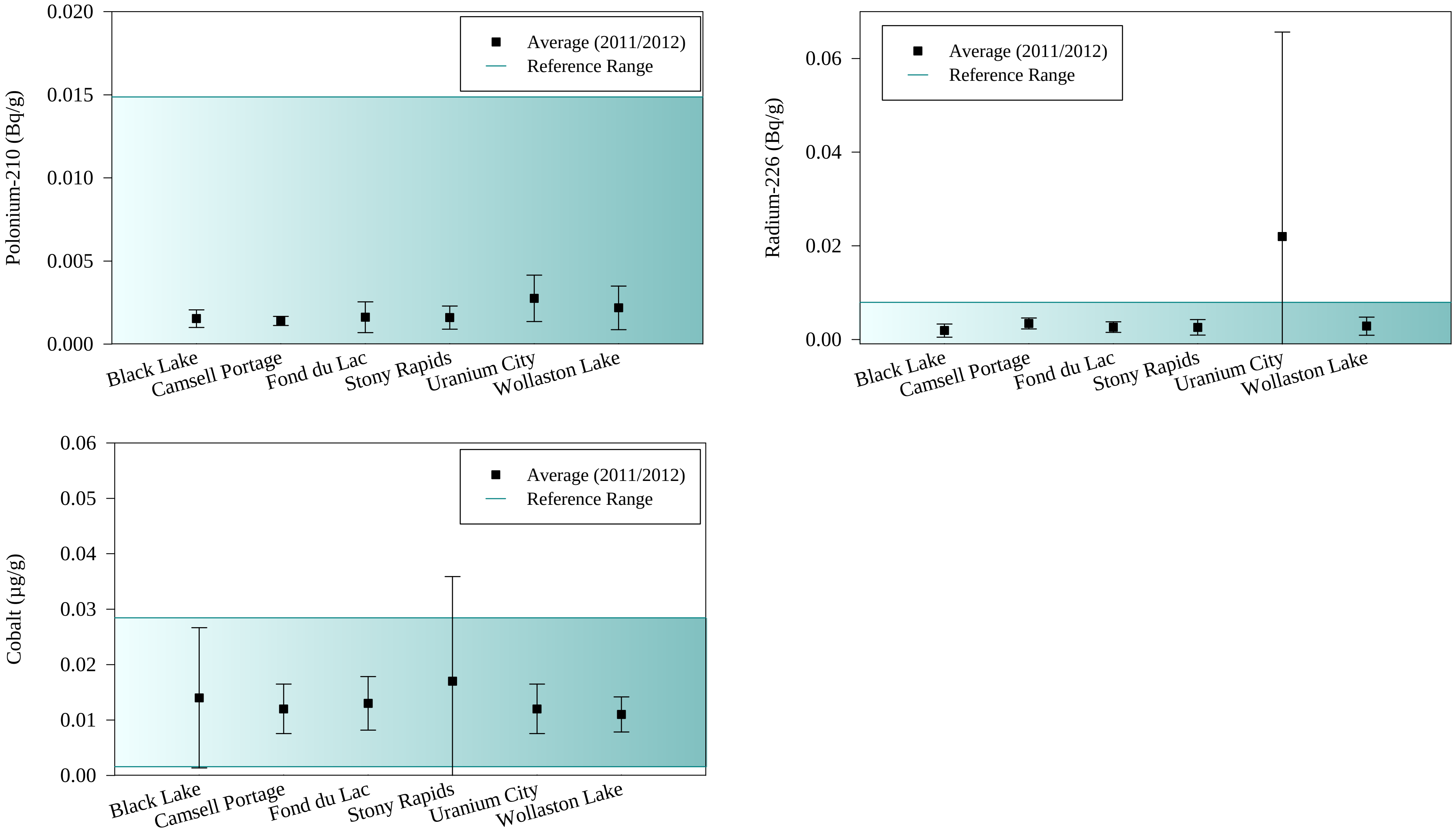


Figure 5
Chemicals in blueberries from the EARMP community study areas collected in 2011 and 2012.

Note: Error bars are standard deviations.

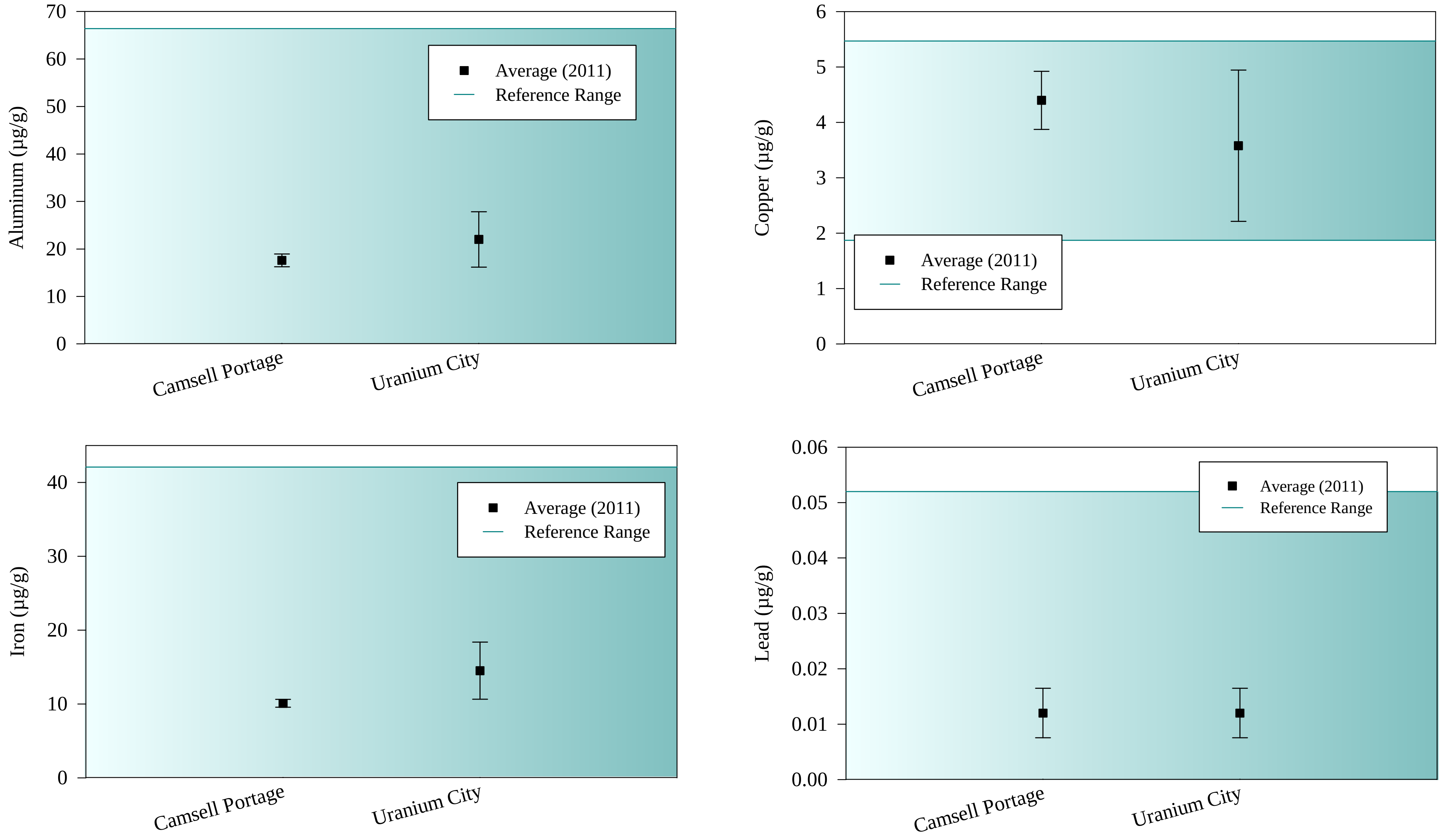


Figure 6
Chemicals in cranberries from the EARMP community study areas collected in 2011.

Note: Error bars are standard deviations.

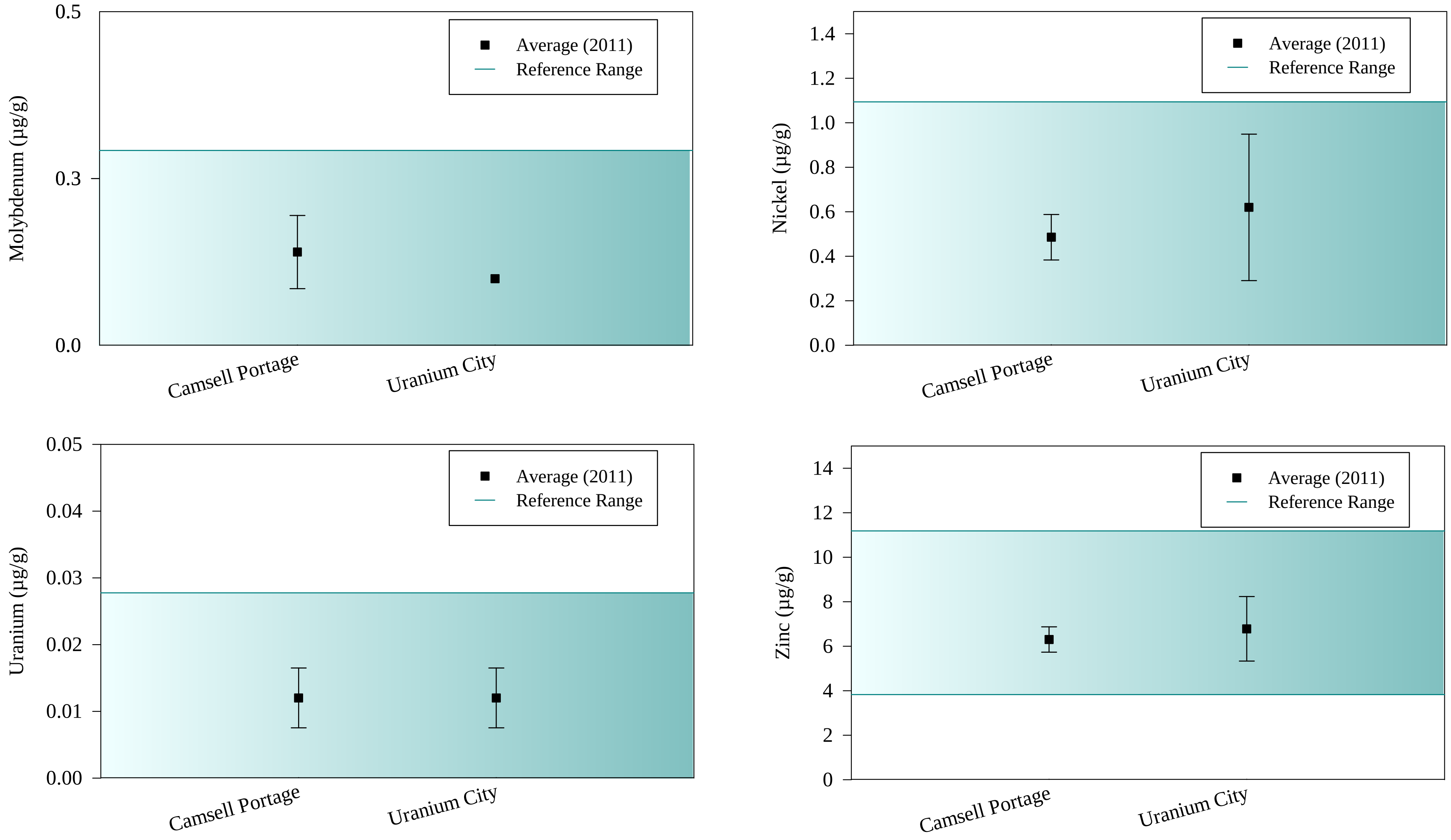


Figure 6
Chemicals in cranberries from the EARMP community study areas collected in 2011.

Note: Error bars are standard deviations.

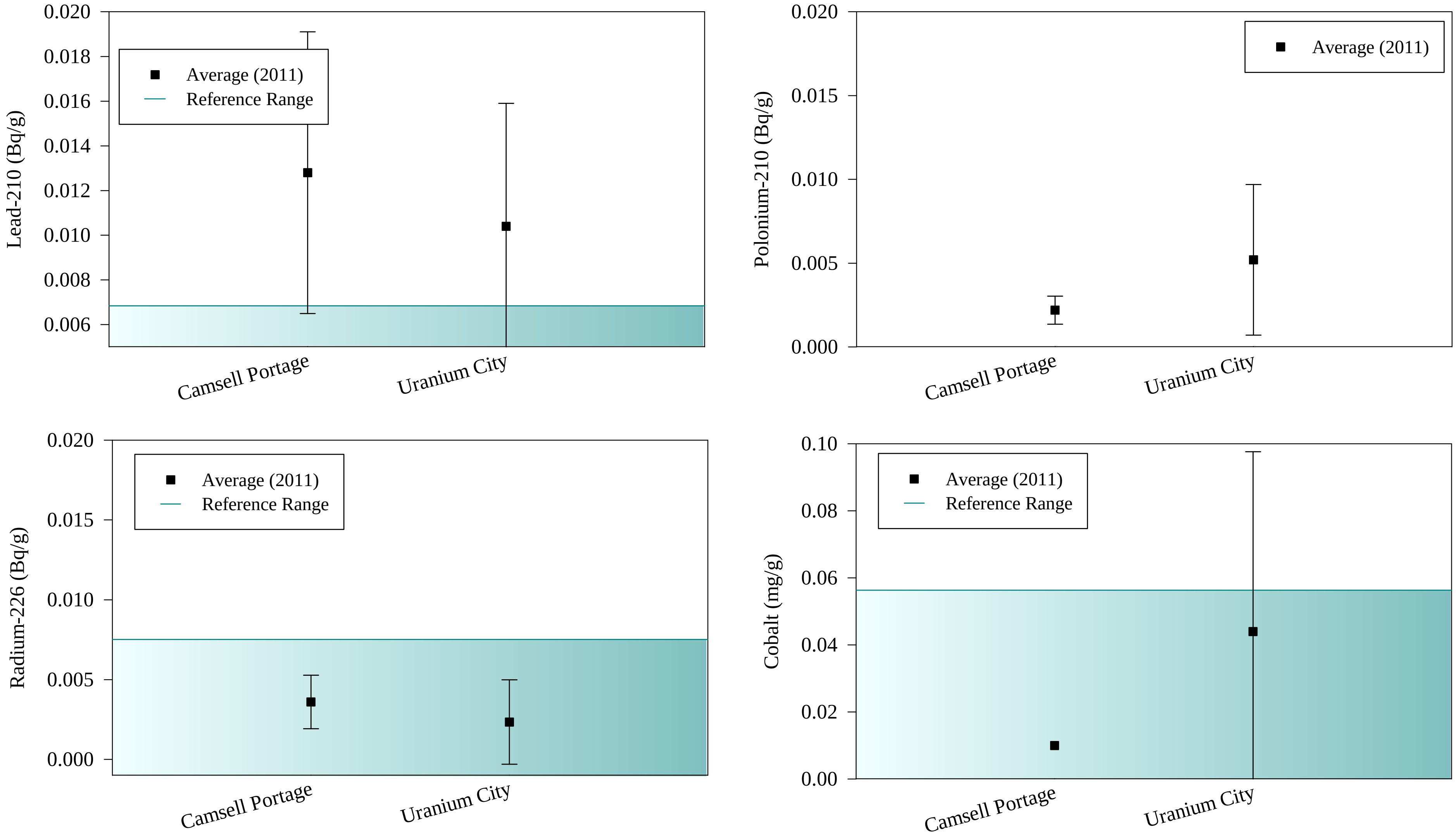


Figure 6
Chemicals in cranberries from the EARMP community study areas collected in 2011.

Note: Error bars are standard deviations.

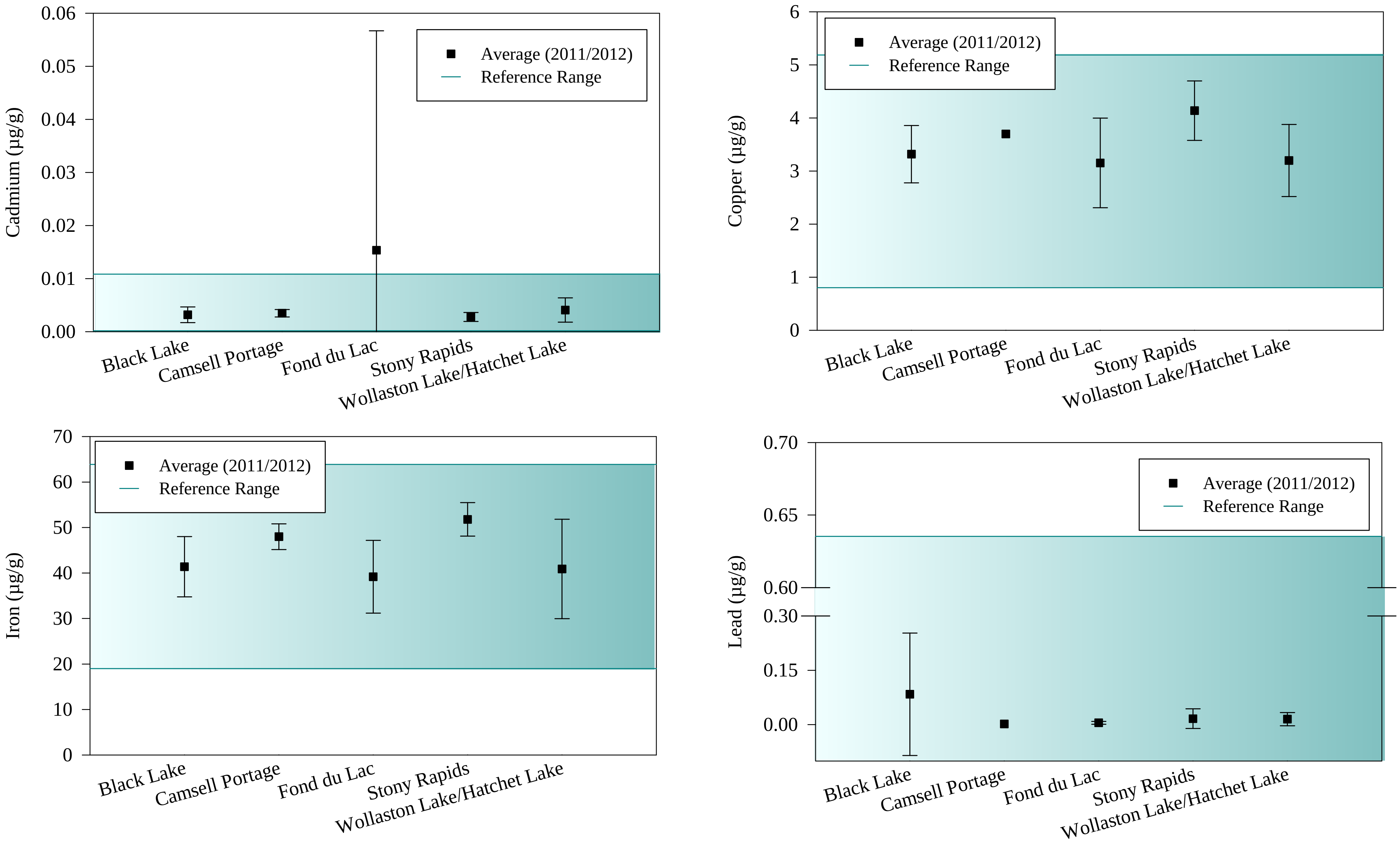


Figure 7
Chemicals in barren-ground caribou from the EARMP community study areas collected in 2011 and 2012.

Note: Error bars are standard deviations.

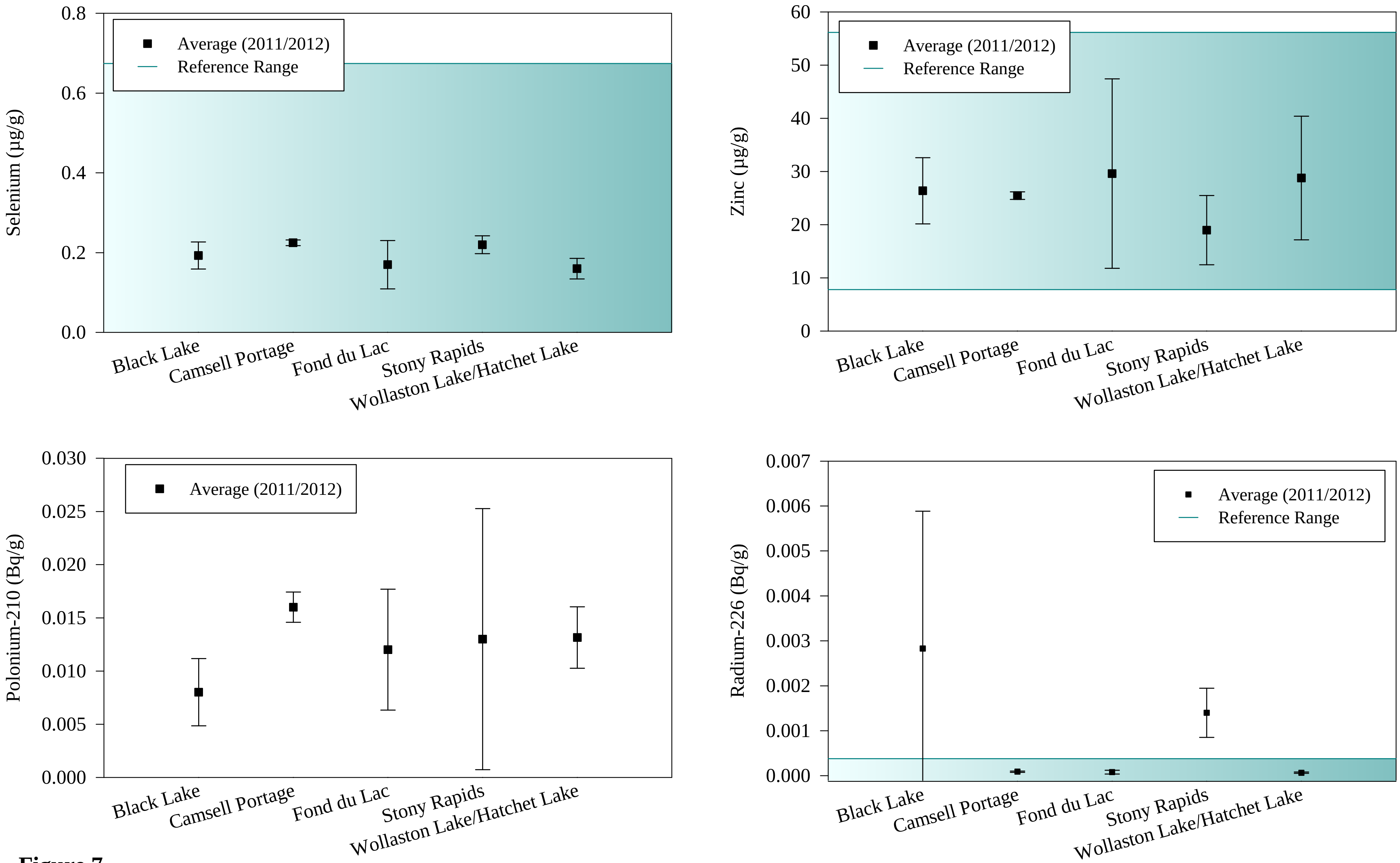
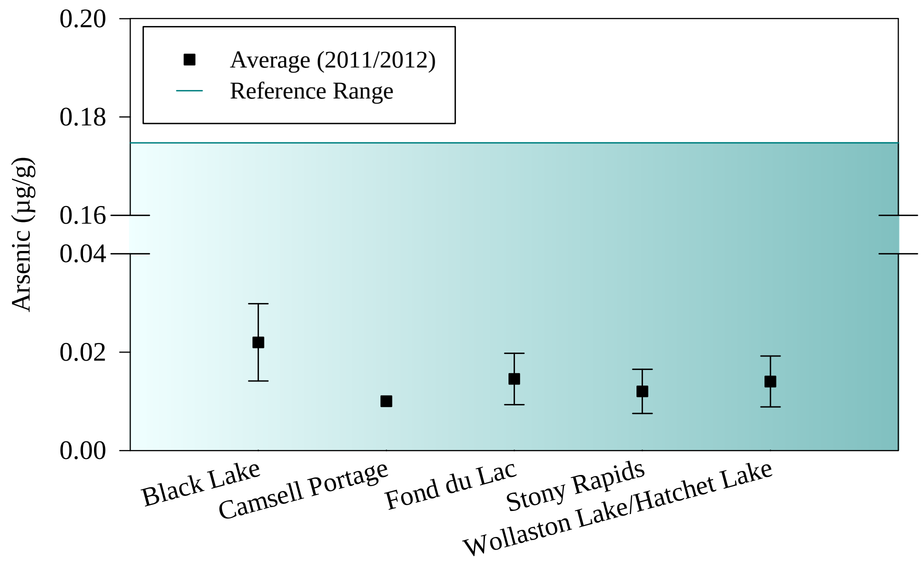


Figure 7
Chemicals in barren-ground caribou from the EARMP community study areas collected in 2011 and 2012.

Note: Error bars are standard deviations.



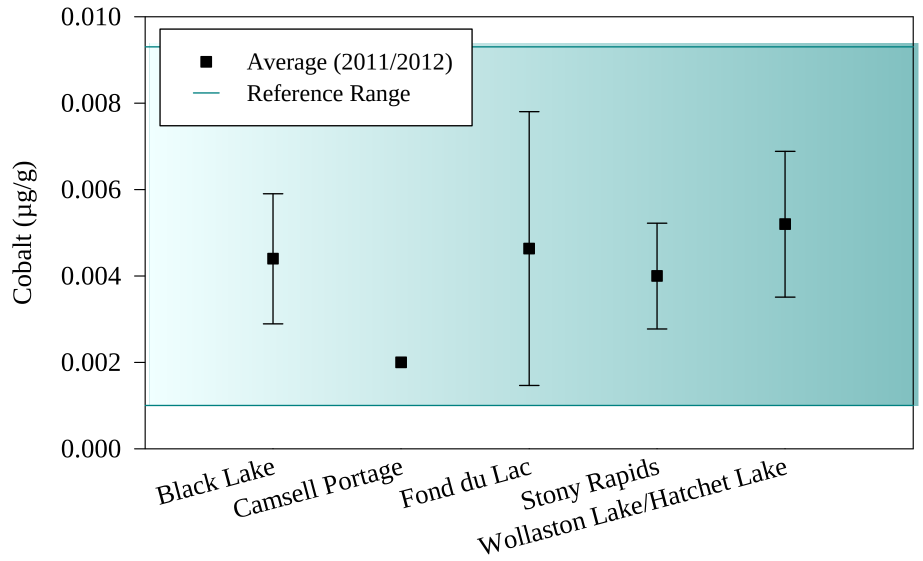


Figure 7
Chemicals in barren-ground caribou from the EARMP community study areas collected in 2011 and 2012.

Note: Error bars are standard deviations.

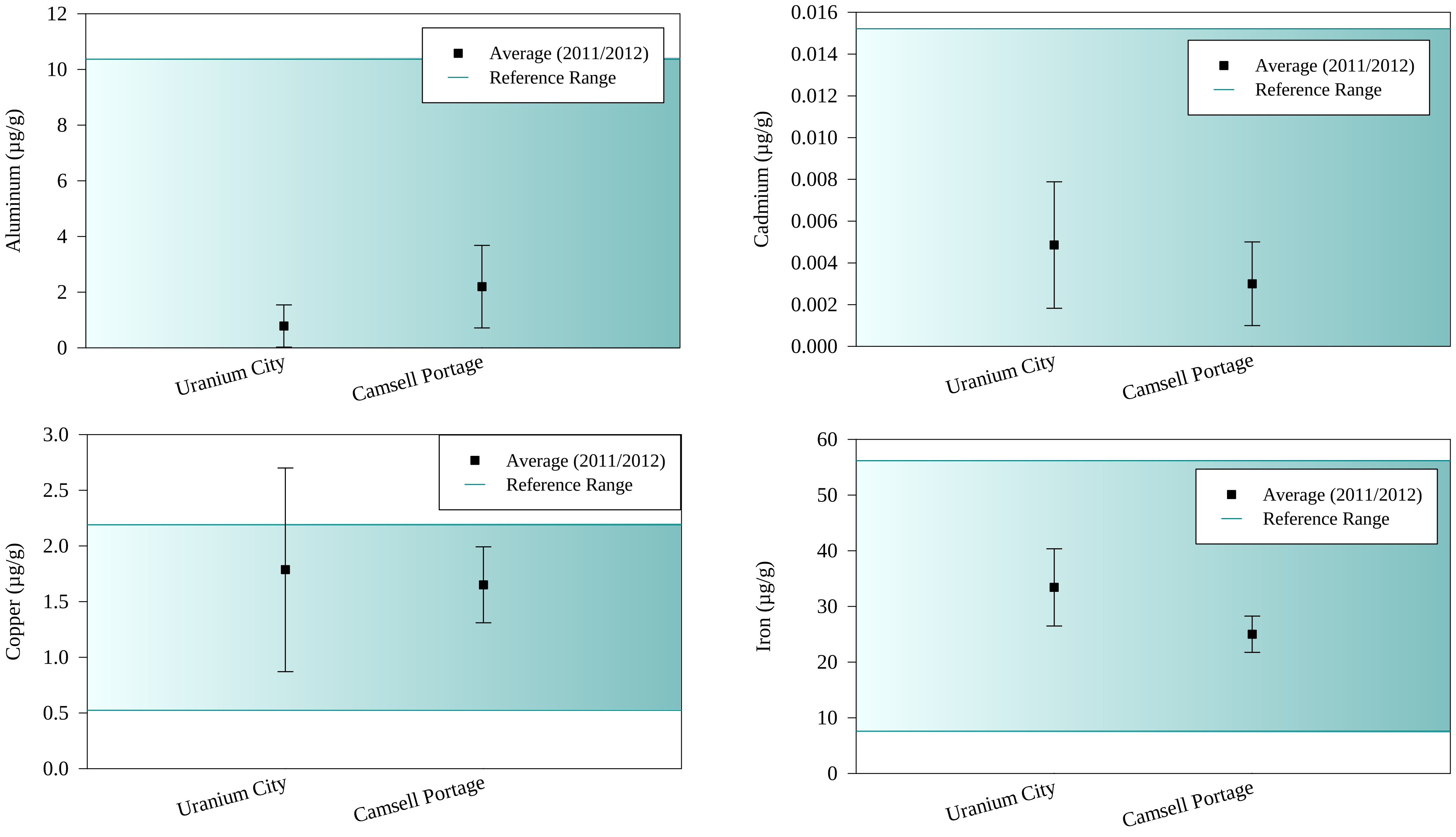


Figure 8
Chemicals in moose from the EARMP community study areas collected in 2011 and 2012.

Note: Error bars are standard deviations.

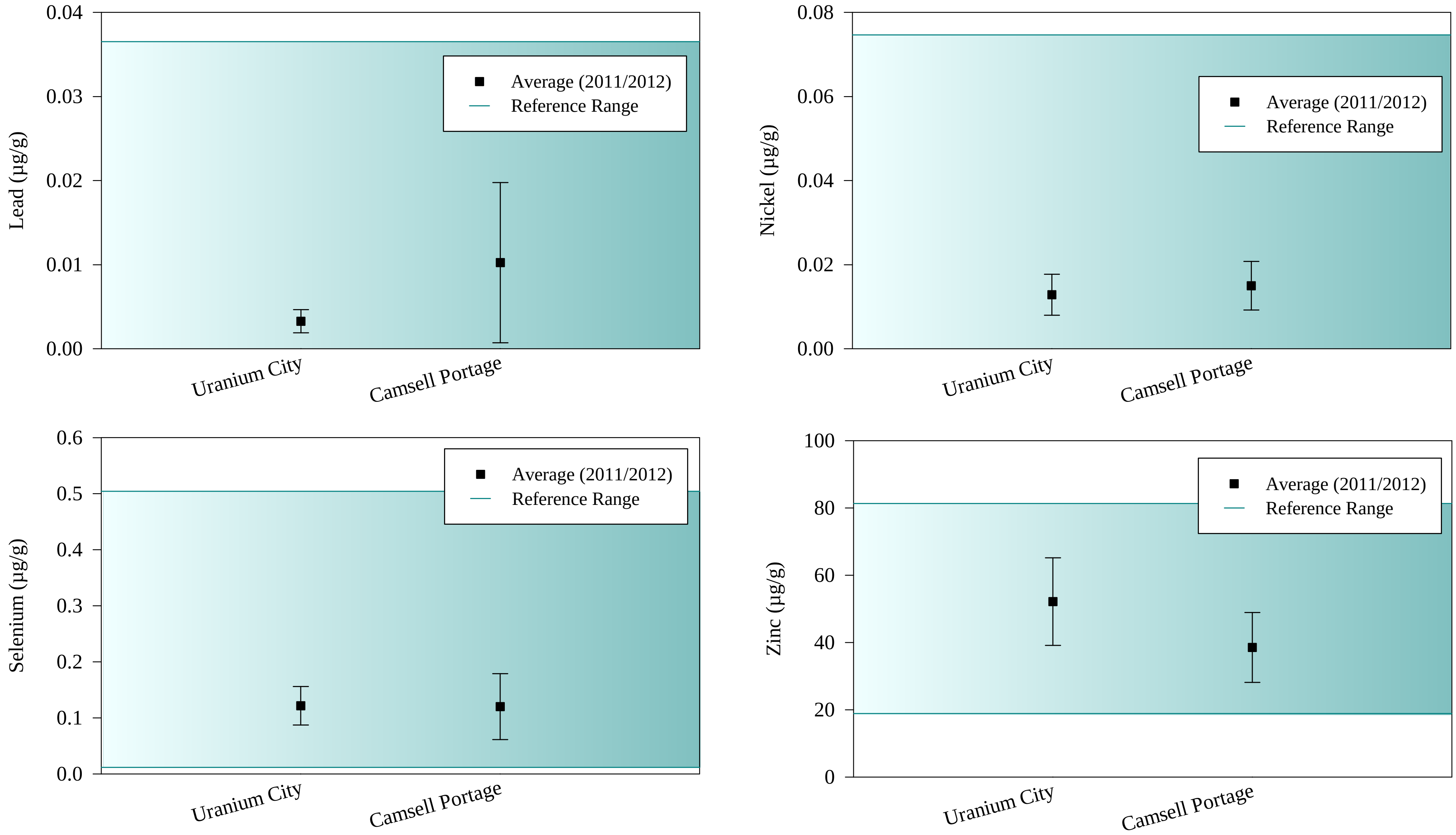


Figure 8
Chemicals in moose from the EARMP community study areas collected in 2011 and 2012.

Note: Error bars are standard deviations.

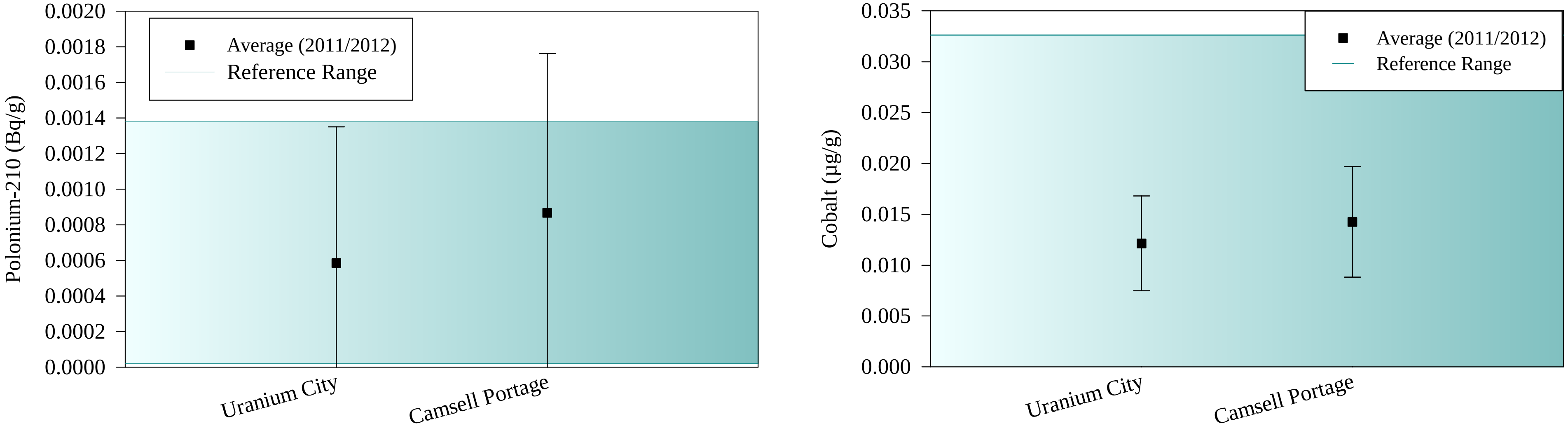


Figure 8
Chemicals in moose from the EARMP community study areas collected in 2011 and 2012.

Note: Error bars are standard deviations.

LIST OF TABLES

APPENDIX B, TABLE 1

Summary water chemistry results for the EARMP community program, 2011 and 2012.

Chemical[1]	Guidelines		Regional Reference[4]		Black Lake		Camsell Portage		Fond du Lac		Stony Rapids		Uranium City		Wollaston Lake/ Hatchet Lake	
	CDWQ[2]	CWQG[3]	Average	SD	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012
Metals																
Aluminum	0.2	0.1[5]	0.0090	0.01435	0.0020	0.0026	0.0016	0.0010	0.0140	0.0200	0.0180	0.0084	0.0051	0.0051	0.0047	0.0140
Cadmium	0.005	-	0.00011	0.00016	0.00001	0.00001	0.00001	0.00001	0.00002	<0.00001	0.00002	<0.00001	0.00001	0.00001	0.00001	<0.00001
Copper	1	0.002[6]	0.0003	0.00107	<0.0002	<0.0002	<0.0002	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Iron	0.3	0.3	0.130	0.1167	0.026	0.013	0.0049	0.0044	0.023	0.030	0.074	0.045	0.031	0.041	0.014	0.035
Lead	0.01	0.001[6]	0.0003	0.00094	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Mercury (µg/L)	1	0.026	0.05	0.016	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Molybdenum	-	0.073	0.0002	0.00029	0.0002	0.0001	0.0002	0.0002	0.0001	0.0001	0.0002	0.0002	0.0004	0.0004	0.0012	0.0012
Nickel	-	0.025[6]	0.0002	0.00037	0.0002	0.0001	0.0002	0.0002	0.0002	0.0002	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001
Selenium	0.01	0.001	0.0001	0.00005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001
Uranium (µg/L)	20	15	0.2	0.31	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	3.5	1.3	<0.1	<0.1
Zinc	5	0.03	0.0021	0.00219	0.0018	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0014	<0.0005	<0.0005	<0.0005
Nutrients																
Ammonia as N	-	1.04-10.3[7]	0.06	0.10	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	<0.01	<0.01
Organic carbon	-	-	3.3	1.8	2.5	3.8	2.8	3.5	2.7	1.9	2.7	3.8	7.4	9.9	2.5	3
Physical Properties																
pH (pH units)	6.5-8.5	6.5-9.0	7.03	0.38	7.12	7.18	7.46	7.50	7.22	7.14	7.30	7.30	7.75	7.72	7.10	7.12
Sp. Cond. (µS/cm)	-	-	33	28.6	40	38	66	69	39	44	39	40	114	112	34	37
Total hardness	-	-	12	13.5	14	13	26	26	14	15	13	14	49	52	13	13
Radionuclides																
Lead-210 (Bq/L)	0.2	-	0.02	0.004	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Polonium-210 (Bq/L)	-	-	0.006	0.0014	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.006	<0.005	<0.005	<0.005	<0.005	<0.005
Radium-226 (Bq/L)	0.5	-	0.006	0.0064	<0.005	0.009	<0.005	<0.005	<0.005	<0.005	<0.005	0.01	0.008	0.01	<0.005	0.009
Thorium-230 (Bq/L)	-	-	0.01	0.007	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Trace Elements																
Arsenic (µg/L)	10	5	0.1	0.07	0.1	0.1	0.1	0.2	0.1	0.1	0.2	0.2	0.1	0.2	<0.1	<0.1
Cobalt	-	-	0.0001	0.00016	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Vanadium	-	-	0.0001	0.00016	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

[1]All values are in mg/L, unless specified otherwise.

[2]CDWQ = Guidelines for Canadian drinking water quality (HC 2012).

[3]CWQG = Canadian water quality guidelines for the protection of aquatic life (CCME 2013); guideline values for long-term exposure.

[4]Water chemistry data from reference lakes north of Point's North sampled between 2006 and 2013 were utilized to generate the regional reference values (n = 193 samples from 24 lakes).

[5]Adjusted according to water pH of each waterbody.

[6]Adjusted according to water hardness of each waterbody.

[7]Adjusted according to water temperature and pH of each waterbody. Water temperature was assumed to be approximately 10°C.

Values less than the method detection limit (MDL) were set equal to the MDL when calculating summary statistics.

S.D. = standard deviation.

APPENDIX B, TABLE 2

Summary fish flesh chemistry results for the EARMP community program, 2011 and 2012.

Chemical[1]	Regional Reference[2]						Black Lake (Black Lake)							
	Lake Trout		Lake Whitefish		Northern Pike		Lake Trout				Lake Whitefish			
	Average	S.D.[3]	Average	S.D.	Average	S.D.	Average	S.D.	<MDL	N	Average	S.D.	<MDL	N
Metals														
Aluminum	0.44	0.161	0.38	0.316	0.37	0.892	0.5	-	10	10	0.5	-	10	10
Cadmium	0.002	-	0.002	0	0.002	0.0048	0.002	-	10	10	0.002	-	10	10
Copper	0.35	0.199	0.21	0.081	0.19	0.083	0.37	0.23	0	10	0.19	0.051	0	10
Iron	4.5	2.85	2.8	1.67	2.4	1.19	2.9	1.39	0	10	2.1	0.93	0	10
Lead	0.003	0.0028	0.003	0.0043	0.007	0.0237	0.002	0.0008	6	10	0.002	0.0004	6	10
Mercury	0.15	0.116	0.06	0.047	0.25	0.265	0.31	0.107	0	10	0.12	0.059	0	10
Molybdenum	0.02	0.007	0.02	-	0.02	0.004	0.02	-	10	10	0.02	-	10	10
Nickel	0.01	0.006	0.01	0.009	0.01	0.013	0.01	-	10	10	0.01	0	9	10
Selenium	0.25	0.059	0.30	0.156	0.21	0.104	0.15	0.026	0	10	0.27	0.065	0	10
Uranium	0.002	0.0017	0.001	0.0010	0.003	0.0066	0.001	0.0003	9	10	0.001	0.0003	9	10
Zinc	4.6	2.06	4.9	1.93	5.8	2.29	4.1	1.37	0	10	4.6	1.08	0	10
Radionuclides														
Lead-210 (Bq/g)	0.009	0.0125	0.001	0.0015	0.001	0.0015	0.001	0.0004	7	10	0.002	0.0013	9	10
Polonium-210 (Bq/g)	0.0005	0.00037	0.0021	0.00231	0.003	0.0033	0.0002	0	9	10	0.0004	0.00034	7	10
Radium-226 (Bq/g)	0.0004	0.00052	0.00009	0.000065	0.00009	0.000065	0.00006	0.000016	9	10	0.0004	0.00065	7	10
Thorium-230 (Bq/g)	0.0002	0.00041	0.0002	0.00029	0.0002	0.00089	0.00011	0.000033	9	10	0.0005	0.00080	9	10
Trace Elements														
Arsenic	0.04	0.029	0.05	0.063	0.02	0.033	0.07	0.028	0	10	0.18	0.136	0	10
Cobalt	0.003	0.0009	0.005	0.0074	0.004	0.0067	0.002	0.0003	7	10	0.003	0.0009	4	10
Vanadium	0.02	-	0.02	-	0.02	-	0.02	-	10	10	0.02	-	10	10

APPENDIX B, TABLE 2

Summary fish flesh chemistry results for the EARMP community program, 2011 and 2012.

Chemical[1]	Uranium City (Crackingstone Inlet)												Uranium City (Prospector Bay)							
	Lake Trout				Lake Whitefish				Northern Pike				Lake Trout				Lake Whitefish			
	Average	S.D.	<MDL	N	Average	S.D.	<MDL	N	Average	S.D.	<MDL	N	Average	S.D.	<MDL	N	Average	S.D.	<MDL	N
Metals																				
Aluminum	0.5	0.13	8	10	0.5	-	10	10	0.5	-	10	10	0.5	-	5	5	0.5	-	5	5
Cadmium	0.002	-	10	10	0.002	0.0003	9	10	0.002	-	10	10	0.002	-	5	5	0.002	-	5	5
Copper	0.22	0.051	0	10	0.19	0.036	0	10	0.19	0.051	0	10	0.24	0.029	0	5	0.15	0.026	0	5
Iron	2.2	1.28	0	10	2.2	1.23	0	10	2.0	0.90	0	10	2.8	1.11	0	5	1.6	0.38	0	5
Lead	0.002	-	10	10	0.002	-	10	10	0.002	-	10	10	0.002	-	5	5	0.002	-	5	5
Mercury	0.14	0.048	0	10	0.03	0.022	0	10	0.11	0.042	0	10	0.20	0.046	0	5	0.09	0.036	0	5
Molybdenum	0.02	-	10	10	0.02	0	9	10	0.02	-	10	10	0.02	-	5	5	0.02	-	5	5
Nickel	0.02	0.019	7	10	0.02	0.022	9	10	0.02	0.011	8	10	0.01	-	5	5	0.01	-	5	5
Selenium	0.16	0.024	0	10	0.63	0.722	0	10	0.46	0.128	0	10	0.17	0.005	0	5	0.26	0.040	0	5
Uranium	0.001	0	9	10	0.004	0.0040	6	10	0.001	-	10	10	0.001	-	5	5	0.001	-	5	5
Zinc	3.8	1.83	0	10	4.0	0.76	0	10	5.5	1.92	0	10	4.3	0.65	0	5	4.8	1.63	0	5
Radionuclides																				
Lead-210 (Bq/g)	0.001	-	10	10	0.001	-	10	10	0.001	-	10	10	0.001	-	5	5	0.001	-	5	5
Polonium-210 (Bq/g)	0.0002	-	10	10	0.0004	0.00023	3	10	0.0009	0.00048	0	10	0.0002	-	5	5	0.0003	0.00018	4	5
Radium-226 (Bq/g)	0.00010	0.000106	9	10	0.00011	0.000078	7	10	0.00007	0.000013	9	10	0.00006	0.000004	4	5	0.00006	-	5	5
Thorium-230 (Bq/g)	0.00013	0.000048	7	10	0.0002	0.00016	8	10	0.0001	0.000067	9	10	0.0001	-	5	5	0.0001	-	5	5
Trace Elements																				
Arsenic	0.07	0.027	0	10	0.12	0.089	0	10	0.07	0.044	0	10	0.08	0.026	0	5	0.07	0.029	0	5
Cobalt	0.002	0.0003	9	10	0.003	0.0022	5	10	0.002	0	5	10	0.002	-	5	5	0.006	0.0050	2	5
Vanadium	0.02	-	10	10	0.02	-	10	10	0.02	-	10	10	0.02	-	5	5	0.02	-	5	5

APPENDIX B, TABLE 2

Summary fish flesh chemistry results for the EARMP community program, 2011 and 2012.

Chemical[1]	Camsell Portage (Ellis Bay)												Fond du Lac (Fond du Lac River)							
	Lake Trout				Lake Whitefish				Northern Pike				Lake Trout				Lake Whitefish			
	Average	S.D.	<MDL	N	Average	S.D.	<MDL	N	Average	S.D.	<MDL	N	Average	S.D.	<MDL	N	Average	S.D.	<MDL	N
Metals																				
Aluminum	0.5	-	10	10	0.5	-	7	7	0.5	-	5	5	0.5	-	10	10	0.6	0.25	9	10
Cadmium	0.002	-	10	10	0.002	-	7	7	0.002	-	5	5	0.002	-	10	10	0.002	0.0013	8	10
Copper	0.34	0.153	0	10	0.18	0.092	0	7	0.29	0.129	0	5	0.28	0.081	0	10	0.18	0.057	0	10
Iron	2.8	1.48	0	10	2.2	1.13	0	7	2.2	1.20	0	5	2.4	0.90	0	10	2.2	1.48	0	10
Lead	0.002	-	10	10	0.002	0.0004	6	7	0.002	-	5	5	0.002	0.0007	8	10	0.002	0.0007	5	10
Mercury	0.15	0.070	0	10	0.05	0.019	0	7	0.16	0.061	0	5	0.22	0.073	0	10	0.09	0.068	0	10
Molybdenum	0.02	-	10	10	0.02	-	7	7	0.02	-	5	5	0.02	-	10	10	0.02	-	10	10
Nickel	0.01	0.006	8	10	0.01	0.004	6	7	0.01	-	5	5	0.01	-	10	10	0.01	0.003	9	10
Selenium	0.16	0.024	0	10	0.26	0.030	0	7	0.19	0.019	0	5	0.15	0.019	0	10	0.22	0.048	0	10
Uranium	0.002	0.0041	9	10	0.001	0.0004	6	7	0.001	-	5	5	0.001	0.0003	8	10	0.001	0.0007	8	10
Zinc	5.0	3.11	0	10	3.2	0.55	0	7	6.2	2.20	0	5	3.7	0.47	0	10	3.9	0.94	0	10
Radionuclides																				
Lead-210 (Bq/g)	0.001	-	10	10	0.001	0.0004	6	7	0.001	-	5	5	0.001	0.0004	8	10	0.004	-	10	10
Polonium-210 (Bq/g)	0.0003	0.00016	9	10	0.0002	0.00011	5	7	0.0004	0.00023	0	5	0.0002	-	10	10	0.0004	0.00034	8	10
Radium-226 (Bq/g)	0.00008	0.000045	7	10	0.0001	0.00010	6	7	0.00007	0.000010	4	5	0.00006	-	10	10	0.0004	0.00065	9	10
Thorium-230 (Bq/g)	0.00012	-	10	10	0.0001	-	7	7	0.0007	-	5	5	0.0001	-	10	10	0.002	-	10	10
Trace Elements																				
Arsenic	0.11	0.071	0	10	0.30	0.081	0	7	0.11	0.025	0	5	0.10	0.040	0	10	0.24	0.136	0	10
Cobalt	0.002	0.0004	6	10	0.003	0.0019	3	7	0.003	0.0005	2	5	0.002	-	10	10	0.004	0.0039	1	10
Vanadium	0.02	-	10	10	0.02	-	7	7	0.02	-	5	5	0.02	-	10	10	0.02	-	10	10

APPENDIX B, TABLE 2

Summary fish flesh chemistry results for the EARMP community program, 2011 and 2012.

Chemical[1]	Stony Rapids (Fond du Lac River)								Wollaston Lake/Hatchet Lake (Wollaston Lake)							
	Lake Trout				Lake Whitefish				Lake Trout				Lake Whitefish			
	Average	S.D.	<MDL	N	Average	S.D.	<MDL	N	Average	S.D.	<MDL	N	Average	S.D.	<MDL	N
Metals																
Aluminum	0.5	-	9	9	0.5	-	10	10	0.5	-	10	10	0.5	-	10	10
Cadmium	0.002	-	9	9	0.002	-	10	10	0.002	-	10	10	0.002	-	10	10
Copper	0.29	0.191	0	9	0.20	0.083	0	10	0.45	0.146	0	10	0.16	0.045	0	10
Iron	2.8	2.32	0	9	2.1	0.98	0	10	3.0	1.34	0	10	1.7	0.79	0	10
Lead	0.002	-	9	9	0.002	-	10	10	0.002	-	10	10	0.002	0	9	10
Mercury	0.33	0.156	0	9	0.13	0.103	0	10	0.16	0.035	0	10	0.05	0.019	0	10
Molybdenum	0.02	-	9	9	0.02	-	10	10	0.02	-	10	10	0.02	-	10	10
Nickel	0.01	0	8	9	0.01	0.013	8	10	0.01	0.003	8	10	0.01	-	10	10
Selenium	0.14	0.037	0	9	0.15	0.049	0	10	0.21	0.036	0	10	0.45	0.104	0	10
Uranium	0.001	0.0003	8	9	0.001	0	8	10	0.001	-	10	10	0.001	-	10	10
Zinc	3.7	0.86	0	9	4.9	1.70	0	10	4.4	1.25	0	10	4.1	0.67	0	10
Radionuclides																
Lead-210 (Bq/g)	0.001	0	8	9	0.001	-	10	10	0.001	0	9	10	0.002	-	10	10
Polonium-210 (Bq/g)	0.0002	0.00007	8	9	0.0003	-	10	10	0.0002	-	10	10	0.0005	0.00036	6	10
Radium-226 (Bq/g)	0.00006	-	9	9	0.00016	0.00029	6	10	0.00009	0.000076	8	10	0.0005	0.00082	7	10
Thorium-230 (Bq/g)	0.0001	-	9	9	0.0003	0.00060	9	10	0.0001	-	10	10	0.0007	-	10	10
Trace Elements																
Arsenic	0.07	0.044	0	9	0.04	0.018	0	10	0.04	0.018	0	10	0.16	0.042	0	10
Cobalt	0.002	0	8	9	0.006	0.0031	1	10	0.002	-	10	10	0.002	0.0010	7	10
Vanadium	0.02	-	9	9	0.02	-	10	10	0.02	-	10	10	0.02	-	10	10

[1]All concentrations are reported on a µg/g wet weight basis, except when specified otherwise.

[2]Regional reference data are from reference lakes north of Point's North sampled between 2006 and 2012 (n = 30 for lake trout; n = 58 for lake whitefish; n = 166 for northern pike).

[3]S.D. = Standard deviation; standard deviations of 0 signify "no variance between samples", not "a very small variance".

<MDL = less than the laboratory method detection limit.

Values less than the MDL were set equal to the MDL when calculating summary statistics.

APPENDIX B, TABLE 3

Summary blueberry chemistry results for the EARMP community program, 2011 and 2012.

Chemical[1]	Regional Reference[2]		Black Lake				Camsell Portage				Fond du Lac				Stony Rapids				Uranium City				Wollaston Lake/ Hatchet Lake			
	Average	**S.D.[3]**	**Average**	**S.D.**	**<MDL**	**N**	**Average**	**S.D.**	**<MDL**	**N**	**Average**	**S.D.**	**<MDL**	**N**	**Average**	**S.D.**	**<MDL**	**N**	**Average**	**S.D.**	**<MDL**	**N**	**Average**	**S.D.**	**<MDL**	**N**
Metals																										
Aluminum	14.6	12.63	7.9	2.07	0	10	7.0	0.57	0	5	9.4	4.88	0	10	14.7	10.21	0	10	5.9	1.64	0	5	12.5	7.77	0	10
Cadmium	0.01	0.002	0.01	-	10	10	0.01	-	5	5	0.01	-	10	10	0.01	0.003	9	10	0.01	-	5	5	0.01	-	10	10
Copper	3.4	0.80	3.2	0.46	0	10	3.2	0.39	0	5	3.3	0.49	0	10	2.5	0.49	0	10	3.5	0.38	0	5	2.8	0.51	0	10
Iron	40.1	114.18	10.6	3.47	0	10	12.1	3.68	0	5	12.1	3.90	0	10	14.9	7.18	0	10	10.3	1.26	0	5	13.3	5.51	0	10
Lead	0.02	0.015	0.03	0.024	4	10	0.02	0.013	4	5	0.02	0.008	4	10	0.03	0.028	4	10	0.01	0.004	1	5	0.02	0.011	4	10
Molybdenum	0.2	0.11	0.1	0.05	4	10	0.1	0.05	0	5	0.3	0.13	2	10	0.2	0.11	4	10	0.2	0.11	1	5	0.1	0.07	3	10
Nickel	0.64	0.260	0.55	0.117	0	10	0.53	0.169	0	5	0.66	0.156	0	10	0.59	0.189	0	10	0.51	0.055	0	5	0.56	0.129	0	10
Selenium	0.05	0.002	0.05	0.010	8	10	0.05	-	5	5	0.06	0.011	8	10	0.05	0	9	10	0.05	-	5	5	0.05	0	9	10
Uranium	0.01	-	0.01	-	10	10	0.02	0.031	3	5	0.01	0.003	8	10	0.01	0.004	7	10	0.01	-	5	5	0.01	0.003	9	10
Zinc	6.7	1.89	5.3	0.90	0	10	8.5	2.80	0	5	6.4	1.59	0	10	4.7	1.05	0	10	5.8	0.90	0	5	5.7	1.54	0	10
Radionuclides																										
Lead-210 (Bq/g)	0.006	0.0055	0.0050	0.00400	2	10	0.0018	0.00130	1	5	0.004	0.0040	6	10	0.008	0.0030	7	10	0.0062	0.00776	0	5	0.0050	0.00394	3	10
Polonium-210 (Bq/g)	0.006	0.0046	0.0015	0.00053	1	10	0.0014	0.00027	0	5	0.0016	0.00092	0	10	0.002	0.0007	2	10	0.0028	0.00140	0	5	0.0022	0.00131	1	10
Radium-226 (Bq/g)	0.003	0.0023	0.0019	0.00141	2	10	0.003	0.0012	0	5	0.003	0.0011	0	10	0.003	0.0017	2	10	0.022	0.0437	0	5	0.003	0.0019	3	10
Thorium-230 (Bq/g)	0.002	0	0.002	0.0005	9	10	0.001	-	5	5	0.001	-	10	10	0.002	-	10	10	0.001	-	5	5	0.0016	-	10	10
Trace Elements																										
Arsenic	0.05	-	0.05	-	10	10	0.05	-	5	5	0.05	-	10	10	0.05	-	10	10	0.05	-	5	5	0.05	-	10	10
Cobalt	0.02	0.007	0.01	0.013	7	10	0.01	0.004	4	5	0.01	0.005	6	10	0.02	0.019	3	10	0.01	0.004	2	5	0.01	0.003	6	10
Vanadium	0.1	-	0.1	-	10	10	0.1	-	5	5	0.1	-	10	10	0.1	-	10	10	0.1	-	5	5	0.1	-	10	10

[1]All concentrations are in µg/g on a dry weight basis, unless specified otherwise.

[2]Regional reference data are from the AWG program (2008 to 2010) and the Uranium City Country Foods program (2011). Data are not available from all communities in all years. Number of samples = 22, with the exception of polonium-210 and thorium-230 where only data from the Uranium City Country Foods program are available (n=8).

[3]S.D. = Standard deviation; standard deviations of 0 signify "no variance between samples", not "a very small variance".

<MDL = less than the laboratory method detection limit.

Values less than the MDL were set equal to the MDL when calculating summary statistics.

APPENDIX B, TABLE 4

Summary bog cranberry chemistry results for the EARMP community program, 2011.

Chemical[1]	Regional Reference[2]		Camsell Portage				Uranium City			
	Average	S.D.[3]	Average	S.D.	<MDL	N	Average	S.D.	<MDL	N
Metals										
Aluminum	28.2	19.12	18	1.3	0	5	22	5.8	0	5
Cadmium	0.01	0.007	0.01	0	4	5	0.01	-	5	5
Copper	3.7	0.90	4.4	0.52	0	5	3.6	1.36	0	5
Iron	17.1	12.49	10.1	0.54	0	5	15	3.9	0	5
Lead	0.02	0.015	0.01	0.004	3	5	0.01	0.004	0	5
Molybdenum	0.1	0.07	0.1	0.05	1	5	0.1	-	5	5
Nickel	0.41	0.344	0.49	0.102	0	5	0.62	0.329	0	5
Selenium	0.05	0	0.05	-	5	5	0.05	-	5	5
Uranium	0.01	0.008	0.01	0.004	2	5	0.01	0.004	2	5
Zinc	7.5	1.84	6.3	0.57	0	5	6.8	1.45	0	5
Radionuclides										
Lead-210 (Bq/g)	0.0029	0.00198	0.013	0.0063	0	5	0.010	0.0055	0	5
Polonium-210 (Bq/g)	-	-	0.002	0.0008	0	5	0.005	0.0045	0	5
Radium-226 (Bq/g)	0.0025	0.00249	0.004	0.0017	0	5	0.0023	0.0026	3	5
Thorium-230 (Bq/g)	-	-	0.002	-	5	5	0.002	-	5	5
Trace Elements										
Arsenic	0.05	0	0.05	-	5	5	0.05	-	5	5
Cobalt	0.02	0.020	0.01	0	0	5	0.04	0.054	0	5
Vanadium	0.1	0	0.1	-	5	5	0.1	-	5	5

[1]All concentrations are in µg/g on a dry weight basis, unless specified otherwise.

[2]Regional reference data are from the AWG program. Data used are from 2008 to 2011 (n=21); however, data are not available from all

[3]S.D. = Standard deviation; standard deviations of 0 signify "no variance between samples", not "a very small variance".

<MDL = less than the laboratory method detection limit.

Values less than the MDL were set equal to the MDL when calculating summary statistics.

APPENDIX B, TABLE 5

Summary barren-ground caribou flesh chemistry results for the EARMP community program, 2011 and 2012.

Chemical[1]	Regional Reference[2]		Black Lake				Camsell Portage				Fond du Lac				Stony Rapids				Wollaston Lake/ Hatchet Lake			
	Average	S.D.[3]	Average	S.D.	<MDL	N	Average	S.D.	<MDL	N	Average	S.D.	<MDL	N	Average	S.D.	<MDL	N	Average	S.D.	<MDL	N
Metals																						
Aluminum	0.6	0.77	0.5	0	9	10	0.5	-	2	2	0.5	-	11	11	0.6	0.31	4	5	0.52	0.063	9	10
Cadmium	0.006	0.0027	0.003	0.0015	2	10	0.004	0.0007	0	2	0.015	0.0414	2	11	0.003	0.0008	0	5	0.004	0.0023	1	10
Copper	3.0	1.10	3.3	0.54	0	10	3.7	0	0	2	3.2	0.84	0	11	4.1	0.56	0	5	3.2	0.68	0	10
Iron	41	11.2	41	6.6	0	10	48	2.8	0	2	39	8.0	0	11	52	3.7	0	5	41	10.9	0	10
Lead	0.096	0.2695	0.084	0.1688	2	10	0.002	-	2	2	0.005	0.0038	5	11	0.017	0.0272	0	5	0.015	0.0183	2	10
Molybdenum[4]	0.05	0.009	0.02	-	10	10	0.02	-	2	2	0.02	-	11	11	0.02	-	5	5	0.02	-	10	10
Nickel	0.02	0.006	0.01	0.005	6	10	0.01	-	2	2	0.02	0.021	7	11	0.01	0	4	5	0.01	0.003	9	10
Selenium	0.32	0.176	0.19	0.034	0	10	0.23	0.007	0	2	0.17	0.060	0	11	0.22	0.022	0	5	0.16	0.026	0	10
Uranium	0.002	0.0021	0.001	0	9	10	0.001	-	2	2	0.001	0.0004	9	11	0.001	0.0004	4	5	0.001	-	10	10
Zinc	32	12.1	26	6.2	0	10	26	0.7	0	2	30	17.8	0	11	19	6.5	0	5	29	11.6	0	10
Radionuclides																						
Lead-210 (Bq/g)	0.001	0.0008	0.001	0	9	10	0.001	-	2	2	0.002	0.0021	7	11	0.001	0.0004	4	5	0.001	0.0003	9	10
Polonium-210 (Bq/g)	-	-	0.008	0.0032	0	10	0.016	0.0014	0	2	0.0120	0.00568	0	11	0.013	0.0123	1	5	0.0132	0.00289	0	10
Radium-226 (Bq/g)	0.00012	0.000131	0.0028	0.00305	9	10	0.00009	-	2	2	0.00008	0.000043	7	11	0.001	0.0005	2	5	0.00007	0.000014	9	10
Thorium-230 (Bq/g)	-	-	0.0001	-	10	10	0.0002	-	2	2	0.0001	0.00007	9	11	0.002	-	5	5	0.0001	-	10	10
Trace Elements																						
Arsenic	0.07	0.054	0.02	0.008	0	10	0.01	-	2	2	0.01	0.005	3	11	0.01	0.004	0	5	0.01	0.005	3	10
Cobalt	0.005	0.0021	0.004	0.0015	0	10	0.002	0	1	2	0.005	0.0032	1	11	0.004	0.0012	0	5	0.005	0.0017	0	10
Vanadium[5]	0.04	0.013	0.02	-	10	10	0.02	-	2	2	0.02	-	11	11	0.02	-	5	5	0.02	-	10	10

[1]All concentrations are reported on a µg/g wet weight basis, except when specified otherwise.

[2]Regional reference data are from the AWG program. Data used are from 2000 to 2010 (n=32); however, data are not available from all communities in all years. Exceptions were cadmium, lead, and cobalt where only data from 2007 to 2010 (n=13) could be used due to large differences in MDLs.

[3]S.D. = Standard deviation; standard deviations of 0 signify "no variance between samples", not "a very small variance".

[4]The regional reference concentrations for molybdenum and vanadium were all <MDL; however, in most samples the MDL was 0.05, while a few samples had a MDL of 0.02. The differences in MDLs between samples results in regional reference averages that appear higher than the EARMP values and standard deviations being created.

<MDL = less than the laboratory method detection limit.

Values less than the MDL were set equal to the MDL when calculating summary statistics.

APPENDIX B, TABLE 6

Summary moose flesh chemistry results for the EARMP community program, 2011 and 2012.

Chemical[1]	Regional Reference[2]		Uranium City				Camsell Portage			
	Average	S.D.[3]	Average	S.D.	<MDL	N	Average	S.D.	<MDL	N
Metals										
Aluminum	2.1	4.13	0.8	0.76	6	7	2.2	1.48	1	4
Cadmium	0.007	0.0043	0.005	0.0030	1	7	0.003	0.0020	2	4
Copper	1.4	0.42	1.8	0.92	0	7	1.7	0.34	0	4
Iron	32	12.2	33	6.9	0	7	25	3.27	0	4
Lead	0.015	0.0107	0.003	0.0012	4	7	0.010	0.0095	1	4
Molybdenum[4]	0.05	0.012	0.02	-	7	7	0.02	-	4	4
Nickel	0.03	0.023	0.01	0.005	4	7	0.02	0.006	2	4
Selenium	0.26	0.123	0.12	0.034	0	7	0.12	0.059	0	4
Uranium	0.003	0.0037	0.001	0.0008	5	7	0.001	-	4	4
Zinc	50	15.6	52	13.0	0	7	39	10.4	0	4
Radionuclides										
Lead-210 (Bq/g)	0.0005	0.00058	0.0007	0.00075	6	7	0.0008	-	4	4
Polonium-210 (Bq/g)[5]	0.0007	0.00034	0.0006	0.00076	2	7	0.0009	0.00090	0	3
Radium-226 (Bq/g)	0.00008	0.000106	0.00007	-	7	7	0.00010	0.000066	3	4
Thorium-230 (Bq/g)	-	-	0.0001	0.00005	6	7	0.0001	0.00006	3	3
Trace Elements										
Arsenic	0.06	0.060	0.01	0	6	7	0.01	-	4	4
Cobalt	0.015	0.0089	0.012	0.0047	0	7	0.014	0.0054	0	4
Vanadium[5]	0.05	0.005	0.02	-	7	7	0.02	-	4	4

[1]All concentrations are reported on a µg/g wet weight basis, except when specified otherwise.

[2]Regional reference data are from the AWG program. Data used are from 2000 to 2010 (n=37); however, data are not available from all communities in all years and the 2007 data were omitted due to obvious differences in MDLs. Exceptions were cadmium, lead, and cobalt where only data from 2008 to 2010 (n=9) could be used due to large differences in MDLs.

[3]S.D. = Standard deviation; standard deviations of 0 signify "no variance between samples", not "a very small variance".

[4]The regional reference concentrations for molybdenum and vanadium were almost all <MDL; however, in most samples the MDL was 0.05, while a few samples had a MDL of 0.02. The differences in MDLs between samples results in regional reference averages that appear higher than the EARMP values and standard deviations being created.

[5]Regional reference data are not available from AWG program for this parameter. Data used are from Thomas et al. (2005) and include 19 moose samples collected from Meadow Lake, SK and 2 moose samples collected near Edmonton, AB.

<MDL = less than the laboratory method detection limit.

Values less than the MDL were set equal to the MDL when calculating summary statistics.

APPENDIX C

RAW DATA

LIST OF TABLES

APPENDIX C, TABLE 1

Water chemistry results for the EARMP community program, fall 2011.

Chemical[1]	Black Lake	Camsell Portage	Fond du Lac	Stony Rapids	Uranium City	Wollaston Lake
	Black Lake	Ellis Bay, Lake Athabasca	Fond du Lac River	Fond du Lac River	Fredette River	Welcome Bay, Wollaston Lake
Inorganic Ions						
Bicarbonate	20	35	18	21	63	17
Calcium	3.5	6.9	3.7	3.4	15	3.4
Carbonate	<1	<1	<1	<1	<1	<1
Chloride	3.6	3.1	2.8	3.2	1.5	0.4
Hydroxide	<1	<1	<1	<1	<1	<1
Magnesium	1.3	2.1	1.3	1.1	2.9	1.1
Potassium	0.8	0.9	0.8	0.8	0.9	0.7
Sodium	1.8	2.5	1.6	1.7	1.9	1.4
Sulfate	1.4	3.6	1.5	1.4	4.5	4
Metals						
Aluminum	0.002	0.0016	0.014	0.018	0.0051	0.0047
Barium	0.0044	0.01	0.0051	0.0046	0.032	0.0041
Boron	0.01	<0.01	0.01	0.01	<0.01	<0.01
Cadmium	0.00001	0.00001	0.00002	0.00002	0.00001	0.00001
Chromium	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Copper	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Iron	0.026	0.0049	0.023	0.074	0.031	0.014
Lead	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Manganese	0.036	0.0008	0.003	0.027	0.014	0.0047
Mercury (µg/L)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Molybdenum	0.0002	0.0002	0.0001	0.0002	0.0004	0.0012
Nickel	0.0002	0.0002	0.0002	0.0002	0.0001	0.0001
Selenium	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	<0.0001
Silver	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Thallium	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Tin	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Titanium	<0.0002	<0.0002	0.0008	0.0016	0.0003	<0.0002
Uranium (µg/L)	<0.1	<0.1	<0.1	<0.1	3.5	<0.1
Zinc	0.0018	<0.0005	<0.0005	<0.0005	0.0014	<0.0005

APPENDIX C, TABLE 1

Water chemistry results for the EARMP community program, fall 2011.

Chemical[1]	Black Lake	Camsell Portage	Fond du Lac	Stony Rapids	Uranium City	Wollaston Lake
	Black Lake	Ellis Bay, Lake Athabasca	Fond du Lac River	Fond du Lac River	Fredette River	Welcome Bay, Wollaston Lake
Nutrients						
Ammonia as nitrogen	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrate	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Organic carbon	2.5	2.8	2.7	2.7	7.4	2.5
Phosphorus	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Total Kjeldahl nitrogen	0.27	0.23	0.26	0.28	0.41	0.28
Total nitrogen	0.27	0.23	0.26	0.28	0.41	0.28
Physical Properties						
P. alkalinity	<1	<1	<1	<1	<1	<1
pH (pH units)	7.12	7.46	7.22	7.3	7.75	7.1
Specific conductivity (µS/cm)	40	66	39	39	114	34
Sum of ions	32	54	30	33	90	28
Total alkalinity	16	29	15	17	52	14
Total dissolved solids	30	40	28	32	72	24
Total hardness	14	26	14	13	49	13
Total suspended solids	<1	<1	<1	5	2	<1
Turbidity (NTU)	0.6	0.3	1	1.3	0.3	0.3
Radionuclides						
Lead-210 (Bq/L)	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Polonium-210 (Bq/L)	<0.005	<0.005	<0.005	<0.006	<0.005	<0.005
Radium-226 (Bq/L)	<0.005	<0.005	<0.005	<0.005	0.008	<0.005
Thorium-230 (Bq/L)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Trace Elements						
Antimony	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Arsenic (µg/L)	0.1	0.1	0.1	0.2	0.1	<0.1
Beryllium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Cobalt	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Fluoride	0.04	0.06	0.05	0.04	0.1	0.05
Strontium	0.047	0.051	0.043	0.044	0.049	0.012
Vanadium	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001

[1]All values are in mg/L, unless specified otherwise.

APPENDIX C, TABLE 2

Water chemistry results for the EARMP community program, fall 2012.

Chemical[1]	Black Lake	Camsell Portage	Fond du Lac	Stony Rapids	Uranium City	Wollaston Lake
	Black Lake	Ellis Bay, Lake Athabasca	Fond du Lac River	Fond du Lac River	Fredette River	Welcome Bay, Wollaston Lake
Inorganic Ions						
Bicarbonate	26	30	27	20	60	20
Calcium	3.3	7.1	3.9	3.4	16	3.5
Carbonate	<1	<1	<1	<1	<1	<1
Chloride	2	2.9	2.8	2.8	1.2	0.5
Hydroxide	<1	<1	<1	<1	<1	<1
Magnesium	1.2	2.1	1.4	1.3	3	1.1
Potassium	0.7	0.9	0.8	0.7	1	0.6
Sodium	1.5	2.5	1.7	1.6	1.6	1.4
Sulfate	1.0	3.3	1.5	1.2	3.8	4.0
Metals						
Aluminum	0.0026	0.001	0.02	0.0084	0.0051	0.014
Barium	0.0044	0.01	0.0055	0.0043	0.031	0.0042
Boron	<0.01	0.01	0.01	0.01	<0.01	<0.01
Cadmium	0.00001	0.00001	<0.00001	<0.00001	0.00001	<0.00001
Chromium	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Copper	<0.0002	0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Iron	0.013	0.0044	0.03	0.045	0.041	0.035
Lead	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Manganese	0.0068	0.0008	0.0027	0.013	0.024	0.0087
Mercury (µg/L)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Molybdenum	0.0001	0.0002	0.0001	0.0002	0.0004	0.0012
Nickel	0.0001	0.0002	0.0002	0.0001	0.0001	0.0001
Selenium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Silver	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Thallium	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Tin	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Titanium	<0.0002	<0.0002	0.0008	0.0007	<0.0002	0.0002
Uranium (µg/L)	<0.1	<0.1	<0.1	<0.1	1.3	<0.1
Zinc	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005

APPENDIX C, TABLE 2

Water chemistry results for the EARMP community program, fall 2012.

Chemical[1]	Black Lake	Camsell Portage	Fond du Lac	Stony Rapids	Uranium City	Wollaston Lake
	Black Lake	Ellis Bay, Lake Athabasca	Fond du Lac River	Fond du Lac River	Fredette River	Welcome Bay, Wollaston Lake
Nutrients						
Ammonia as nitrogen	<0.01	<0.01	<0.01	<0.01	0.03	<0.01
Nitrate	<0.04	0.09	<0.04	<0.04	<0.04	<0.04
Organic carbon	3.8	3.5	1.9	3.8	9.9	3
Phosphorus	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Total Kjeldahl nitrogen	0.2	0.21	0.22	0.23	0.37	0.21
Total nitrogen	0.2	0.23	0.22	0.23	0.37	0.21
Physical Properties						
P. alkalinity	<1	<1	<1	<1	<1	<1
pH (pH units)	7.18	7.5	7.14	7.3	7.72	7.12
Specific conductivity (µS/cm)	38	69	44	40	112	37
Sum of ions	36	49	39	31	87	31
Total alkalinity	21	25	22	16	49	16
Total dissolved solids	30	44	32	33	76	28
Total hardness	13	26	15	14	52	13
Total suspended solids	1	<1	2	2	1	2
Turbidity (NTU)	0.7	0.4	1.1	1.2	0.6	0.8
Radionuclides						
Lead-210 (Bq/L)	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Polonium-210 (Bq/L)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Radium-226 (Bq/L)	0.009	<0.005	<0.005	0.01	0.01	0.009
Thorium-230 (Bq/L)	<0.01	0.02	<0.01	<0.01	<0.01	<0.01
Trace Elements						
Antimony	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Arsenic (µg/L)	0.1	0.2	0.1	0.2	0.2	<0.1
Beryllium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Cobalt	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Fluoride	0.07	0.07	0.07	0.06	0.13	0.07
Strontium	0.033	0.05	0.04	0.04	0.045	0.012
Vanadium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

[1]All values are in mg/L, unless specified otherwise.

APPENDIX C, TABLE 3

Detailed fish capture results for the EARMP community program, fall 2011.

Community (Waterbody)	Net Site[1]	Catch Date	Species[2]	Fish Ordinal Number	Length (cm)	Weight (g)	Sex[3]	Maturity[4]	Spawning Condition[5]	Age (yrs)	Stomach Contents[6]
Uranium City (Crackingstone Inlet, Lake Athabasca)	SP01-01	05-Oct-2011	LT	1	55.1	2280	M	A	SP	14	10% Stickleback
			LT	2	55.7	2160	F	A	SP	19	Empty
			LT	3	54.1	1780	F	A	SP	14	Empty
			LT	4	53.3	1950	M	A	SP	14	70% Stickleback
			LT	5	52.6	1680	M	A	SP	-	Empty
			LW	6	40.1	1090	F	A	M	14	20% Unidentified BI
			LW	7	41.4	1220	M	A	M	8	Empty
			LW	8	43.4	1260	M	A	NS	13	35% Unidentified BI
			LW	9	40.4	1060	F	A	NS	14	40% Unidentified BI
			LW	10	41.3	1150	F	A	M	19	Empty
			NP	1	55.2	1320	M	A	MT	5	10% Lake whitefish
			NP	2	55.9	1410	F	A	MT	5	30% Lake whitefish
			NP	3	59.9	1720	F	A	MT	5	Empty
			NP	4	61.7	1960	F	A	MT	7	10% Unidentified BI
			NP	5	71.5	2560	F	A	MT	9	Empty
Fond du Lac (Fond du Lac River)	SP01-01	24-Sep-2011	LT	1	49.6	1430	M	A	SP	12	Empty
			LT	2	46.4	1310	F	A	NS	10	Empty
			LT	3	53.9	2020	F	A	SP	15	Empty
			LT	4	49.1	1230	F	A	NS	9	20% Unidentified
			LT	5	49.2	1530	M	A	SP	8	Empty
			LW	6	38.5	900	M	A	MT	30	Empty
			LW	7	44.9	1340	M	A	MT	26	Empty
			LW	8	36.4	805	F	A	M	31	Empty
			LW	9	41.1	1100	F	A	M	33	Empty
			LW	10	42.2	1120	M	A	MT	38	Empty
Black Lake (Black Lake)	SP01-01	22-Sep-2011	LT	1	44.9	1730	F	A	SP	12	Empty
			LT	2	51.2	1710	M	A	M	10	Empty
			LT	3	48.7	1480	M	A	SP	7	Empty
			LT	4	48.3	1450	F	A	SP	10	Empty
			LT	5	50.5	1740	M	A	M	10	Empty
			LW	6	38.3	840	F	A	M	21	20% Unidentified BI
			LW	7	41.8	1060	M	A	MT	21	40% Unidentified BI
			LW	8	45.5	1360	M	A	M	26	15% Unidentified BI
			LW	9	48	890	F	A	NS	10	Empty
			LW	10	45.2	1450	F	A	M	27	30% Unidentified BI

APPENDIX C, TABLE 3

Detailed fish capture results for the EARMP community program, fall 2011.

Community (Waterbody)	Net Site[1]	Catch Date	Species[2]	Fish Ordinal Number	Length (cm)	Weight (g)	Sex[3]	Maturity[4]	Spawning Condition[5]	Age (yrs)	Stomach Contents[6]
Camsell Portage (Ellis Bay, Lake Athabasca)	SP01-01	05-Oct-2011	LT	1	49.8	1490	M	A	NS	12	30% Stickleback
			LT	2	48.6	1480	M	A	NS	8	50% Sucker
			LT	3	53.9	1920	F	A	NS	23	60% Stickleback
			LT	4	48.5	1420	F	A	NS	8	50% Stickleback
			LT	5	55.6	2480	F	A	NS	11	25% Stickleback
			LW	6	32	1250	M	A	M	31	Empty
			LW	7	43.2	1260	M	A	M	27	Empty
			LW	8	40	1380	F	A	M	22	Empty
			LW	9	39.5	1120	F	A	M	18	Empty
			LW	10	38.6	880	F	A	M	11	Empty
Stony Rapids (Fond du Lac River)	SP01-01	06-Oct-2011	LT	1	54.9	1750	F	A	ST	10	Empty
			LT	2	55.9	2060	F	A	ST	15	30% White Sucker
			LT	3	57.2	2180	F	A	ST	16	25% Ninespine stickleback
			LT	4	64.9	2840	F	A	ST	17	40% White sucker
			LT	5	69.6	3720	M	A	ST	15	Empty
			LW	6	47.8	1490	F	A	SP	27	Empty
			LW	7	44.8	1640	F	A	SP	14	Empty
			LW	8	48.1	1730	F	A	SP	13	Empty
			LW	9	51.4	2060	F	A	SP	29	Empty
			LW	10	42.5	1410	M	A	SP	8	25% Unidentified BI
Wollaston Lake/Hatchet Lake (Welcome Bay, Wollaston Lake)	SP01-01	27-Sep-2011	LT	1	51.5	1730	F	A	NS	7	Empty
			LT	2	46.3	1220	M	A	NS	7	80% Lake chub + unidentified fish
			LT	3	46.8	1440	M	A	SP	7	Empty
			LT	4	47.9	1410	F	A	NS	8	Empty
			LT	5	46.6	1430	M	A	M	6	Empty
			LW	6	36.5	780	M	A	M	16	Empty
			LW	7	38	820	M	A	MT	16	Empty
			LW	8	40.6	940	M	A	MT	14	Empty
			LW	9	36.9	810	M	A	MT	12	Empty
			LW	10	39.2	825	F	A	M	17	Empty

[1]For the community program, all fish were captured using gill nets.

[2]LT = lake trout, LW = lake whitefish, NP = northern pike.

[3]M = male, F = female.

[4]A = adult.

[5]NS = non-spawner, MT = green, M = ripe, SP = running ripe, ST = spent.

[6]BI = benthic invertebrate.

APPENDIX C, TABLE 4

Detailed fish capture results for the EARMP community program, fall 2012.

Community (Waterbody)	Net Site[1]	Catch Date	Species[2]	Fish Ordinal Number	Length (cm)	Weight (g)	Sex[3]	Maturity[4]	Spawning Condition[5]	Age (yrs)	Stomach Contents[6]
Uranium City (Crackingstone Inlet, Lake Athabasca)	AN01-01	28-Sep-2012	NP	1	83.1	4100	F	A	MT	8	Empty
			NP	2	64.5	1630	F	A	MT	6	Empty
			NP	3	63.8	1390	F	A	MT	6	Empty
			NP	4	65.6	1610	F	A	MT	5	20% White sucker
			NP	5	60.8	1320	M	A	MT	7	40% Unidentified
	SP01-01	29-Sep-2012	LW	1	44.8	905	M	A	MT	12	Empty
			LW	2	43.5	820	F	A	MT	12	Empty
			LW	3	39.1	740	F	A	NS	6	Empty
			LSU	4	33.1	460	M	A	MT	11	Empty
			LT	5	49.7	1290	F	A	SP	-	Empty
			LT	6	52.4	1090	M	A	SP	-	Empty
	SP01-02	29-Sep-2012	NF	-	-	-	-	-	-	-	-
	SP01-03	30-Sep-2012	LW	1	43.1	780	F	A	NS	16	15% Unidentified BI
			LW	2	41.2	750	M	A	MT	13	Empty
	SP02-01	29-Sep-2012	LT	1	63.4	2290	F	A	SP	13	Empty
			LT	2	55.4	1720	M	A	SP	16	Empty
			LT	3	58.9	1850	F	A	SP	23	10% Unidentified fish
			LT	4	52.2	1310	F	A	SP	13	30% Unidentified fish
			LT	5	56.3	1590	M	A	SP	-	Empty
			LT	6	50.1	1150	M	A	SP	9	Empty
			LT	7	52.6	1090	M	A	SP	-	Empty
			LT	8	51.1	1060	M	A	SP	-	Empty
			NP	9	67.5	2140	F	A	MT	-	50% White sucker
			NP	10	77.2	2980	F	A	MT	-	25% White sucker
			NP	11	64.5	1520	F	A	MT	-	Empty
			NP	12	65.5	1670	M	A	MT	-	Empty
Uranium City (Prospector Bay, Lake Athabasca)	SP01-01	07-Oct-2012	LT	1	55.6	1380	M	A	U	12	100% Unidentified fish
			LT	2	60.2	1700	M	A	U	24	Empty
			LT	3	59.1	1520	M	A	U	25	Empty
			LT	4	61.8	1840	M	A	U	19	25% Unidentified fish
			LT	5	63.4	2140	M	A	U	11	100% Unidentified fish
			LW	6	46.7	640	M	A	U	12	Empty
			LW	7	49.6	980	M	A	U	29	25% Unidentified BI
			LW	8	48.8	1140	F	A	MT	14	50% Unidentified BI
			LW	9	55	1520	F	A	MT	17	100% Unidentified BI
			LW	10	50	1080	F	A	M	21	Empty
Fond du Lac (Fond du Lac River)	SP01-01	25-Aug-2012	LW	1	44.4	940	M	A	MT	7	25% Unidentified fish
			LW	2	43.8	1040	F	A	M	27	Empty
			LW	3	46.6	1100	M	A	MT	20	Empty
			LW	4	42.8	860	F	A	M	15	Empty
			LW	5	36.5	520	M	A	M	27	Empty
			LT	6	60.5	1680	M	A	U	17	Empty
			LT	7	55.6	1420	M	A	U	11	75% Unidentified fish
			LT	8	61.2	1940	F	A	MT	15	100% Unidentified fish
			LT	9	63.4	1840	F	A	MT	-	100% Lake trout
			LT	10	63.5	2280	F	A	M	14	100% Unidentified fish

APPENDIX C, TABLE 4

Detailed fish capture results for the EARMP community program, fall 2012.

Community (Waterbody)	Net Site[1]	Catch Date	Species[2]	Fish Ordinal Number	Length (cm)	Weight (g)	Sex[3]	Maturity[4]	Spawning Condition[5]	Age (yrs)	Stomach Contents[6]
Black Lake (Black Lake)	SP01-01	23-Aug-2012	LT	1	51.3	1360	F	A	SP	7	25% Unidentified fish
			LT	2	52.7	1740	F	A	SP	7	Empty
			LT	3	51.2	1180	M	A	SP	6	100% Lake chub
			LT	4	62.5	2060	F	A	M	27	100% Unidentified fish
			LT	5	65.2	2410	F	A	M	19	75% Unidentified fish
			LW	6	46	980	M	A	MT	9	10% Unidentified BI
			LW	7	45.7	1020	M	A	MT	15	50% Unidentified BI
			LW	8	45.5	920	M	A	MT	15	100% Unidentified BI
			LW	9	40.2	760	M	A	MT	7	Empty
			LW	10	46.2	1140	F	A	MT	10	Empty
Camsell Portage (Ellis Bay, Lake Athabasca)	AN01-01	28-Jun-2012	NP	1	76	2800	F	A	MT	6	100% Unidentified fish
			NP	2	67.7	2760	M	A	MT	9	25% Unidentified fish
			NP	3	67.8	1660	F	A	M	5	Empty
			NP	4	72.3	2760	F	A	M	7	25% Unidentified fish
			NP	5	89.5	4860	F	A	MT	16	100% Lake whitefish
	SP01-01	01-Oct-2012	LT	1	62.2	3640	F	A	SP	19	Empty
			LT	2	69.1	2920	M	A	SP	13	Empty
			LT	3	53	1420	M	A	SP	9	Empty
			LT	4	60.3	1760	M	A	SP	20	Empty
			LT	5	63.5	2560	F	A	SP	18	Empty
			LW	6	49.1	1180	M	A	U	30	Empty
			LW	7	48.5	1120	M	A	U	33	25% Unidentified BI
Stony Rapids (Fond du Lac River)	SP01-01	10-Oct-2012	LW	1	48	1420	F	A	M	9	Empty
			LW	2	47	980	F	A	M	14	Empty
			LW	3	50.6	1680	M	A	M	18	Empty
			LW	4	50.8	1360	F	A	M	15	Empty
			LW	5	49.5	1520	F	A	M	18	Empty
			LT	6	57.2	1520	M	A	M	14	10% Unidentified
			LT	7	62.8	2060	M	A	M	22	25% Unidentified BI
			LT	8	61	1840	M	A	M	21	25% Unidentified fish
			LT	9	59.8	1820	M	A	SP	22	Empty
Wollaston Lake/Hatchet Lake (Welcome Bay, Wollaston Lake)	SP01-01	28-Aug-2012	LW	1	47.9	1380	M	A	MT	19	80% Unidentified BI
			LW	2	43.3	880	F	A	MT	11	Empty
			LW	3	46.2	1060	F	A	MT	21	Empty
			LW	4	44.4	860	F	A	MT	12	25% Unidentified BI
			LW	5	43.6	840	M	A	MT	18	90% Unidentified BI
			LT	6	55.6	1760	M	A	MT	6	100% Lake whitefish
			LT	7	50.5	1420	M	A	MT	7	100% Unidentified fish
			LT	8	50.8	1360	M	A	MT	7	Empty
			LT	9	50.5	1400	M	A	MT	9	50% Unidentified
			LT	10	52	1520	M	A	MT	7	Empty

[1]For the community program, all fish were captured using gill nets and angling.

[2]LT = lake trout, LW = lake whitefish, NP = northern pike, LSU = longnose sucker, NF = no fish.

[3]M = male, F = female.

[4]A = adult.

[5]NS = non-spawner, MT = green, M = ripe, SP = running ripe, ST = spent.

[6]BI = benthic invertebrate.

APPENDIX C, TABLE 5

Descriptive statistics of fish collected for chemistry for the EARMP community program, fall 2011 and 2012.

Waterbody	Statistic	Lake Trout		Lake Whitefish		Northern Pike		All Species	
		Length (cm)	Weight (g)	Length (cm)	Weight (g)	Length (cm)	Weight (g)	Length (cm)	Weight (g)
Black Lake	N	10	10	10	10	-	-	20	20
	Average	52.7	1686	44.2	1042	-	-	48.4	1364
	S.D.	6.3	355	3.1	221	-	-	6.5	438
	Minimum	44.9	1180	38.3	760	-	-	38.3	760
	Maximum	65.2	2410	48.0	1450	-	-	65.2	2410
Uranium City (Crackingstone Inlet)	N	10	10	10	10	9	9	35	35
	Average	55.1	1817	41.8	978	68.1	2040	53.6	1511
	S.D.	3.8	381	1.8	201	7.2	925	11.3	697
	Minimum	50.1	1150	39.1	740	60.8	1320	33.1	460
	Maximum	63.4	2290	44.8	1260	83.1	4100	83.1	4100
Uranium City (Prospector's Bay)	N	5	5	5	5	-	-	10	10
	Average	60.0	1716	50.0	1072	-	-	55.0	1394
	S.D.	3.0	294	3.1	316	-	-	6.0	445
	Minimum	55.6	1380	46.7	640	-	-	46.7	640
	Maximum	63.4	2140	55.0	1520	-	-	63.4	2140
Ellis Bay	N	10	10	7	7	5	5	22	22
	Average	56.5	2109	41.6	1170	74.7	2968	55.9	2005
	S.D.	7.0	762	6.0	157	9.0	1162	14.1	986
	Minimum	48.5	1420	32.0	880	67.7	1660	32.0	880
	Maximum	69.1	3640	49.1	1380	89.5	4860	89.5	4860
Stony Rapids	N	4	4	5	5	-	-	9	9
	Average	60.2	1810	49.2	1392	-	-	54.1	1578
	S.D.	2.3	222	1.6	260	-	-	6.1	318
	Minimum	57.2	1520	47.0	980	-	-	47.0	980
	Maximum	62.8	2060	50.8	1680	-	-	62.8	2060
Wollaston Lake/Hatchet Lake	N	10	10	10	10	-	-	20	20
	Average	49.9	1469	41.7	920	-	-	45.8	1194
	S.D.	3.0	164	4.0	181	-	-	5.4	328
	Minimum	46.3	1220	36.5	780	-	-	36.5	780
	Maximum	55.6	1760	47.9	1380	-	-	55.6	1760

S.D. = standard deviation.

APPENDIX C, TABLE 6

Detailed Black Lake fish flesh chemistry data for the EARMP community program, 2011 and 2012.

Chemical[1]	Black Lake (Black Lake)																			
	Lake Trout										Lake Whitefish									
	2011					2012					2011					2012				
	LT01	LT02	LT03	LT04	LT05	LT01	LT02	LT03	LT04	LT05	LW06	LW07	LW08	LW09	LW10	LW06	LW07	LW08	LW09	LW10
Metals																				
Aluminum	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Barium	0.02	0.03	0.01	<0.01	0.03	<0.01	0.01	0.01	0.02	0.01	0.06	0.13	0.09	<0.01	0.02	0.02	0.01	0.02	<0.01	0.02
Boron	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Cadmium	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Chromium	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Copper	0.27	0.41	0.31	0.22	1	0.31	0.31	0.43	0.18	0.25	0.24	0.21	0.12	0.17	0.14	0.16	0.19	0.25	0.28	0.18
Iron	1.9	3.3	2	4.5	6	2.2	2	2.6	1.5	2.9	2.3	2.9	2.5	1.4	1.5	1	2	2.7	4	1.1
Lead	<0.002	0.004	<0.002	<0.002	<0.002	0.002	<0.002	0.002	<0.002	0.004	<0.002	0.002	<0.002	<0.002	<0.002	0.002	<0.002	0.003	<0.002	0.003
Manganese	0.06	0.08	0.08	0.08	0.09	0.08	0.06	0.05	0.07	0.1	0.18	0.39	0.22	0.06	0.09	0.06	0.07	0.11	0.06	0.06
Mercury	0.45	0.41	0.37	0.33	0.37	0.16	0.16	0.18	0.36	0.35	0.16	0.13	0.14	0.06	0.21	0.13	0.16	0.15	0.02	0.05
Molybdenum	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Nickel	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Selenium	0.11	0.15	0.15	0.11	0.13	0.15	0.18	0.17	0.18	0.16	0.30	0.35	0.25	0.36	0.31	0.28	0.24	0.26	0.15	0.2
Silver	<0.002	<0.002	<0.002	<0.002	0.005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Thallium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Tin	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Titanium	0.08	0.09	0.08	0.07	0.08	0.07	0.07	0.08	0.07	0.08	0.08	0.09	0.08	0.08	0.08	0.07	0.08	0.09	0.08	0.08
Uranium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	2.9	4.7	2.5	2.2	5.9	3.6	4.7	4.4	3.6	6.3	3.9	4.6	3.5	4.7	3.3	6.7	6.2	4.6	4.4	4.4
Physical Properties																				
Moisture (%)	77.19	77.72	73.93	76.78	77.42	73.79	71.07	77.81	77.02	76.28	75.22	76.01	76.93	75.27	75.79	74.3	72.89	75.74	78.39	76.9
Radionuclides																				
Lead-210 (Bq/g)	0.002	<0.001	0.002	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.004	<0.004	<0.001
Polonium-210 (Bq/g)	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0002	0.0002	<0.0002	0.0005	0.0007	<0.0002	<0.0002	<0.0002	<0.001	<0.001	<0.0002
Radium-226 (Bq/g)	<0.00004	<0.00006	<0.00007	<0.00005	<0.00006	<0.00006	<0.0001	<0.00005	0.00005	<0.00006	<0.00006	<0.00006	0.00009	<0.00007	<0.00006	<0.00006	<0.00006	0.001	0.002	<0.00006
Thorium-230 (Bq/g)	<0.00009	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0002	<0.0001	<0.00009	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	<0.002	<0.002	<0.0001
Trace Elements																				
Antimony	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Arsenic	0.05	0.06	0.07	0.05	0.10	0.06	0.14	0.07	0.06	0.06	0.25	0.27	0.40	0.14	0.37	0.04	0.05	0.08	0.14	0.04
Beryllium	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Cobalt	<0.002	<0.002	<0.002	0.002	0.002	<0.002	<0.002	<0.002	0.003	<0.002	0.003	0.005	<0.002	0.003	0.003	<0.002	0.002	<0.002	<0.002	0.003
Strontium	0.10	0.07	0.09	0.05	0.13	0.07	0.21	0.27	0.2	0.8	0.79	0.24	1.20	0.28	0.22	0.27	0.31	0.25	0.16	0.17
Vanadium	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02

[1]All concentrations are presented on a µg/g wet weight basis, unless specified otherwise.

APPENDIX C, TABLE 7

Detailed Uranium City (Crackingstone Inlet) fish flesh chemistry data for the EARMP community program, 2011 and 2012.

Chemical[1]	Uranium City (Crackingstone Inlet)																													
	Lake Trout										Lake Whitefish										Northern Pike									
	2011					2012					2011					2012					2011					2012				
	LT01	LT02	LT03	LT04	LT05	LT01	LT02	LT03	LT04	LT06	LW06	LW07	LW08	LW09	LW10	LW01	LW02	LW03	LW04	LW05	NP01	NP02	NP03	NP04	NP05	NP01	NP02	NP03	NP04	NP05
Metals																														
Aluminum	0.9	<0.5	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Barium	0.03	<0.01	0.04	0.01	<0.01	0.01	0.02	0.02	0.02	0.01	0.63	0.6	0.01	0.17	0.04	0.02	0.01	0.02	0.02	<0.01	0.02	0.04	0.01	0.12	<0.01	0.02	0.03	0.02	0.02	0.02
Boron	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Cadmium	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.003	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Chromium	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Copper	0.27	0.13	0.2	0.24	0.22	0.3	0.23	0.15	0.22	0.24	0.19	0.25	0.15	0.19	0.2	0.2	0.17	0.22	0.12	0.2	0.28	0.25	0.25	0.16	0.17	0.2	0.14	0.13	0.17	0.18
Iron	5.3	1.9	1.9	2.3	3.4	1.5	2.1	1.2	1.2	1.2	1.3	2.1	4.4	1.8	4.3	1.4	0.9	1.3	2.6	2.0	2.8	2.3	2.4	2.0	1.3	1.7	1.1	0.7	3.8	1.9
Lead	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Manganese	0.2	0.06	0.07	0.06	0.09	0.06	0.09	0.08	0.09	0.05	0.09	0.08	0.07	0.11	0.11	0.07	0.07	0.07	0.14	0.08	0.12	0.13	0.11	0.13	0.07	0.10	0.09	0.08	0.12	0.09
Mercury	0.13	0.17	0.18	0.17	0.13	0.08	0.15	0.22	0.08	0.08	0.04	0.04	0.09	0.02	0.02	0.03	0.02	0.03	0.02	0.02	0.09	0.06	0.05	0.13	0.14	0.16	0.15	0.08	0.06	0.14
Molybdenum	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Nickel	<0.01	0.01	<0.01	0.02	<0.01	0.07	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.08	<0.01	<0.01	<0.01	<0.01	<0.01	0.04	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Selenium	0.16	0.15	0.12	0.21	0.18	0.17	0.15	0.14	0.15	0.15	0.18	0.21	0.58	2.6	0.28	0.37	0.33	0.55	0.85	0.32	0.64	0.52	0.32	0.36	0.42	0.59	0.40	0.38	0.34	0.66
Silver	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Thallium	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Tin	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Titanium	0.11	0.07	0.08	0.08	0.08	0.01	0.02	0.01	<0.01	<0.01	0.07	0.07	0.06	0.08	0.07	0.02	0.01	0.01	0.02	0.01	0.09	0.07	0.07	0.09	0.07	0.01	0.01	0.02	0.01	<0.01
Uranium	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.007	0.006	0.008	0.012	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	6.5	3.4	3.8	2.6	7.8	2.8	2.9	2.6	3.3	2.5	3.6	4.4	5.3	5	4.1	3.4	3.7	4.2	3	3.2	6.2	6.6	7.9	6	3.5	5.9	3.3	3.4	8.5	3.8
Physical Properties																														
Moisture (%)	66.65	72.8	72.26	70.93	75.14	74.44	75.35	80.02	75.97	76.17	75.91	75.86	76.21	73.83	74.66	73.3	75.53	76.72	74.93	75.2	78.43	78.59	79.09	78.21	77.81	77.48	78.26	77.67	78.08	77.64
Radionuclides																														
Lead-210 (Bq/g)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Polonium-210 (Bq/g)	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0007	0.0007	<0.0002	0.0006	0.0004	0.0003	0.0007	0.0002	0.0008	0.001	0.0003	0.001	0.0004	0.0006	0.0013	0.0004	0.0012	0.0018
Radium-226 (Bq/g)	<0.00007	<0.00006	<0.00007	<0.00006	0.0004	<0.00006	<0.00006	<0.00006	<0.00007	<0.00009	<0.00008	<0.00006	0.0003	<0.00007	<0.00008	<0.00005	0.0002	<0.0001	<0.00008	0.00009	0.00006	<0.00006	<0.00006	<0.00006	<0.00006	<0.00007	<0.00007	<0.00008	<0.00006	<0.0001
Thorium-230 (Bq/g)	<0.0001	0.0002	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0002	<0.0002	0.0004	<0.0001	<0.0002	<0.0001	<0.0002	<0.0001	<0.0002	<0.0002	0.0006	<0.0002	0.0003	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002
Trace Elements																														
Antimony	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Arsenic	0.11	0.08	0.12	0.07	0.06	0.06	0.05	0.04	0.09	0.05	0.12	0.05	0.12	0.11	0.11	0.09	0.02	0.03	0.3	0.24	0.05	0.06	0.05	0.05	0.1	0.19	0.08	0.05	0.05	0.06
Beryllium	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Cobalt	<0.002	<0.002	<0.002	<0.002	0.003	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.009	0.004	<0.002	0.004	0.002	0.004	<0.002	<0.002	<0.002	0.002	0.002	0.002	0.002	0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Strontium	0.17	0.17	0.46	0.07	0.12	0.1	0.04	0.04	0.14	0.1	0.22	0.18	0.34	0.75	0.45	0.13	0.08	0.12	0.1	0.17	0.14	0.27	0.13	0.57	0.09	0.16	0.18	0.09	0.11	0.06
Vanadium	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02

[1]All concentrations are presented on a µg/g wet weight basis, unless specified otherwise.

APPENDIX C, TABLE 8

Detailed Uranium City (Prospectors Bay) fish flesh chemistry data for the EARMP community program, fall 2012.

Chemical[1]	Uranium City (Prospectors Bay)[2]									
	Lake Trout					Lake Whitefish				
	2012					2012				
	LT01	LT02	LT03	LT04	LT05	LW06	LW07	LW08	LW09	LW10
Metals										
Aluminum	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Barium	0.01	0.03	0.02	0.02	0.03	0.01	0.02	0.01	0.01	0.01
Boron	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Cadmium	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Chromium	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Copper	0.27	0.21	0.21	0.26	0.26	0.12	0.13	0.17	0.18	0.14
Iron	2.2	4.5	2.0	3.3	1.9	1.0	2.0	1.8	1.6	1.4
Lead	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Manganese	0.08	0.07	0.05	0.05	0.05	0.07	0.06	0.07	0.07	0.12
Mercury	0.17	0.24	0.23	0.21	0.13	0.05	0.13	0.06	0.12	0.11
Molybdenum	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Nickel	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Selenium	0.18	0.17	0.17	0.18	0.17	0.28	0.22	0.23	0.32	0.26
Silver	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Thallium	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Tin	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Titanium	0.07	0.07	0.07	0.07	0.06	0.08	0.07	0.08	0.08	0.08
Uranium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	4.3	4.0	3.7	5.4	4.1	4.3	4.5	7.6	4.3	3.3
Physical Properties										
Moisture (%)	74.73	78.66	78.14	75.87	76.3	79.31	78.4	75.72	73.83	76.89
Radionuclides										
Lead-210 (Bq/g)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Polonium-210 (Bq/g)	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0006	<0.0002	<0.0002
Radium-226 (Bq/g)	<0.00005	<0.00006	<0.00006	<0.00006	0.00006	<0.00006	<0.00007	<0.00005	<0.00006	<0.00008
Thorium-230 (Bq/g)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002
Trace Elements										
Antimony	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Arsenic	0.07	0.07	0.08	0.07	0.13	0.08	0.03	0.09	0.05	0.1
Beryllium	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Cobalt	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.003	0.013	0.009	<0.002
Strontium	0.17	0.11	0.13	0.25	0.32	0.22	0.19	0.4	0.4	0.25
Vanadium	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02

[1]All concentrations are presented on a µg/g wet weight basis, unless specified otherwise.

[2]Data were not collected in 2011.

APPENDIX C, TABLE 9

Detailed Camsell Portage (Ellis Bay) fish flesh chemistry data for the EARMP community program, 2011 and 2012.

Chemical[1]	Camsell Portage (Ellis Bay)																					
	Lake Trout										Lake Whitefish							Northern Pike				
	2011					2012					2011					2012		2012				
	LT01	LT02	LT03	LT04	LT05	LT01	LT02	LT03	LT04	LT05	LW06	LW07	LW08	LW09	LW10	LW06	LW07	NP01	NP02	NP03	NP04	NP05
Metals																						
Aluminum	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Barium	0.04	0.01	<0.01	<0.01	<0.01	0.05	0.08	0.02	0.04	0.02	<0.01	0.04	0.06	<0.01	<0.01	0.03	0.02	0.02	0.02	0.02	0.02	<0.01
Boron	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Cadmium	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Chromium	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Copper	0.52	0.52	0.11	0.32	0.28	0.24	0.28	0.33	0.58	0.21	0.12	0.15	0.38	0.11	0.15	0.18	0.18	0.39	0.45	0.16	0.17	0.28
Iron	4.5	3.0	1.0	2.2	2.0	1.5	2.7	3.5	5.8	1.6	1.5	1.2	3.6	1.1	2.2	1.8	3.9	2.8	3.2	1.3	0.6	3.2
Lead	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.003	<0.002	<0.002	<0.002	<0.002	<0.002
Manganese	0.1	0.09	0.09	0.07	0.08	0.06	0.09	0.6	0.08	0.06	0.12	0.19	0.13	0.12	0.1	0.11	0.11	0.08	0.09	0.08	0.08	0.08
Mercury	0.13	0.2	0.28	0.07	0.18	0.17	0.08	0.06	0.21	0.14	0.07	0.06	0.03	0.03	0.02	0.05	0.06	0.19	0.13	0.08	0.17	0.24
Molybdenum	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Nickel	0.03	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Selenium	0.14	0.18	0.15	0.16	0.18	0.15	0.16	0.15	0.18	0.1	0.29	0.25	0.25	0.22	0.25	0.31	0.25	0.2	0.17	0.22	0.18	0.19
Silver	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Thallium	<0.01	0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Tin	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Titanium	0.07	0.15	0.06	0.07	0.06	0.01	0.02	0.02	0.01	<0.01	0.07	0.07	0.06	0.06	0.07	0.02	<0.01	0.02	0.02	0.02	0.01	0.01
Uranium	0.014	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	11	3.8	2.9	3.8	3.5	2.6	3.2	2.6	10	6.3	3	2.8	4.4	3.3	3.1	2.8	3.2	4.2	9.8	5.4	4.9	6.5
Physical Properties																						
Moisture (%)	73.73	71.7	74.1	70.34	67.36	73.93	76.07	75.33	76.29	72.6	74.81	78.24	73.86	77.91	76.16	74.12	74.97	76.89	77.35	76.06	77.29	79.91
Radionuclides																						
Lead-210 (Bq/g)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Polonium-210 (Bq/g)	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0007	<0.0002	<0.0002	0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0002	0.0002	0.0004	0.0008	0.0003	0.0003
Radium-226 (Bq/g)	<0.00007	<0.00006	0.0002	0.00009	0.0001	<0.00007	<0.00007	<0.00006	<0.00005	<0.00004	<0.00006	<0.00006	<0.0002	<0.00006	0.0003	<0.00007	<0.00006	<0.00006	<0.00007	<0.00008	<0.00006	0.00008
Thorium-230 (Bq/g)	<0.0001	<0.0001	<0.0001	<0.0002	<0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0003	<0.0001	<0.0001	<0.0001	<0.0002	<0.0001	<0.0001	<0.0002	<0.0002	<0.003
Trace Elements																						
Antimony	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Arsenic	0.12	0.08	0.12	0.08	0.12	0.06	0.14	0.04	0.06	0.29	0.38	0.24	0.36	0.31	0.17	0.37	0.24	0.09	0.15	0.09	0.12	0.1
Beryllium	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Cobalt	0.003	0.003	<0.002	<0.002	0.002	<0.002	<0.002	<0.002	0.002	<0.002	<0.002	<0.002	0.007	0.002	0.002	<0.002	0.003	0.003	0.003	<0.002	<0.002	0.003
Strontium	0.3	0.19	0.26	0.2	0.15	0.06	0.13	0.07	0.68	0.65	0.15	0.74	1	0.18	0.24	0.15	0.23	0.16	0.2	0.18	0.11	0.14
Vanadium	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02

[1]All concentrations are presented on a µg/g wet weight basis, unless specified otherwise.

APPENDIX C, TABLE 10

Detailed Fond du Lac fish flesh chemistry data for the EARMP community program, 2011 and 2012.

Chemical[1]	Fond du Lac (Fond du Lac River)																			
	Lake Trout										Lake Whitefish									
	2011					2012					2011					2012				
	LT01	LT02	LT03	LT04	LT05	LT06	LT07	LT08	LT09	LT10	LW06	LW07	LW08	LW09	LW10	LW01	LW02	LW03	LW04	LW05
Metals																				
Aluminum	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.3	<0.5	<0.5	<0.5	<0.5	<0.5
Barium	<0.01	0.02	0.01	0.66	0.01	0.02	0.02	0.02	<0.01	<0.01	0.06	0.04	0.02	<0.01	0.03	0.02	0.04	0.01	0.07	0.02
Boron	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Cadmium	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.002	<0.002	<0.002	<0.002	0.006	<0.002	<0.002	<0.002	<0.002	<0.002
Chromium	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Copper	0.17	0.31	0.4	0.19	0.4	0.31	0.26	0.23	0.28	0.21	0.14	0.18	0.12	0.22	0.28	0.27	0.16	0.16	0.15	0.13
Iron	2.1	2.1	3.2	1.8	2.8	3.4	1.8	1.4	4.0	1.4	1.7	2.9	1.3	2.6	6.0	2.0	1.0	1.4	1.4	1.3
Lead	<0.002	<0.002	<0.002	<0.002	<0.002	0.004	0.003	<0.002	<0.002	<0.002	<0.002	0.002	<0.002	<0.002	<0.002	0.003	0.004	0.003	<0.002	0.002
Manganese	0.09	0.08	0.09	0.1	0.08	0.07	0.04	0.07	0.06	0.08	0.17	0.13	0.07	0.14	0.08	0.05	0.08	0.14	0.19	0.08
Mercury	0.26	0.30	0.24	0.1	0.23	0.17	0.14	0.14	0.26	0.31	0.14	0.12	0.14	0.18	0.18	0.02	0.05	0.02	0.02	0.03
Molybdenum	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Nickel	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01
Selenium	0.17	0.12	0.16	0.16	0.13	0.16	0.14	0.18	0.15	0.13	0.25	0.15	0.22	0.20	0.29	0.17	0.28	0.2	0.16	0.23
Silver	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Thallium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Tin	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Titanium	0.08	0.09	0.09	0.1	0.08	0.08	0.07	0.08	0.08	0.08	0.08	0.08	0.09	0.07	0.1	0.07	0.08	0.07	0.08	0.07
Uranium	<0.001	0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	0.003	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	3	3.7	4.2	3.2	3.9	4.2	3.4	3.8	4.4	3.4	3	4.2	3.2	3	4.2	6.2	3.8	3.5	4	3.4
Physical Properties																				
Moisture (%)	76.91	76.77	74.35	75.75	71.88	77.01	75.5	69.03	77.64	68.66	73.98	78.34	76.86	75.56	75.69	75.73	71.01	74.93	73.77	76.15
Radionuclides																				
Lead-210 (Bq/g)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.004	<0.004
Polonium-210 (Bq/g)	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0002	<0.001	<0.001
Radium-226 (Bq/g)	<0.00006	<0.00006	<0.00006	<0.00006	<0.00006	<0.00005	<0.00006	<0.00005	<0.00006	<0.00006	<0.00008	<0.00006	<0.00006	<0.00006	<0.00007	<0.00007	<0.00008	<0.00009	<0.001	0.002
Thorium-230 (Bq/g)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002	<0.0002	<0.002	<0.002
Trace Elements																				
Antimony	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Arsenic	0.17	0.08	0.10	0.05	0.12	0.05	0.06	0.1	0.14	0.08	0.40	0.19	0.20	0.52	0.29	0.02	0.22	0.22	0.18	0.19
Beryllium	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Cobalt	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.003	0.005	0.003	0.003	0.015	0.003	0.002	0.003	0.003	<0.002
Strontium	0.11	0.16	0.18	0.20	0.18	0.12	0.09	0.21	0.16	0.15	1.00	0.88	0.55	0.15	0.36	0.51	0.24	0.27	1.6	0.2
Vanadium	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02

[1]All concentrations are presented on a µg/g wet weight basis, unless specified otherwise.

APPENDIX C, TABLE 11

Detailed Stony Rapids (Fond du Lac River) fish flesh chemistry data for the EARMP community program, 2011 and 2012.

Chemical[1]	Stony Rapids (Fond du Lac River)																		
	Lake Trout									Lake Whitefish									
	2011					2012				2011					2012				
	LT01	LT02	LT03	LT04	LT05	LT06	LT07	LT08	LT09	LW06	LW07	LW08	LW09	LW10	LW01	LW02	LW03	LW04	LW05
Metals																			
Aluminum	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Barium	<0.01	<0.01	0.01	<0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.09	<0.01	0.02	0.01	0.05	0.01	0.01	0.02
Boron	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Cadmium	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Chromium	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Copper	0.28	0.2	0.22	0.22	0.17	0.21	0.78	0.2	0.36	0.36	0.15	0.14	0.26	0.19	0.24	0.14	0.3	0.14	0.11
Iron	1.9	1.7	1.5	1.6	1.2	2.3	8.6	2.6	4.0	3.5	2.0	2.0	2.2	1.7	1.3	1.4	4.2	1.9	1.1
Lead	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Manganese	0.09	0.09	0.08	0.12	0.06	0.09	0.08	0.1	0.07	0.09	0.1	0.18	0.08	0.1	0.08	0.22	0.08	0.1	0.1
Mercury	0.27	0.46	0.57	0.38	0.49	0.12	0.19	0.18	0.27	0.23	0.06	0.15	0.37	0.06	0.05	0.05	0.14	0.06	0.13
Molybdenum	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Nickel	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.05	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Selenium	0.10	0.11	0.09	0.14	0.16	0.15	0.19	0.17	0.19	0.13	0.10	0.15	0.27	0.12	0.18	0.12	0.14	0.18	0.13
Silver	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Thallium	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	0.02	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Tin	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Titanium	0.08	0.07	0.08	0.08	0.08	0.07	0.08	0.08	0.08	0.07	0.08	0.08	0.07	0.09	0.06	0.07	0.07	0.06	0.06
Uranium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001
Zinc	4.7	3.1	3.4	3.3	2.5	3.8	5.4	3.6	3.8	4.0	4.0	4.1	8.3	4.7	6.1	7.0	3.6	3.4	3.4
Physical Properties																			
Moisture (%)	77.77	77.9	77.43	76.77	73.64	78.8	76.77	78.11	78.05	76.78	78.07	78.94	77.19	75.5	74.99	80.97	76.82	80.22	79.53
Radionuclides																			
Lead-210 (Bq/g)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Polonium-210 (Bq/g)	<0.0002	<0.0002	0.0004	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002
Radium-226 (Bq/g)	<0.00007	<0.00006	<0.00006	<0.00006	<0.00006	<0.00006	<0.00006	<0.00006	<0.00006	<0.00008	0.0001	0.00006	0.0001	<0.00006	<0.00005	0.001	<0.00006	<0.00007	<0.00005
Thorium-230 (Bq/g)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002	<0.00009	<0.00008	<0.0002	<0.0001	<0.0001	<0.002	<0.0001	<0.0001	0.0001
Trace Elements																			
Antimony	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Arsenic	0.02	0.06	0.05	0.06	0.09	0.07	0.18	0.06	0.07	0.06	0.03	0.03	0.07	0.02	0.02	0.06	0.05	0.03	0.04
Beryllium	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Cobalt	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.002	<0.002	<0.002	0.005	0.009	0.012	0.004	0.008	<0.002	0.009	0.005	0.007	0.003
Strontium	0.10	0.09	0.21	0.23	0.09	0.13	0.14	0.14	0.14	0.23	0.26	2.00	0.12	0.24	0.28	1.8	0.3	0.23	0.24
Vanadium	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02

[1]All concentrations are presented on a µg/g wet weight basis, unless specified otherwise.

APPENDIX C, TABLE 12

Detailed Wollaston Lake/Hatchet Lake (Welcome Bay) fish flesh chemistry data for the EARMP community program, 2011 and 2012.

Chemical[1]	Wollaston Lake/Hatchet Lake (Welcome Bay, Wollaston Lake)																			
	Lake Trout										Lake Whitefish									
	2011					2012					2011					2012				
	LT01	LT02	LT03	LT04	LT05	LT06	LT07	LT08	LT09	LT10	LW06	LW07	LW08	LW09	LW10	LW01	LW02	LW03	LW04	LW05
Metals																				
Aluminum	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Barium	0.02	0.02	0.02	0.02	<0.01	0.02	0.01	<0.01	0.02	<0.01	0.11	0.01	0.01	0.02	0.02	0.02	0.02	0.04	0.02	0.02
Boron	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Cadmium	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Chromium	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Copper	0.62	0.48	0.53	0.31	0.3	0.52	0.39	0.4	0.69	0.24	0.26	0.16	0.18	0.12	0.14	0.12	0.18	0.13	0.14	0.21
Iron	6.0	4.0	2.6	1.8	1.9	3.1	2.8	2.2	3.8	1.6	2.2	1.3	1.5	3.1	1.4	1.1	1.0	1.5	1.0	3.0
Lead	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Manganese	0.1	0.1	0.07	0.06	0.07	0.08	0.06	0.08	0.07	0.05	0.15	0.09	0.09	0.12	0.1	0.09	0.07	0.14	0.1	0.13
Mercury	0.15	0.16	0.16	0.20	0.12	0.24	0.15	0.13	0.16	0.14	0.06	0.05	0.05	0.05	0.08	0.03	0.02	0.07	0.03	0.05
Molybdenum	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Nickel	0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Selenium	0.17	0.28	0.19	0.18	0.19	0.27	0.21	0.22	0.22	0.21	0.39	0.41	0.34	0.38	0.38	0.5	0.53	0.38	0.68	0.51
Silver	<0.002	0.003	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Thallium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Tin	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Titanium	0.09	0.09	0.09	0.09	0.07	0.07	0.07	0.07	0.08	0.07	0.07	0.08	0.08	0.11	0.08	0.07	0.07	0.07	0.07	0.07
Uranium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	5.5	6.6	3.9	3.1	3.3	5.8	3.6	3.8	4.8	3.1	5.1	3.0	3.8	4.7	4.3	3.7	4.5	3.2	4.5	4.0
Physical Properties																				
Moisture (%)	78.93	75.5	76.46	75.65	75.48	75.41	73.15	73.02	79.09	75.73	73.6	75.29	75.27	76.01	73.6	73.9	70.19	74.68	71.83	76.61
Radionuclides																				
Lead-210 (Bq/g)	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.004	<0.001	<0.004	<0.004
Polonium-210 (Bq/g)	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0003	0.0004	<0.0002	0.0002	0.0004	<0.0002	<0.001	<0.0002	<0.001	<0.001
Radium-226 (Bq/g)	<0.00006	<0.00006	<0.00006	0.0003	0.00009	<0.00006	<0.00006	<0.00005	<0.00007	<0.00005	<0.00006	<0.00006	<0.00008	<0.00006	<0.00006	<0.00006	0.001	<0.00005	0.002	0.002
Thorium-230 (Bq/g)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00009	<0.0001	<0.0001	<0.0002	<0.0001	<0.0001	<0.0001	<0.002	<0.0001	<0.002	<0.002
Trace Elements																				
Antimony	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Arsenic	0.06	0.03	0.04	0.02	0.04	0.05	0.04	0.04	0.08	0.02	0.24	0.13	0.17	0.09	0.18	0.19	0.12	0.17	0.16	0.13
Beryllium	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Cobalt	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.005	<0.002	<0.002	<0.002	0.002	<0.002	0.003
Strontium	0.09	0.22	0.09	0.15	0.05	0.19	0.09	0.07	0.11	0.03	0.47	0.08	0.11	0.24	0.14	0.11	0.13	0.25	0.15	0.18
Vanadium	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02

[1]All concentrations are presented on a µg/g wet weight basis, unless specified otherwise.

APPENDIX C, TABLE 13

Detailed blueberry chemistry results for the EARMP community program, 2011 and 2012.

Chemical[1]	Black Lake										Camsell Portage					Fond du Lac									
	2011					2012					2012[2]					2011					2012				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Metals																									
Aluminum	6.0	8.6	7.9	8.6	6.0	13.0	6.0	7.1	7.9	7.7	7.2	7.3	7.0	7.4	6.0	4.4	9.5	6.2	7.0	6.2	14.0	20.0	7.3	13.0	5.9
Barium	12	15	13	11	15	13.0	14.0	17.0	15.0	15.0	12.0	24.0	20.0	22.0	20.0	12.0	12.0	13.0	13.0	12.0	12.0	9.9	14.0	11.0	11.0
Boron	6	5	5	3	5	6	8	5	5	7	5	8	8	8	6	8	6	7	8	6	14	6	5	8	5
Cadmium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chromium	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Copper	3.3	3.2	2.5	2.6	3.1	2.8	3.8	3.5	3.4	3.8	3.5	3.0	3.4	3.5	2.6	2.7	3.0	3.6	3.2	3.9	2.8	3.9	3.3	3.9	2.8
Iron	8.4	11.0	8.6	11.0	10.0	20.0	10.0	8.1	8.8	9.8	11.0	8.7	9.7	18.0	13.0	10.0	8.2	9.7	11.0	9.3	14.0	21.0	12.0	16.0	10.0
Lead	0.07	0.02	0.02	0.07	<0.01	0.03	<0.01	<0.01	0.02	<0.01	<0.01	0.04	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	0.03	0.01	0.03	0.01	<0.01	0.01	<0.01
Manganese	160	130	120	180	220	100	100	170	170	120	280	490	490	480	580	140	150	140	140	130	280	460	240	370	310
Molybdenum	0.2	0.2	0.1	0.1	0.2	<0.1	<0.1	<0.1	<0.1	0.1	0.1	0.1	0.2	0.2	0.1	0.4	0.2	0.4	0.4	0.4	0.2	0.2	<0.1	0.2	<0.1
Nickel	0.66	0.68	0.54	0.56	0.38	0.32	0.56	0.58	0.66	0.54	0.44	0.37	0.60	0.79	0.44	0.97	0.67	0.75	0.80	0.74	0.48	0.55	0.54	0.60	0.50
Selenium	<0.05	0.08	<0.05	<0.05	0.06	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.08	0.07	<0.05	<0.05	<0.05	<0.05	<0.05
Silver	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Thallium	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Tin	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.09	<0.05	0.07
Titanium	<0.05	0.08	0.06	0.10	0.15	0.10	0.05	0.05	0.08	<0.05	0.07	<0.05	<0.05	<0.05	<0.05	<0.05	0.08	0.08	0.08	0.10	0.35	0.88	0.07	0.42	0.05
Uranium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	0.08	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	4.8	6.1	5.0	3.9	5.5	3.9	6.1	6.0	5.3	6.4	13.0	6.5	8.9	8.0	5.9	5.6	6.0	7.5	7.0	7.1	4.4	5.1	10.0	5.4	5.8
Physical Properties																									
Moisture (%)	86.2	86.7	85.1	86.0	87.4	86.2	85.9	85.0	85.0	84.9	84.0	85.2	84.3	84.6	85.6	87.1	85.5	86.7	84.6	86.3	84.0	83.9	84.6	83.8	84.1
Radionuclides																									
Lead-210 (Bq/g)	0.009	0.005	0.007	0.009	0.012	0.0020	0.0020	<0.001	0.0020	<0.001	0.0010	0.0040	<0.001	0.0010	0.0020	<0.004	0.0070	0.0100	0.0110	0.0060	<0.001	<0.001	<0.001	<0.001	<0.001
Polonium-210 (Bq/g)	0.001	0.002	0.001	0.002	<0.0009	0.0015	0.0020	0.0024	0.0014	0.0012	0.0014	0.0017	0.0013	0.0010	0.0016	0.0010	0.0020	0.0010	0.0040	0.0020	0.0012	0.0009	0.0015	0.0012	0.0014
Radium-226 (Bq/g)	0.002	0.004	0.004	0.002	0.002	<0.00003	0.001	<0.00003	0.003	0.001	0.003	0.003	0.003	0.005	0.005	0.002	0.004	0.003	0.001	0.005	0.002	0.002	0.003	0.002	0.003
Thorium-230 (Bq/g)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	<0.001	<0.0004	<0.001	<0.0003
Trace Elements																									
Antimony	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Arsenic	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Beryllium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cobalt	0.05	0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	0.0	0.0	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	0.02	<0.01
Strontium	2.1	4.4	3.5	2.1	1.2	1.1	1.7	1.7	2.0	1.8	1.4	1.4	1.4	1.6	1.5	1.3	1.3	1.4	1.6	1.3	2.8	1.8	1.8	2.6	1.6
Vanadium	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

APPENDIX B, TABLE 13

Detailed blueberry chemistry results for the EARMP community program, 2011 and 2012.

Chemical[1]	Stony Rapids										Uranium City					Wollaston Lake/Hatchet Lake									
	2011					2012					2012[2]					2011					2012				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Metals																									
Aluminum	21.0	8.0	27.0	37.0	10.0	9.6	8.9	7.0	11.0	7.6	5.3	5.6	8.7	4.4	5.4	6.1	3.9	8.7	6.2	5.9	14.0	20.0	12.0	26.0	22.0
Barium	15	15	16	8.9	13	14.0	12.0	12.0	10.0	13.0	12.0	11.0	12.0	12.0	9.9	16	17	15	14	15	10.0	9.9	7.7	16.0	16.0
Boron	12	5	4	3	4	5	4	11	14	6	8	8	9	6	7	7	4	7	13	6	5	7	17	7	8
Cadmium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chromium	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Copper	2.9	3.2	3.0	2.4	2.9	1.9	2.0	2.3	2.1	2.0	3.9	3.4	3.7	3.5	2.9	2.9	1.7	3.0	3.0	2.6	3.4	2.9	2.5	2.6	3.5
Iron	16.0	12.0	23.0	32.0	11.0	12.0	12.0	11.0	10.0	9.9	11.0	9.7	10.0	12.0	8.7	6.8	5.4	12.0	9.5	9.0	17.0	17.0	15.0	21.0	20.0
Lead	0.01	<0.01	0.02	0.04	<0.01	0.10	<0.01	0.03	0.03	<0.01	0.01	0.01	0.02	0.01	<0.01	0.04	<0.01	0.01	<0.01	<0.01	<0.01	0.01	0.03	0.02	0.02
Manganese	140	100	130	70	180	290	250	230	240	260	280	330	280	200	140	270	290	300	290	260	150	160	110	180	190
Molybdenum	0.1	0.2	<0.1	<0.1	<0.1	0.1	<0.1	0.4	0.3	0.3	0.2	0.2	0.3	0.4	<0.1	<0.1	<0.1	<0.1	0.1	0.1	0.3	0.1	0.1	0.2	0.2
Nickel	0.75	0.68	0.84	0.82	0.74	0.39	0.48	0.47	0.37	0.40	0.54	0.47	0.58	0.44	0.51	0.66	0.28	0.59	0.5	0.59	0.66	0.44	0.68	0.50	0.68
Selenium	<0.05	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Silver	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Thallium	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Tin	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Titanium	0.26	0.12	1.60	1.40	0.19	0.20	0.23	0.09	0.26	0.11	<0.05	<0.05	<0.05	0.05	0.05	<0.05	0.07	0.13	0.09	0.09	0.38	1.30	0.40	0.91	0.51
Uranium	<0.01	<0.01	0.02	0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01
Zinc	5.8	6.4	5.1	4.9	5.3	3.3	3.7	4.9	3.4	4.0	6.3	5.9	6.2	6.3	4.2	5.7	3.0	5.5	5.1	4.4	6.6	7.7	4.7	6.7	8.0
Physical Properties																									
Moisture (%)	85.8	85.5	84.1	85.1	86.6	85.4	85.1	84.4	85.1	84.8	84.4	84.0	84.0	85.1	84.4	85.3	84.5	84.8	84.4	85.1	84.4	84.8	84.1	85.4	84.2
Radionuclides																									
Lead-210 (Bq/g)	<0.004	0.005	0.012	0.006	<0.004	<0.01	<0.01	<0.01	<0.01	<0.01	0.0020	0.0040	0.0030	0.0020	0.0200	0.005	0.009	0.008	0.010	0.004	<0.001	0.0010	0.0010	<0.001	<0.01
Polonium-210 (Bq/g)	0.002	0.002	0.002	0.003	0.002	0.0010	<0.001	0.0010	0.0010	<0.001	0.0021	0.0050	0.0032	0.0015	0.0020	0.002	0.002	0.004	0.004	0.004	0.0012	0.0012	0.0008	0.0017	<0.001
Radium-226 (Bq/g)	0.003	0.006	0.001	<0.0009	0.001	0.003	<0.001	0.003	0.003	0.004	0.001	0.006	0.002	0.100	0.001	<0.001	0.001	<0.001	0.006	<0.001	0.002	0.003	0.003	0.006	0.004
Thorium-230 (Bq/g)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	<0.001	<0.0009	<0.001	<0.002
Trace Elements																									
Antimony	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Arsenic	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Beryllium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cobalt	0.01	0.07	0.01	0.02	0.01	0.01	0.01	<0.01	<0.01	<0.01	0.01	<0.01	0.01	<0.01	0.02	0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	0.02	0.01	<0.01
Strontium	2.6	1.7	2.9	2.5	2.0	1.7	1.5	2.9	2.6	2.4	1.3	1.1	1.4	1.3	1.6	3.4	1.2	3.1	3.8	3.6	1.3	1.2	1.1	1.4	2.8
Vanadium	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

[1]All concentrations are in µg/g on a dry weight basis, unless specified otherwise.

[2]In Camsell Portage and Uranium City, blueberries were collected and analyzed in 2012 only (cranberries collected in 2011).

APPENDIX C, TABLE 14

Detailed bog cranberry chemistry results for the EARMP community program, fall 2011.

Chemical[1]	Camsell Portage					Uranium City				
	2011[2]					2011[2]				
	1	2	3	4	5	1	2	3	4	5
Metals										
Aluminum	17	17	19	19	16	20	29	15	19	27
Barium	14	13	14	15	9.1	13	9.1	11	9.4	13
Boron	9	8	8	10	9	10	9	8	14	10
Cadmium	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chromium	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Copper	4.5	4.2	4.8	4.9	3.6	5.9	3.6	2.6	2.6	3.2
Iron	9.7	9.7	10	10	11	16	20	9.5	13	14
Lead	<0.01	<0.01	<0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.02
Manganese	110	120	100	100	80	150	110	300	210	220
Molybdenum	0.1	0.1	0.2	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	0.46	0.46	0.49	0.65	0.37	1.1	0.8	0.28	0.5	0.42
Selenium	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Silver	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Thallium	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Tin	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Titanium	0.06	0.06	<0.05	0.08	0.17	0.07	0.47	0.06	0.18	0.14
Uranium	0.01	<0.01	0.01	<0.01	0.02	0.01	0.02	<0.01	0.01	<0.01
Zinc	6.6	6.4	6.5	6.7	5.3	8.9	7.3	5.7	5.2	6.8
Physical Properties										
Moisture (%)	87.53	87.36	87.13	86.87	86.78	88.39	87.69	87.22	86.9	87.44
Radionuclides										
Lead-210 (Bq/g)	0.007	0.006	0.020	0.013	0.018	0.005	0.005	0.016	0.010	0.016
Polonium-210 (Bq/g)	0.003	0.002	0.001	0.002	0.003	0.003	0.003	0.013	0.002	0.005
Radium-226 (Bq/g)	0.004	0.002	0.006	0.004	0.002	0.002	0.007	<0.0009	<0.0009	<0.0009
Thorium-230 (Bq/g)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Trace Elements										
Antimony	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Arsenic	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Beryllium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cobalt	0.01	0.01	0.01	0.01	0.01	0.02	0.14	0.02	0.02	0.02
Strontium	2.3	2	2.1	2.5	1.8	3.4	2.5	2.5	2.4	1.8
Vanadium	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

[1]All concentrations are in µg/g dry weight, unless specified otherwise.

[2]In Camsell Portage and Uranium City, cranberries were collected and analyzed in 2011 (blueberries collected in 2012).

APPENDIX C, TABLE 15

Detailed barren-ground caribou flesh chemistry results for the EARMP community program, 2011 and 2012.

Chemical[1]	Black Lake										Camsell Portage		Fond du Lac				
	2011					2012					2012[2]		2011				
	1	2	3	4	5	1	2	3	4	5	1	2	1	2	3	4	5
Metals																	
Aluminum	<0.5	<0.5	<0.5	<0.5	<0.5	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Barium	0.2	0.03	0.04	0.03	0.25	0.04	0.02	0.02	0.01	<0.01	0.02	<0.01	0.08	0.02	0.03	0.04	0.02
Boron	0.7	0.2	0.6	<0.2	0.9	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.4	0.5	0.3	0.2	<0.2
Cadmium	0.002	0.004	0.002	<0.002	<0.002	0.004	0.003	0.002	0.006	0.005	0.004	0.003	0.004	0.002	0.003	0.002	<0.002
Chromium	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.3	<0.1	<0.1	<0.1	<0.1
Copper	4.3	2.6	3.0	3.0	3.3	3.3	4.2	3.4	3.0	3.1	3.7	3.7	3.9	2.3	2.2	4.1	3.1
Iron	43	29	40	38	45	33	49	44	50	43	50	46	48	31	29	48	32
Lead	0.013	<0.002	0.008	<0.002	0.005	0.003	0.31	0.003	0.48	0.013	<0.002	<0.002	0.008	<0.002	<0.002	<0.002	<0.002
Manganese	0.45	0.29	0.35	0.38	0.42	0.28	0.53	0.34	0.3	0.26	0.35	0.26	0.39	0.26	0.25	0.43	0.32
Molybdenum	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Nickel	0.01	<0.01	<0.01	0.02	0.02	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	0.08	<0.01	<0.01	<0.01	<0.01
Selenium	0.15	0.2	0.21	0.19	0.2	0.15	0.27	0.18	0.2	0.18	0.23	0.22	0.15	0.15	0.15	0.18	0.15
Silver	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Thallium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Tin						<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01					
Titanium	0.08	0.08	0.07	0.07	0.08	0.09	0.11	0.08	0.08	0.08	0.08	0.07	0.08	0.08	0.07	0.08	0.09
Uranium	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	17	31	21	16	29	26	29	33	30	32	26	25	22	56	59	16	49
Physical Properties																	
Moisture (%)	74.06	74.11	74.21	73.58	72.53	76.52	73.84	75.07	75.5	74.1	72.15	72.11	71.24	76.19	74.05	73.91	73.77
Radionuclides																	
Lead-210 (Bq/g)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Polonium-210 (Bq/g)	0.011	0.0095	0.0083	0.01	0.011	0.0007	0.0052	0.0065	0.0085	0.0094	0.017	0.015	0.0042	0.0084	0.0098	0.0096	0.0021
Radium-226 (Bq/g)	<0.00006	<0.00006	<0.00006	<0.00006	<0.00006	0.008	<0.005	<0.005	<0.005	<0.005	<0.00008	<0.0001	<0.00005	0.0002	0.0001	<0.00004	0.00008
Thorium-230 (Bq/g)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002	<0.0002	<0.0001	0.0003	<0.0002	<0.00008	<0.0001
Trace Elements																	
Antimony	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.04	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Arsenic	0.02	0.01	0.02	0.02	0.02	0.04	0.02	0.03	0.02	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	0.02
Beryllium	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Cobalt	0.005	0.004	0.003	0.003	0.003	0.008	0.005	0.004	0.004	0.005	0.002	<0.002	0.004	0.006	0.006	0.003	0.003
Strontium	0.03	0.03	0.02	0.02	0.03	0.05	0.04	0.03	0.03	0.03	0.04	0.04	0.07	0.05	0.06	0.05	0.03
Vanadium	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02

APPENDIX C, TABLE 15

Detailed barren-ground caribou flesh chemistry results for the EARMP community program, 2011 and 2012.

Chemical[1]	Fond du Lac						Stony Rapids					Wollaston Lake/Hatchet Lake									
	2012						2012[2]					2011					2012				
	1	2	3	4	5	6	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Metals																					
Aluminum	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.7	<0.5	<0.5	<0.5	<0.5
Barium	0.05	0.14	0.11	0.08	0.12	0.32	<0.01	<0.01	<0.01	<0.01	<0.01	0.04	0.09	0.03	0.04	0.09	0.01	<0.01	<0.01	<0.01	<0.01
Boron	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.8	<0.2	<0.2	<0.2	0.4	<0.2	0.4	0.3	0.4	0.3	<0.2	<0.2	<0.2	<0.2
Cadmium	0.004	0.002	0.005	<0.002	0.003	0.14	0.003	0.004	0.002	0.003	0.002	0.005	0.008	0.002	0.004	0.002	0.008	0.003	<0.002	0.004	0.003
Chromium	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Copper	1.8	2.6	3.2	3.3	3.9	4.3	4.0	4.6	4.7	3.3	4.1	3.1	3.2	2.5	3.9	3.1	4.4	2.3	2.4	3.6	3.5
Iron	30	36	43	50	39	45	52	55	46	51	55	37	35	26	45	29	63	36	43	52	43
Lead	0.006	0.006	0.008	<0.002	0.014	0.004	0.002	0.065	0.009	0.003	0.004	0.013	0.002	<0.002	0.046	0.051	0.006	0.003	0.013	0.014	<0.002
Manganese	0.24	0.26	0.33	0.37	0.53	0.8	0.46	0.55	0.42	0.44	0.44	0.35	0.29	0.25	0.53	0.33	0.46	0.27	0.29	0.5	0.44
Molybdenum	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Nickel	0.01	<0.01	<0.01	<0.01	0.01	0.02	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01
Selenium	0.12	0.13	0.16	0.2	0.14	0.34	0.21	0.26	0.21	0.21	0.21	0.15	0.17	0.17	0.19	0.13	0.18	0.13	0.12	0.19	0.17
Silver	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Thallium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Tin	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01						<0.01	<0.01	<0.01	<0.01	<0.01
Titanium	0.08	0.05	0.09	0.08	0.08	0.08	0.03	0.12	0.2	0.09	0.11	0.07	0.07	0.07	0.07	0.07	0.11	0.09	0.11	0.08	0.09
Uranium	0.002	<0.001	<0.001	<0.001	0.002	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	40	15	23	12	16	18	22	13	16	29	15	33	30	30	20	29	16	52	42	20	16
Physical Properties																					
Moisture (%)	71.94	71.95	72.9	73.46	71.99	68.45	70.86	70.2	70	70.4	71	74.5	73.6	75.2	74.14	75.2	72.82	78.45	77.45	73.98	72.58
Radionuclides																					
Lead-210 (Bq/g)	0.003	0.002	0.002	<0.001	<0.001	0.008	<0.001	0.001	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002
Polonium-210 (Bq/g)	0.015	0.015	0.015	0.016	0.016	0.021	0.026	0.001	<0.001	0.012	0.025	0.016	0.013	0.011	0.015	0.011	0.011	0.012	0.0095	0.019	0.014
Radium-226 (Bq/g)	<0.00006	<0.00006	<0.00006	<0.00007	<0.00007	0.00009	0.002	<0.001	<0.001	0.002	0.001	<0.00006	<0.00007	<0.00006	<0.00006	<0.00005	<0.00008	<0.00006	<0.00006	0.0001	<0.00007
Thorium-230 (Bq/g)	<0.0001	<0.0001	0.0002	<0.0001	<0.0001	<0.0001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002	<0.0001	<0.0001	<0.0001	<0.0001
Trace Elements																					
Antimony	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Arsenic	0.01	0.01	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.02	0.01	<0.01	<0.01	0.01	0.02	0.02	0.02	0.02	0.01	0.01	<0.01
Beryllium	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Cobalt	0.003	<0.002	0.003	0.002	0.006	0.013	0.006	0.003	0.004	0.004	0.003	0.003	0.003	0.007	0.005	0.004	0.008	0.006	0.006	0.004	0.006
Strontium	0.06	0.07	0.07	0.05	0.08	0.14	0.02	0.03	0.02	<0.02	<0.02	0.04	0.03	0.03	0.02	0.03	0.05	0.03	0.03	0.02	<0.02
Vanadium	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02

[1]All concentrations are in µg/g on a dry weight basis, unless specified otherwise.

[2]In Camsell Portage, only 2 samples were collected in 2012 (none in 2011); in Stony Rapids, 5 samples were collected in 2012 only (none in 2011).

APPENDIX C, TABLE 16

Detailed moose flesh chemistry results for the EARMP community program, 2011 and 2012.

Chemical[1]	Uranium City Study Area							Camsell Portage Study Area			
	2011				2012			2011			
	Mackintosh Bay	Deadman Channel	Melville Lake	Orbit Bay	Ace Creek	Gunnar	Milliken Lake	Sample 1	Sample 2	Sample 3	Sample 4
Metals											
Aluminum	2.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.5	3	<0.5	3.8
Barium	0.03	0.02	<0.01	0.02	0.04	0.22	0.08	0.04	0.15	0.03	0.02
Boron	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.3	<0.2	<0.2	<0.2
Cadmium	0.003	<0.002	0.002	0.004	0.011	0.006	0.003	<0.002	0.006	0.002	<0.002
Chromium	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Copper	1.3	1.8	3.8	1.7	1.2	1.4	1.3	2.0	1.2	1.8	1.6
Iron	30	25	42	42	35	34	26	21	25	25	29
Lead	<0.002	<0.002	<0.002	<0.002	0.005	0.004	0.003	0.018	0.019	<0.002	0.002
Manganese	0.16	0.16	0.33	0.14	0.17	0.18	0.15	0.2	0.18	0.21	0.13
Molybdenum	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Nickel	0.01	0.02	0.02	<0.01	<0.01	<0.01	<0.01	0.02	0.02	<0.01	<0.01
Selenium	0.11	0.16	0.18	0.09	0.1	0.11	0.1	0.2	0.06	0.1	0.12
Silver	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Thallium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Tin	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Titanium	0.14	0.08	0.1	0.13	0.08	0.08	0.06	0.09	0.25	0.09	0.08
Uranium	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	0.003	<0.001	<0.001	<0.001	<0.001
Zinc	50	49	31	49	75	56	55	24	38	47	45
Physical Properties											
Moisture (%)	74.42	72.36	72.74	73.84	69.87	74.09	74.28	75.01	73.92	75.02	75.12
Radionuclides											
Lead-210 (Bq/g)	0.002	<0.001	<0.001	<0.001	<0.00002	<0.00001	<0.00002	<0.001	<0.001	<0.001	<0.0003
Polonium-210 (Bq/g)	<0.0002	0.0005	0.0023	0.0003	0.0002	0.0004	<0.0002	0.0019	0.0004	0.0003	-
Radium-226 (Bq/g)	<0.00006	<0.0001	<0.00006	<0.00007	<0.00009	<0.00006	<0.00008	<0.00008	<0.00007	0.0002	<0.00006
Thorium-230 (Bq/g)	<0.0001	<0.0002	<0.0001	<0.0001	<0.0002	0.0001	<0.0002	<0.0002	<0.0001	<0.0001	-
Trace Elements											
Antimony	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Arsenic	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Beryllium	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Cobalt	0.013	0.014	0.003	0.017	0.016	0.01	0.012	0.014	0.011	0.022	0.01
Strontium	<0.02	<0.02	0.04	0.03	0.08	0.05	0.05	0.1	0.06	0.03	0.02
Vanadium	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02

[1]All concentrations are in µg/g on a dry weight basis, unless specified otherwise.

APPENDIX D

HUMAN HEALTH RISK ASSESSMENT

Final:

HUMAN HEALTH RISK EVALUATION FOR THE ATHABASCA BASIN

Prepared For:

Canada North Environmental Services

Prepared By:

SENES Consultants

October 2013

FINAL

HUMAN HEALTH RISK EVALUATION FOR THE ATHABASCA BASIN

Prepared for:

Canada North Environmental Services
Saskatoon, Saskatchewan

Prepared by:

SENES Consultants
121 Granton Drive, Unit 12
Richmond Hill, Ontario
L4B 3N4

October 2013

Printed on Recycled Paper Containing Post-Consumer Fibre

FINAL

HUMAN HEALTH RISK EVALUATION FOR THE ATHABASCA BASIN

Prepared for:

Canada North Environmental Services
Saskatoon, Saskatchewan

Prepared by:

SENES Consultants
121 Granton Drive, Unit 12
Richmond Hill, Ontario
L4B 3N4

Harriet A. Phillips, Ph.D.
Senior Specialist, Risk Assessment/Toxicology

Helen Manolopoulos, Ph.D.
Senior Geochemist

October 2013

EXECUTIVE SUMMARY

Many communities within the Athabasca Basin in northern Saskatchewan occur downstream of uranium mining and milling operations. In 2011 and 2012, a community program was completed to monitor the safety of traditionally harvested country foods by collecting and testing water, fish, berry, and mammal chemistry from six Athabasca Basin communities: Camsell Portage, Uranium City (includes two community study areas), Fond-du-Lac, Stony Rapids, Black Lake, and Wollaston Lake/Hatchet Lake. This report presented the results of an evaluation that was conducted to assess exposure to the residents of each community mentioned above to constituents measured in country foods.

The results of the evaluation indicated that the non-radiological exposures to residents as a result of country food consumption are similar to those to members of the general Canadian population and are below values that are considered to be protective of health effects and therefore do not represent a cause for concern. Similarly, the radiological doses are below the public dose limit and as such are not a concern from a human health perspective.

Overall, the results indicate that traditional harvesting of country foods does not present health risks to Athabasca Basin residents.

TABLE OF CONTENTS

Page No.

LIST OF TABLES

Page No.

LIST OF FIGURES

Page No.

ACRONYMS

ATSDR	Agency for Toxic Substances and Disease Registry
BWI	Boreal Watershed Initiative
CalEPA	California Environmental Protection Agency
CCME	Canadian Council of Ministers of the Environment
COPC	Constituent of Potential Concern
DC	Dose Coefficient
EARMP	Eastern Athabasca Region Monitoring Program
EDI	Estimated Daily Intake
EPA	Environmental Protection Agency
EPC	Exposure Point Concentration
HHRA	Human Health Risk Assessment
ICRP	International Commission on Radiological Protection
IRIS	Integrated Risk Information System
JECFA	Joint FAO/WHO Expert Committee on Food Additives
LC	Life Stage Conversion factor
LOAEL	Lowest Observable Adverse Effects Level
MDL	Method Detection Limit
NOAEL	No Observable Adverse Effects Level
pTWI	provisional Tolerable Weekly Intake
TDS	Total Diet Study
TRV	Toxicological Reference Value
WHO	World Health Organization

1.0 INTRODUCTION

1.1 BACKGROUND INFORMATION

The Eastern Athabasca Regional Monitoring Program (EARMP) was established in 2011 under Saskatchewan's Boreal Watershed Initiative (BWI) to address a foreseen gap in available long-range environment information and cumulative impacts downstream of uranium and milling operations in the Athabasca Basin in northern Saskatchewan (Figure 1.1-1). As part of the two-year (2011 and 2012) EARMP framework, CanNorth (2013) completed a community program to monitor the safety of traditionally harvested country foods by collecting and testing water, fish, berry, and mammal chemistry from six communities in northern Saskatchewan: Camsell Portage, Uranium City (includes two community study areas), Fond-du-Lac, Stony Rapids, Black Lake, and Wollaston Lake/Hatchet Lake (see Figure 1.1-2). As a follow-up to this study, SENES Consultants was retained to conduct a human health risk evaluation to estimate potential risks to the residents of the aforementioned Athabasca Basin communities.

The human health risk evaluation for the Athabasca Basin described in this report considers two relevant dietary surveys that have been completed by CanNorth for communities included within this region. The Hatchet Lake study (CanNorth 2000) was completed in 2000 for communities residing around Wollaston Lake and was applied to the Wollaston Lake/Hatchet Lake, Black Lake, Stony Rapids, Fond-du-Lac, and Camsell Portage communities. This study has been used in all previous Rabbit Lake assessments (e.g., SENES 2012a; 2013). In 2011, a specific dietary study was carried out for residents in Uranium City (CanNorth 2011) and was applied to the two Uranium City communities. This study was used in the Beaverlodge Country Foods assessment (SENES 2012b).

Figure 1.1-1 Location of Athabasca Basin in Northern Saskatchewan

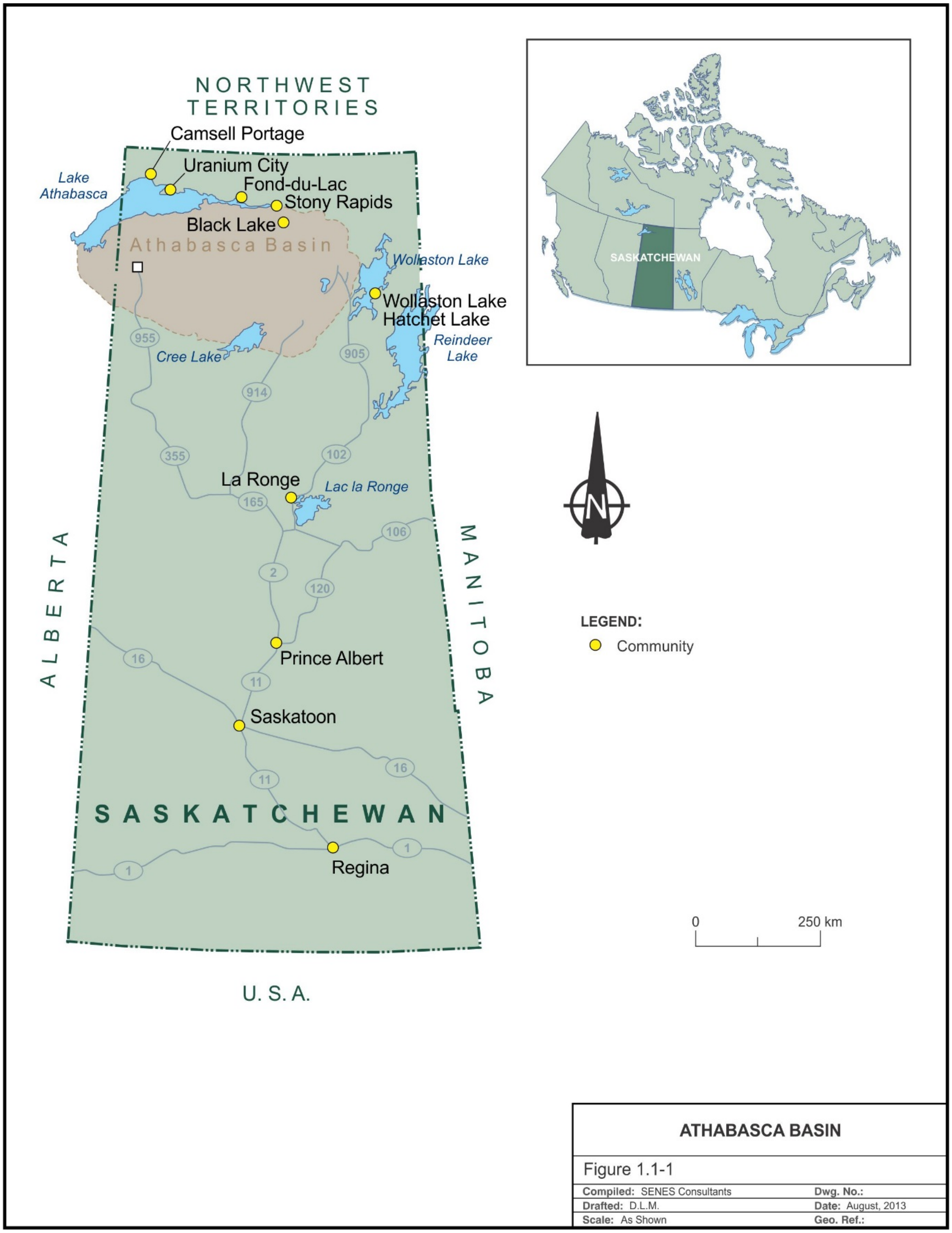
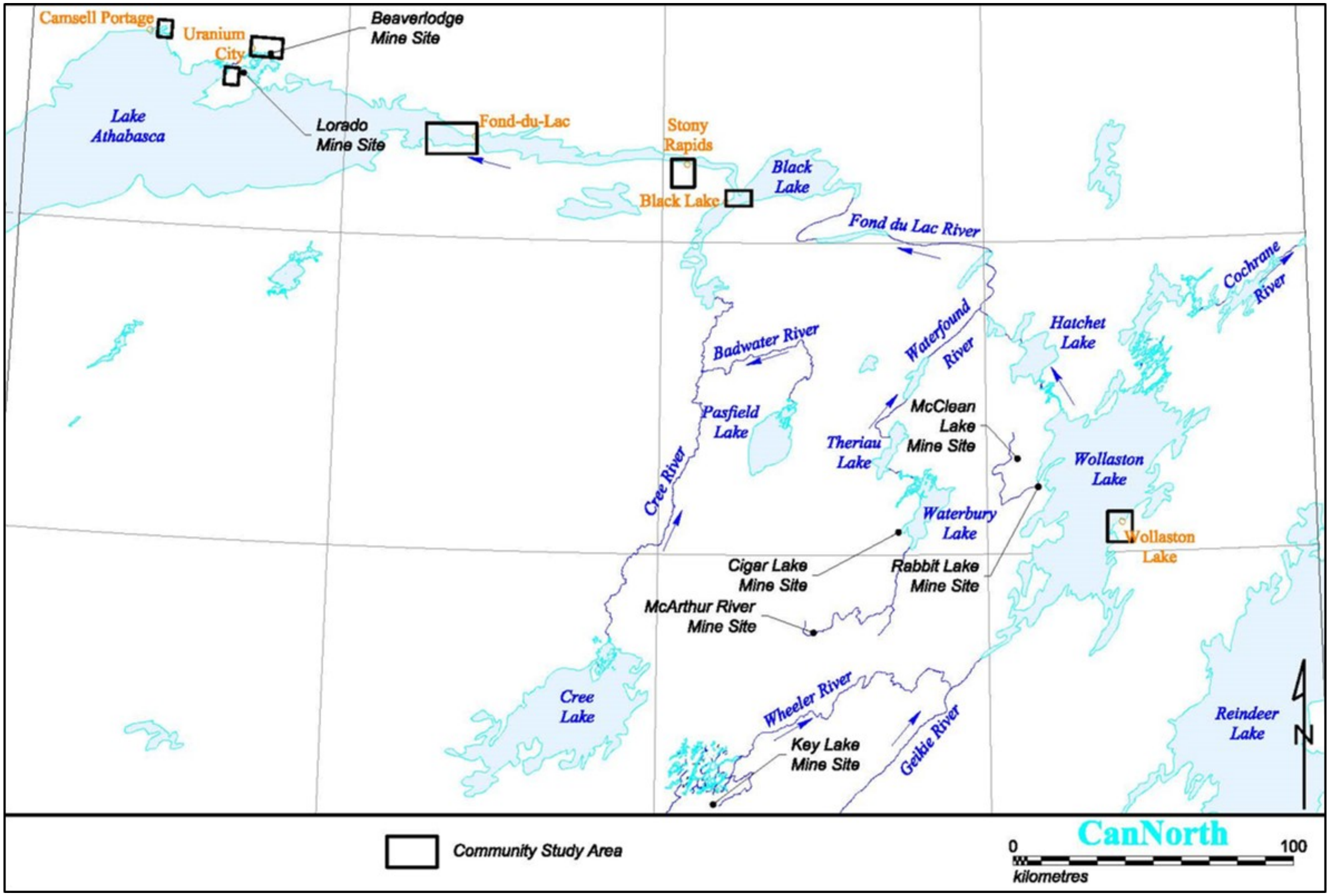


Figure 1.1-2 The EARMP Community Program Study Locations



Notes: Modified from Figure 2.1-1 of CanNorth (2013); EARMP – Eastern Athabasca Regional Monitoring Program.

1.2 STUDY OBJECTIVES

The current study uses risk assessment principles to evaluate the probability of adverse health consequences resulting from the consumption of country foods obtained from communities within the Athabasca Basin. Human health risk assessment is a scientific procedure that is used to evaluate the probability of adverse health consequences to humans caused by the presence of constituents of potential concern (COPC). To assess this probability it is necessary to take receptor characteristics, exposure pathways and mitigating circumstances into consideration. Using toxicological information associated with the particular COPC, site conditions and known characteristics of the people and animals, levels of risk are evaluated. Risk assessments involve the application of a staged, formal and reproducible process that incorporates procedures accepted by the regulatory authorities in the jurisdiction within which the study is being undertaken.

In the Athabasca Basin risk evaluation, human receptor characteristics (e.g., foods consumed, harvest locations, etc.) and exposure pathways (e.g., inhalation, ingestion, etc.) were taken into consideration. Country food intake rates developed from the information collected during the Hatchet Lake and Uranium City communities dietary surveys (CanNorth 2000; 2011) and concentrations of COPC measured in the country foods collected during the EARMP community program (CanNorth 2013) were used in the evaluation. This report presents the results of the risk evaluation.

The assumptions made in the evaluation were intended to err on the side of caution and therefore likely result in over-estimated intakes. The level of caution in these assumptions is consistent with the approach typically adopted in risk assessments (Health Canada 2010a).

1.3 REPORT STRUCTURE

This report has been structured into several sections, each of which describes specific aspects of the evaluation. These aspects include:

Section 2 – Site Characterization: This section provides a brief description of the Athabasca Basin and communities within and summarizes the relevant results of the EARMP community program.

Section 3 – Receptor Characterization: This section identifies the human life-stages and describes the receptor-specific characteristics such as body weight, dietary characteristics, etc. It also identifies the pathways of exposure.

Section 4 – Exposure Assessment: This section presents the concentrations to which the residents will be exposed and also summarizes the estimated non-radiological intakes and radiological doses.

Section 5 – Toxicity Assessment: This section selects the toxicological reference values (TRVs) against which the exposure values are compared. The values, and the justification for their use, are presented.

Section 6 – Risk Characterization: This section evaluates the potential risks to the residents as a result of exposure to the COPC in country foods, based on the information presented in Sections 4 and 5.

Section 7 – Conclusions: This section provides a summary of the conclusions from the risk evaluation.

Section 8 – References: This section provides references used in the evaluation.

2.0 SITE CHARACTERIZATION

The EARMP community program completed by CanNorth (2013) focused on the collection of country foods from communities established within the Athabasca Basin in northern Saskatchewan. This section provides a brief description of the study areas as well as summaries of the dietary surveys and EARMP community program findings that were used in the HHRA. All the details are provided in the CanNorth (2013) report.

2.1 STUDY AREA

The Athabasca Basin in northern Saskatchewan is the only region in the world known to host ultrahigh grade uranium deposits and consequently, a number of communities established within the basin are located downstream of uranium mining operations. Active operations in the region shown in Figure 1.1-2 include the Key Lake, McArthur River, Cigar Lake, Rabbit Lake, and McClean Lake mine sites, while the Beaverlodge Mine was decommissioned from 1983 to 1985 and plans to remediate the abandoned Lorado Mine are currently underway.

The EARMP community program focused on the communities of Wollaston Lake/Hatchet Lake (assessed as one area), Black Lake, Stony Rapids, Fond-du-Lac, Uranium City, and Camsell Portage. The Wollaston Lake and Hatchet Lake Band communities are located adjacent to each other on the eastern shore of Wollaston Lake. The Black Lake, Stony Rapids, and Fond-du-Lac communities are all located progressively downstream along the Fond-du-Lac River, which flows from Wollaston Lake to Lake Athabasca. Uranium City is located near the north shore of Lake Athabasca and approximately 8 km west of the decommissioned Beaverlodge Mine site. Samples for the EARMP community program were collected from two community study areas near Uranium City: a) the Fredette River where it enters Martin Lake and the surrounding area, and b) the Crackingstone River inlet to Lake Athabasca. Although the Crackingstone River inlet is sampled for the EARMP technical program that was established to determine whether cumulative effects are occurring in aquatic environments downstream of converging watersheds that are exposed to mining and milling operations in the Eastern Athabasca Region (CanNorth 2013), the inlet is fished by the community of Uranium City (CanNorth 2013). Camsell Portage is located on the northern shore of Lake Athabasca, approximately 35 km northwest of Uranium City, and is the most northern and isolated community in Saskatchewan and is considered a background location.

2.2 SUMMARY OF DIETARY SURVEY FINDINGS

Two relevant dietary surveys that have been completed for communities within the Athabasca Basin were used in the HHRA. The Hatchet Lake Dietary Survey (CanNorth 2000) was completed in 2000 for communities residing around Wollaston Lake and was applied to the

Wollaston Lake/Hatchet Lake, Black Lake, Stony Rapids, Fond-du-Lac, and Camsell Portage communities. The Uranium City Country Foods Study (CanNorth 2011) was completed in 2011 specifically for Uranium City residents and was applied to the two Uranium City communities (Crackingstone River inlet and Fredette River/Prospector's Bay).

2.2.1 Hatchet Lake Dietary Survey

The Hatchet Lake Band resides on the east side of Wollaston Lake in northeastern Saskatchewan in the community of Wollaston Lake. The results of the Hatchet Lake Dietary Survey (CanNorth 2000) are based on 261 food frequency questionnaires that were administered in the summer of 1998 and the winter of 1999 at Wollaston Lake. The survey respondents were randomly selected from the 1,035 registered members of the Hatchet Lake Band and the number of respondents that were surveyed from each age group (2-10 years; 11-20 years; 21-40 years; 41-60 years; and, >60 year) were determined using proportionate allocation. A total of 116 interviews were conducted for the summer survey and 145 interviews for the winter survey representing 11.2% and 14.0% of the population, respectively. Approximately 57% and 54% of the summer and winter respondents, respectively, were below the age of 20. The food frequency questionnaire included both traditional foods and store bought foods.

Results from the Hatchet Lake Dietary Survey that are relevant to the current assessment, namely mean intakes of traditional foods for adults (age groups 21-40 years and 41-60 years) and children (age group 2-10 years), are summarized in Table 2.2-1. As seen from Table 2.2-1, traditional meat sources utilized by the Hatchet Lake Band are barren-ground caribou, moose, beaver and other small mammals such as muskrat, porcupine and otter. Caribou are hunted from November to March in the general area north of Wollaston Lake towards the border with the Northwest Territories and east over the Manitoba border. Moose are found locally in small numbers and are available locally all year round. Snowshoe hares and other small mammals are also available locally.

Fish from Wollaston Lake commonly eaten by the Hatchet Lake Band include whitefish, lake trout, walleye, northern pike, Arctic grayling, longnose sucker and white sucker. Whitefish, lake trout and longnose sucker are open and deep water species while northern pike, walleye, Arctic grayling and white sucker are found mostly inshore. All species move into shallow areas or streams to spawn. Walleye are fished from both lakes and streams and are commonly found in Rabbabou Bay and the Cochrane River as well as smaller lakes east of Wollaston Lake including Waspion Lake and Kingsley Lake. Most species are also fished from Charcoal Lake, along the Cochrane River.

Both local and migratory birds are consumed by Hatchet Lake Band members. Local birds include spruce grouse (wild chicken), ruffed grouse, sharptailed grouse and ptarmigan.

Migratory birds are hunted during the open water season and include several species of duck, goose, swan and sandhill crane. Seagull eggs are eaten during early summer and are obtained from islands near the community.

Local plants consumed are Labrador tea, bog cranberries, raspberries, blueberries, and cloudberry. Plants used for medical purposes are bearberry, birch bark, spruce gum, muskrat root (sweet flag) and blackberry leaves (bristly black current).

As seen from Table 2.2-1, caribou meat and fish are by far the most utilized traditional foods for the Hatchet Lake Band accounting for approximately 75% and 15% of the daily intake, respectively, for both adult and child. As noted from the table, considerable amounts of caribou are also consumed in the summer as access to freezers allows for long-term storage. In comparison to caribou, moose consumption only accounts for 0.5% of the daily intake and beaver and other small mammals for less. Collectively, ground and water birds account for less than 1% of the daily intake. Approximately 0.4% and 3% of the adult and child daily intakes are from traditional fruits.

Table 2.2-1 Mean Adult and Child Daily Intakes of Traditional Foods for the Hatchet Lake Band

	Adult - Mean Intake (g/d)									Child - Mean Intake (g/d)				
	21-40 y Female		21-40 y Male		41-60 y Female		41-60 y Male		Average	2-10 y Female		2-10 y Male		Average
%population average	14.85		14.85		4.85		4.85			14.5		14.5		
	summer	winter	summer	winter	summer	winter	summer	winter	Adult[1]	summer	winter	summer	winter	Child[2]
meat														
caribou	250.6	309.7	179.5	559.6	295.2	609.2	278.6	669.4	358.9	278.8	219	208.7	253.5	240
moose	0	0.3	1.4	7.3	3.1	2.9	2.5	3.9	2.5	1.4	4.2	0.2	0.4	1.6
beaver	0	0	2.2	1.7	2	0	0	0	0.9	0	0.05	0.5	0	0.14
other small mammals	0.4	0	0.6	0.6	0.7	3	19.4	0.9	1.8	0	0.6	0	0	0.15
poultry														
ground birds	0	0.2	0.2	3	0	2.7	3.2	7.4	1.5	0.1	0.5	0	0.3	0.2
water birds	2.3	0	0	0.5	3.1	0	31.9	0	2.7	5.3	0	2.8	0	2.0
other														
fish	41.4	6.5	59.9	19.7	256.9	73	376.1	41.6	70.0	107.5	8.5	51.9	7.2	43.8
traditional fruit	2.4	0	2.6	3.2	2.3	1.3	0	0	1.8	19.4	0.9	13.6	0.2	8.5
Total	***297***	***317***	***246***	***596***	***563***	***692***	***712***	***723***	***440***	***413***	***234***	***278***	***262***	***296***

Notes: Summarized from Table 4.2-5 of CanNorth (2000).

(1) Calculated assuming summer and winter are equal and weighted according to population demographics (Table 3.5-1A of CanNorth 2000).

(2) Calculated assuming summer and winter are equal.

2.2.2 Uranium City Country Foods Study

A total of 115 Uranium City residents were surveyed from July to October, 2010 as part of the Uranium City Country Foods Study (CanNorth 2011), representing approximately 91% of year-round and seasonal residents of Uranium City. In total, approximately 26% of the participants were below the age of 20, while the median age class was between 40 and 45 years of age.

The results from the Uranium City Country Foods Study that are pertinent to the current risk evaluation are presented in Table 2.2-2, namely the percentage of the population consuming each country food and the mean annual consumption of these foods per person per year. From this table, it can be seen that moose is the most widely consumed mammal, lake trout is the most widely consumed fish, and ptarmigan is the most widely consumed bird (although the mean annual consumption rates of spruce grouse and duck species are higher). For the most part, consumption of mammals was limited to the flesh; however, moose was a notable exception with about 30% to 50% of people also consuming moose organ meat (heart, liver and/or kidneys), bone marrow and tongue.

Mean annual consumption rates of lynx, muskrat, black bear and porcupine were much lower than those for moose, hare and beaver. Although almost 15% of the population reported beaver consumption, follow-up discussions with residents since the study have suggested that very few people in fact still trap and eat beaver. The reported consumption likely reflects the time when fur prices were higher and beaver were therefore trapped primarily for their pelts. Although caribou (*Ranger tarandus groenlandicus*) are hunted by residents from November to April, they have not been hunted in the area recently as the herds have migrated much further north.

Overall, fish accounts for the largest portion of the country food diet and is consumed at a mean annual rate of more than two times that of mammals and almost six times that of birds. In general, more meat from mammals is consumed in the fall and winter months as compared to the summer months, while fish are consumed year-round on a relatively consistent basis. For the most part, birds, especially migratory waterfowl, are consumed more frequently during the open water season from spring to fall than in the winter, with the exception of ptarmigan, which is consumed largely in the winter.

The most commonly consumed berries are raspberry, blueberry and bog cranberry. Wild mushrooms and mint are also consumed. Medicinal plants such as Labrador tea and spruce gum are also collected, although consumption rates were not derived in the study. Uranium City was identified as the primary berry picking and edible plant harvesting area, although nearby Bushell and Crackingstone inlets were also prime locations for a number of people for bog cranberries, strawberries, pincherries and blueberries. Other important areas included the shorelines of Milliken Lake (berries and edible plants), Course and Nistewuk Islands and the old Goldfields mine area (blueberries), the power lines between Beaverlodge and Martin Lake (Saskatoon berries), the shorelines of Martin Lake (edible plants), near the old Lorado mill site (raspberries), and the area surrounding Gunnar (berries and edible plants). A small number of people also reported picking berries from the areas around Ace Lake and Strike Lake.

Most hunting (bird and mammal) and gathering activities occur close to nearby lakes and small waterbodies, power lines in the area, and areas easily accessed by roads and corridors such as the Bushell and Eldorado roads and roads around town. Moose hunting, however, is spread across the regional study area including the Beaverlodge Properties, the Goldfields area, Milliken Lake and shorelines of Lake Athabasca. Lake Athabasca represents the most important fishing area for Uranium City residents for lake trout, lake whitefish and northern pike, as well as other species consumed in smaller amounts; however, fishing also occurs in moderate amounts at various lakes in the area (e.g., Milliken Lake, Donaldson Lake and Rogers Lake). Minimal fishing also occurs in Beaverlodge Lake and Martin Lake, even though a fish advisory is in place for these waterbodies to limit exposure to selenium from this pathway. Rivers and creeks such as the Crackingstone River are also fished, but primarily for Arctic grayling and sucker species which are consumed in small amounts (i.e., less than 0.2 kg/p/y).

Table 2.2-2 Summary of Frequency and Amount of Country Food Consumption

Food Group	Country Food	Percentage of Population Reporting Consumption (%)	Mean Annual Consumption (kg/p/y) [(a)]
Mammals	Moose (*Alces alces*)	87.83	10.47
	Snowshoe hare (*Lepus americanus*)	55.65	4.08
	Beaver (*Castor canadensis*)	14.78	0.2
	Lynx (*Lynx canadensis*)	5.22	0.004
	Muskrat (*Ondatra zibethicus*)	4.35	0.04
	Black bear (*Ursus americanus*)	1.74	0.01
	Porcupine (*Erethizon dorsatum*)	1.74	0.01
		Total	*14.81*
Birds	Ptarmigan (*Lagopus lagopus*)	60.87	1.02
	Spruce grouse (*Falcipennis canadensis*)	45.22	1.54
	Ruffed grouse (*Bonasa umbellus*)	31.30	0.64
	Sharp-tailed grouse (*Tympanuchus phasianellus*)	21.74	0.47
	Duck species (*Anas sp.*)	31.30	1.98
	Canada goose (*Branta candensis parvipes*)	22.61	0.53
	Tundra swan (*Cygnus columbianus*)	1.74	0.04
		Total	*6.22*
Fish	Lake trout (*Salvelinus namaycush*)	96.52	18.74
	Northern pike (*Esox lucius*)	80.00	8.02
	Lake whitefish (*Coregonus clupeaformis*)	68.70	8.17
	Walleye (*Sander vitreus*)	59.13	1.09
	Arctic grayling (*Thymallus arcticus*)	24.35	0.16
	Burbot (*Lota lota*)	4.35	0.03
	Sucker species (*Catostomus sp.*)	3.48	0.07
		Total	*36.28*
Berries	Raspberry (*Rubus idaeus*)	93.04	1.87
	Blueberry (*Vaccinium myrtilloides*)	87.83	1.68
	Bog cranberry (*Vaccinium vitis-idaea*)	64.35	1.71
	Strawberry (*Fragaria vesca*)	50.43	0.72
	Gooseberry (*Ribes oxyacanthoides*)	31.30	0.29
	Pincherry (*Prunus pensylvanica*)	16.52	0.15
	Blackberry (*Rubus sp.*)	2.61	0.30
	Currant (*Ribes sp.*)	6.09	
	Mooseberry (*Viburum edule*)	1.74	
	Cloudberry (*Rubus chamaemorus*)	3.48	
	Rosehips (*Rosa sp.*)	11.30	
	Saskatoon (*Amelanchier alnifolia*)	10.43	
		Total	*6.72*
		Total Country Foods	***64.03***
Edible Plants [(a)]	Labrador tea (*Ledum groenlandicum*)	32.17	0.31
	Wild mushrooms	20.00	0.20
	Mint (*Mentha arvensis*)	16.52	0.15
	Wild roots	4.35	0.04
	Rhubarb (*Rheum rhabarbarum*)	2.61	0.03
	Chives (*Allium schoenoprasum*)	0.87	0.01
		Total	0.74

Notes: Data obtained from CanNorth (2011).

(a) Mean annual consumption of edible plants in bags picked per person per year (mass not calculated).

2.3 SUMMARY OF EARMP COMMUNITY PROGRAM FINDINGS

As part of the two-year (2011 and 2012) EARMP framework, CanNorth (2013) completed a community program to monitor the safety of traditionally harvested country foods by collecting and testing water, fish, berry, and mammal chemistry from six communities in northern Saskatchewan: Camsell Portage, Uranium City (includes two community study areas), Fond-du-Lac, Stony Rapids, Black Lake, and Wollaston Lake/Hatchet Lake. The study area for each community is shown in Figure 1.1-2 while detailed maps showing the sampling locations within each study area are included in CanNorth (2013).

Foods collected and tested for the community program were identified by community members as being important traditionally harvested foods. Specifically, these included water, blueberry (*Vaccinium myrtiloides*) and/or bog cranberry (*Vaccinium vitis-idaea*), lake trout (*Salvelinus namaycush*), lake whitefish (*Coregonus clupeaformis*), northern pike (*Esox lucius*), and moose (*Alces alces*) or barren-ground caribou (*Rangifer tarandus groenlandicus*).

CanNorth (2013) assessed a full suite of constituents for each environmental medium but focused the data analysis and discussion on those that have been historically identified in the uranium mining and milling environmental process as being of potential concern, as well as mercury, which has been identified as a health concern to community members of the Athabasca Basin. Data collected in year 2011 and 2012 of the program were pooled for the analysis and constituent concentrations were compared to available guidelines and benchmarks for each medium, analogous regional reference values from similar reference sampling areas in northern Saskatchewan and Health Canada supermarket values for freshwater fish (Health Canada 2011).

The results of the EARMP community program established that constituents of potential concern in country foods were generally low, within available regional reference values, and/or comparable to supermarket foods. Exceptions were noted for selenium concentrations in lake whitefish and northern pike samples from Uranium City (Crackingstone River inlet to Lake Athabasca) and lake whitefish from Wollaston Lake/Hatchet Lake, which contained slightly higher concentrations when compared to supermarket fish and regional reference data. In addition, uranium concentrations in lake whitefish from Uranium City, copper in lake trout from Wollaston Lake/Hatchet Lake, and zinc in northern pike from Camsell Portage, which were slightly higher than both the regional reference means and supermarket values (CanNorth 2013).

2.4 SELECTION OF CONSTITUENTS OF POTENTIAL CONCERN

The selection of radiological and non-radiological COPC to carry through the human health risk assessment was based on many years of experience at uranium mine sites in northern Saskatchewan. The COPC identified for inclusion in the assessment included the following: arsenic, cobalt, copper, lead, molybdenum, nickel, selenium and uranium, and the radionuclides lead-210, polonium-210, radium-226, and thorium-230.

3.0 RECEPTOR CHARACTERIZATION

This section details the human life stages that were selected for the risk evaluation and the rationale behind their selection. In the selection it is important to identify people that are likely to be most exposed.

3.1 SELECTION OF APPROPRIATE HUMAN LIFE STAGES

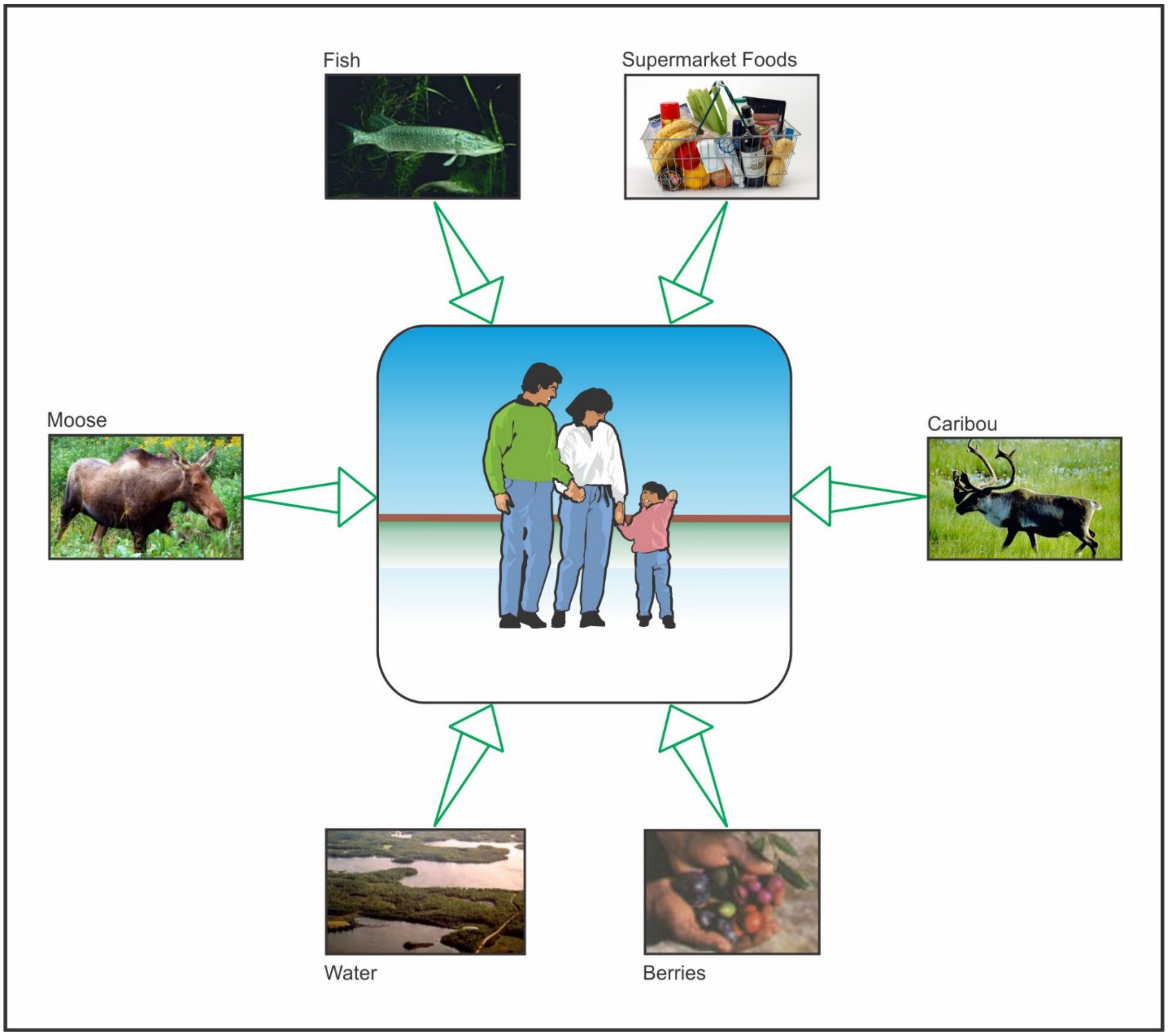
Information collected in 2010 for Uranium City indicated that the population is largely comprised of adults with 26% of the population being below the age of 20 (CanNorth 2011). Information collected in 1998 and 1999 for the Hatchet Lake Band indicated that just over half of the population is below the age of 20 and that 30% of the population is below the age of 10 (CanNorth 2000). Based on this information, an adult (21-60 years of age) and child (6-11 years of age) were selected as representative of individuals in each community that was assessed. While a toddler is generally considered the most exposed receptor, the elevated exposure is due to their increased hand to mouth activities that result in a high incidental soil ingestion rate. Since only water ingestion and food consumption were considered in the evaluation, toddlers were not assessed. In addition, the food intake rates from the Uranium City Country Foods Study were only derived for adults and residents below 20 years of age; thus a child was assumed to be represented by the less than 20 age group. With respect to the Hatchet Lake Dietary Survey, food intake rates derived for the 2-10 year age group were assumed to be representative of a child. For comparative purposes, a typical Canadian child and adult exposed to COPC through the consumption of supermarket food were also evaluated.

3.2 PATHWAYS OF EXPOSURE

As the objective of this risk evaluation was to examine potential risks from the ingestion of country foods, the only pathways evaluated were the ingestion of food and drinking water. Residents were assumed to consume primarily country foods and drinking water from the local environment while supplementing their diet with supermarket foods. Typical Canadians were assumed to be exposed only through the consumption of supermarket foods.

Measured data from the EARMP community program (CanNorth 2013) were used to evaluate exposure from country foods and drinking water. As part of this program, data were only collected for country foods known to be locally important for the area including moose meat, caribou meat (barren-ground), fish flesh (lake whitefish, lake trout and northern pike), and berries (blueberry and bog cranberry). Figure 3.2-1 shows a schematic of the different foods that were considered in the risk evaluation.

Figure 3.2-1 Conceptual Food Consumption Model for Residents in the Athabasca Basin



3.3 RECEPTOR CHARACTERISTICS

Table 3.3-1 summarizes how the data from EARMP community program (CanNorth 2013) were considered within the HHRA. The first part of the table illustrates which dietary study was used for the humans in each exposure location. The second part of the table lists the assumed locations of the different dietary components.

As mentioned previously, dietary intakes derived from the Uranium City Country Foods Study (CanNorth 2011) were used to define the dietary characteristics for residents of the two Uranium City communities (i.e., Crackingstone River inlet and Fredette River/Prospector's Bay) while the Hatchet Lake Dietary Survey (CanNorth 2000) was used to define dietary characteristics for residents of the remaining Athabasca Basin communities (i.e., Wollaston Lake/Hatchet Lake, Black Lake, Stony Rapids, Fond-du-Lac, and Camsell Portage).

Uranium City (Fredette River/Prospector's Bay) residents gathering food near the Beaverlodge Mine site were assumed to obtain drinking water from the Fredette River, moose and berries from the surrounding area, and fish from Prospector's Bay of Lake Athabasca. Although the Crackingstone River inlet to Lake Athabasca occurs downstream of mining and milling operations in the area, the inlet is fished by the community of Uranium City (CanNorth 2013). As such, Uranium City (Crackingstone River inlet) residents were assumed to obtain drinking water and fish from the Crackingstone River inlet but moose and berries from the same area as the Uranium City (Fredette River/Prospector's Bay) community. The residents of all other communities (i.e., Wollaston Lake/Hatchet Lake, Black Lake, Stony Rapids, Fond-du-Lac River, and Camsell Portage) were assumed to obtain drinking water, fish, moose and berries from their respective study areas as shown in Table 3.3-1.

Intake rates of supermarket foods from Health Canada (1994) were used to define the dietary characteristics of typical Canadians. Body weight and water ingestion rate were obtained from Health Canada (2010a). Assumptions regarding the human characteristics are outlined below.

Table 3.3-1 Summary of Receptor Locations and Exposure Pathways

Country Foods Intake Rates	Hatchet Lake Study (CanNorth 2000)					Uranium City Country Foods Study (CanNorth 2011)	
Pathways	**Wollaston Lake/ Hatchet Lake**	**Stony Rapids**	**Black Lake**	**Fond-du-Lac**	**Camsell Portage**	**Uranium City (Crackingstone River Inlet)**	**Uranium City (Fredette River/ Prospector's Bay)**
Drinking Water	Welcome Bay, Wollaston Lake	Fond-du-Lac River at Stony Rapids	Black Lake	Fond-du-Lac River at Fond-du-Lac	Ellis Bay, Lake Athabasca	Crackingstone River Inlet, Lake Athabasca	Fredette River
Moose (Flesh)[a]						Uranium City (Fredette River/ Prospector's Bay)	Uranium City (Fredette River/ Prospector's Bay)
Caribou (Flesh)[b]	Wollaston Lake/ Hatchet Lake	Stony Rapids	Black Lake	Fond du Lac	Camsell Portage		
Fish (Flesh) [c]	Wollaston Lake	Fond-du-Lac River at Stony Rapids	Black Lake	Fond-du-Lac River at Fond-du-Lac	Ellis Bay, Lake Athabasca	Crackingstone River Inlet, Lake Athabasca	Fredette River
Berries (Blueberry & Bog Cranberry)	Wollaston Lake/ Hatchet Lake	Stony Rapids	Black Lake	Fond du Lac	Camsell Portage	Uranium City (Fredette River/ Prospector's Bay)	Uranium City (Fredette River/ Prospector's Bay)

Notes:

(a) Moose flesh data are only available for Uranium City and Camsell Portage; according to the Hatchet Lake Study, moose only represents a small portion of the diet.
(b) Caribou flesh data not available for Uranium City study areas; according to the Uranium City Country Foods Study (CanNorth 2011), caribou is not a significant component of the diet for Uranium City residents.
(c) Considers all species sampled in the EARMP Community Program (CanNorth 2013): Lake Trout, Lake Whitefish and Northern Pike.

3.3.1 Intake Rates of Country Foods

3.3.1.1 Derived from Hatchet Lake Dietary Survey

CanNorth (2000) developed intake rates for different age groups comprising the Hatchet Lake Band, specifically 2-10 years; 11-20 years; 21-40 years; 41-60 years; and, >60 years. As seen from Table 2.2-1, the age group 2-10 years was used to develop intake rates for the child and the age groups comprising 21-60 years for the adult.

The intake rates were developed for numerous country foods; however, this evaluation only considered ingestion of caribou, moose, fish and berries. Therefore, to ensure that exposure from country foods was not under-estimated, the following assumptions were made:

- caribou comprised all animals consumed including moose which was an insignificant pathway;
- fish comprised all types of fish consumed; and,
- berries comprised all types of berries consumed.

As shown in Table 2.2-1, the total country food intake rate for the adult added up to 440 g/d and 296 g/d for the child. The mean daily intake rates and the foods comprising the intakes are summarized in Table 3.3-2 and add up to the total intakes discussed in the previous sentence.

Table 3.3-2 Mean Daily Intakes (g/d) of Traditional Food from the Hatchet Lake Band Survey

Country Food	Intake Rates Summed to Derive the Yearly Intake Rate	Child (6 to 11 yrs)	Adult (21+ yrs)
Caribou Meat	Caribou, moose, beaver and other small animals, ground birds and water birds	244.1	368.4
Fish	Fish	43.8	70
Berries	Berries	8.5	1.8
	Total	***296.4***	***440.2***

3.3.1.2 Derived from Uranium City Country Foods Study

Table 2.2-2 presented mean yearly intake rates per person for various country foods consumed by Uranium City residents (CanNorth 2011); however, intake rates were not developed for different life stages. CanNorth (2011) reported that 32 of the 115 residents surveyed were below the age of 20 while the remaining 83 were above the age of 20 (ranging from 20 to 85 years old). Therefore, to develop child- and adult-specific intake rates for this evaluation, the following methodology was used. Children were assumed to be represented by the 32 respondents under the age of 20, while adults were assumed to be represented by the remaining 83. The average intake rate was then represented according to Equation 3-1:

$$Intake_{avg} = Intake_{adult} \times f_{adult} + Intake_{child} + f_{child} \tag{3-1}$$

Where:

$Intake_{avg}$	=	Mean yearly intake of ‘x’ country food per person [kg/p/y]
$Intake_{adult}$	=	Mean yearly intake of ‘x’ country food for an adult [kg/p/y]
$Intake_{child}$	=	Mean yearly intake of ‘x’ country food for a child [kg/p/y]
f_{adult}	=	Fraction of residents that are adults [-] (83/115)
f_{child}	=	Fraction of residents that are children [-] (32/115)

CanNorth (2011) developed intake rates for numerous country foods; however, this assessment only considered ingestion of caribou, moose, fish and berries. Therefore, to ensure that exposure from country foods was not under-estimated, the following assumptions were made:

- moose comprised all animals consumed including caribou which was an insignificant pathway;
- fish comprised all types of fish consumed; and,
- berries comprised all types of berries consumed.

The total country food intake rate added up to 64.03 kg/p/y, as provided in Table 2.2-2. The resulting mean yearly and daily intake rates and the foods comprising the intakes are summarized in Table 3.3-3.

Table 3.3-3 Mean Intake Rates of Composite Food Items

Country Food	Individual Intake Rates Summed to Derive the Yearly Intake Rate	Summed Mean Intake Rate	
		kg/p/y	g/p/d
Moose meat	Moose, snowshoe hare, beaver, lynx, muskrat, black bear, porcupine, ptarmigan, spruce grouse, ruffed grouse, sharp-tailed grouse, duck species, Canada goose, tundra swan	21.03	57.6
Fish	Lake trout, northern pike, lake whitefish, walleye, Arctic grayling, burbot and sucker species	36.28	99.4
Berries	Raspberry, blueberry, bog cranberry, strawberry, gooseberry, pincherry, blackberry, currant, mooseberry, cloudberry, rosehips and Saskatoon berry	6.72	18.4
	Total	***64.03***	***175***

Notes: Intake rates for individual food items are presented in Table 2.2-2.

To relate the intake rate of the child to that of the adult in Equation 3-1, life stage conversion factors (LCs) were developed as the ratios of child to adult intake rates of fish and wild game by Canadian Aboriginal populations (Health Canada 2010a) for fish, meat and poultry, and of various fruits by the Canadian general population (Health Canada 1994) for berries. It is recognized that there is uncertainty in the use of this methodology but it is the best data available to develop the life stage conversion factors. The adult and child intake rates and resulting LCs are presented in Table 3.3-4. The intake rate for the adult resident of Uranium City was then estimated by rearranging Equation 3-1 to form Equation 3-2, while the intake rate for the child was estimated from Equation 3-3:

$$Intake_{adult} = \frac{Intake_{average}}{f_{adult} + LC \times (1 - f_{adult})} \quad (3\text{-}2)$$

$$Intake_{child} = Intake_{adult} \times LC \quad (3\text{-}3)$$

Table 3.3-4 Summary of Life Stage Conversion Factors Used in the Assessment

Food Group	Daily Intake Rate (kg/d)		Life Stage Conversion Factor	Source	Applies To
	Child	Adult			
Wild Game	0.125	0.27	0.46	Health Canada 2010a	Moose meat, snowshoe hare, spruce grouse
Fish	0.17	0.22	0.77	Health Canada 2010a	Fish
Fruits [a]	0.202	0.186	1.08	Health Canada 1994	Berries

Notes:
(a) Includes raw and canned citrus fruit, fresh and canned citrus juice, raw apples, canned sweetened and unsweetened applesauce, bananas, grapes, bottled grape juice, peaches, pears, plums, dried prunes, canned plums, cherries, melons, strawberries, blueberries, pineapple and raisins.

The resulting child- and adult-specific intake rates of country foods for Uranium City residents are summarized in Table 3.3-5.

Table 3.3-5 Country Food Intake Rates for Uranium City Residents

Country Food	Mean Daily Intake Rate (g/d)	
	Child	Adult
Moose Meat	31.2	67.9
Fish [a]	81.8	106
Berries [b]	19.4	18.0

Notes: Intake rates derived from data presented in CanNorth (2011).

(a) Includes lake trout, northern pike, lake whitefish, walleye, Arctic grayling, burbot and sucker species.
(b) Includes raspberry, blueberry, bog cranberry, strawberry, gooseberry, pincherry, blackberry, currant, mooseberry, cloudberry, rosehips and Saskatoon berry.

3.3.2 Intake Rates of Non-Country Foods

In addition to country foods, residents may also be exposed to COPC through the ingestion of supermarket (non-country) foods. Although exposures from non-country foods are not as a result of exposure to environmental concentrations caused by historical mining activities, they represent a part of the total exposure to COPC and therefore are considered in the evaluation. Health Canada has been conducting Total Dietary Studies (TDS) for several years in an effort to capture this exposure, which requires not only measured concentrations in various supermarket foods but also intake rates of these foods. In the *Human Health Risk Assessment for Priority Substances*, Health Canada (1994) developed mean intake rates of 112 individual food composites for Canadians of different age ranges (i.e., infant, toddler, child, teen and adult).

The intake rates for non-country foods are provided in Table 3.3-6. It should be noted that the intake of fruits and juices by resident in the study area was adjusted from that reported for a typical Canadian population to account for the increased/decreased consumption of berries from the local area.

Table 3.3-6 Non-Country Food Intake Rates

Mean Non-Country Food Intake Rates (g/d)	Resident from Athabasca Basin	
	Child	Adult
Milk and Dairy	622	297
Eggs	21.1	32.3
Root Vegetables	128	142
Other Vegetables	117	161
Other Fruits and Juices [(a)]	193 (182)	184 (168)
Cereals and Grains	300	247
Sugar and Sweets	57.2	57.2
Fats, Nuts and Oils	14.4	14.7
Non-Alcoholic Drinks	228	812
Alcoholic Drinks	2.66	145

Notes: Values from Health Canada (1994); intake rates of individual non-country foods comprising the categories are presented in Annex A.

(a) Intake of other fruits and juices for Uranium City residents decreased from that derived by Health Canada (1994) to account for increased berry consumption by this receptor and are reported in brackets. Intake from other communities was also adjusted by the berry consumption rate from Hatchet Lake Survey.

3.3.3 Intake Rates of Supermarket Foods for Typical Canadians

To enable comparison of total intakes from food between typical Canadians and Athabasca Basin residents, foods consumed by both groups were matched as shown in Table 3.3-7.

Table 3.3-7 Foods Consumed by Athabasca Basin Residents and Typical Canadians

Foods Consumed by Athabasca Basin Residents	Comparable Foods Consumed by Typical Canadians
Game (Meat and Poultry)	
Moose/Caribou Meat	Beef (steak, roast and stewing, hamburger); pork (fresh and cured); veal; lamb; cold cuts and luncheon meats; canned luncheon meats; canned meat soups; and, wieners
Fish	
Lake Trout, Lake Whitefish, Northern Pike	Fresh or frozen marine and freshwater fish; canned fish; and, fresh or frozen shellfish
Fruit	
Berries	Strawberries and blueberries
Other [(a)]	
Supermarket/Non-Country Foods	Milk and dairy products; organs; root vegetables; other vegetables; cereals and grains; eggs; other fruits and juices; fats, nuts and oils; sugar and sweets; non-alcoholic drinks; and, alcoholic drinks

Notes:
(a) Details on the individual food composites comprising each food category are shown in Annex A.

The intake rates for each composite food item were used in this evaluation for the typical Canadian child and adult and are provided in Annex A. Since Athabasca Basin residents consume more fish than the general Canadian population, a typical Canadian receptor with a high fish intake rate was also evaluated. The fish intake rate provided in Health Canada (1994) was developed using data for both people who consume and don't consume fish (i.e., consumers and non-consumers); however, intake rates of fish and shellfish for consumers only are available in the *Compendium of Canadian Human Exposure Factors for Risk Assessment* (Richardson 1997). The fish intake rates for consumers only of 90 g/d and 111 g/d for children and adults are similar to the fish intakes for Athabasca Basin residents and were therefore used in this assessment for the typical Canadian with a high fish intake. In order to maintain the same total meat and fish intake of the typical Canadian, the meat intake rate of a typical Canadian was decreased for the high fish consumer.

The food intake rates for typical Canadians are presented in Table 3.3-8 and are shown as summed intakes for several food groupings (based on the Canadian Council of Ministers of the Environment (CCME 2009)) for information purposes; however, the individual food intake rates for each composite food were used in the calculations and are presented in Annex A.

Table 3.3-8 Food Intake Rates for Typical Canadians

Mean Food Consumption Rates (g/d)	Typical Canadian		Typical Canadian – Fish Eater	
	Child	Adult	Child	Adult
Meat	115	168	33.2 [(a)]	70.8 [(a)]
Organs	1.85	2.81	1.85	2.81
Poultry	16.7	21.2	16.7	21.2
Fish	8.37	13.9	90.0 [(b)]	111 [(b)]
Berries	8.56	9.74	8.56	9.74
Labrador Tea	N/A	N/A	N/A	N/A
Milk and Dairy	622	297	622	297
Eggs	21.1	32.3	21.1	32.3
Root Vegetables	128	142	128	142
Other Vegetables	117	161	117	161
Other Fruits and Juices	193	176	193	176
Cereals and Grains	300	247	300	247
Sugar and Sweets	57.2	57.2	57.2	57.2
Fats, Nuts and Oils	14.4	14.7	14.4	14.7
Non-Alcoholic Drinks	228	812	228	812
Alcoholic Drinks	2.66	145	2.66	145

Notes: Values from Health Canada (1994) unless otherwise noted; intake rates of each non-country food are presented in Annex A.

(a) Intake of other mammals for a typical Canadian fish eater decreased from that derived by Health Canada (1994) to account for increased fish consumption by this receptor.

(b) From Richardson (1997) for consumers of fish only.

3.3.4 Body Weight and Drinking Water Ingestion Rate

The body weights (bw) and drinking water ingestion rate of a child and adult are also necessary in order to calculate daily intake rates (in mg/(kg (bw)-d)). In this assessment, the body weights used for the child and adult were 32.9 and 70.7 kg, respectively and the drinking water ingestion rates were 0.8 L/d (or 800 g/d) for the child and 1.5 L/d (or 1500 g/d) for the adult (Health Canada 2010a).

4.0 EXPOSURE ASSESSMENT

This section details the exposure point concentrations (EPCs) used in the evaluation and the equations used to estimate the exposures.

4.1 EXPOSURE POINT CONCENTRATIONS

4.1.1 Country Foods

Two exposure scenarios were considered for the Athabasca Basin resident using the mean and maximum concentrations of COPC in country foods in order to provide both likely and worst-case exposure estimates. The use of the maximum measured values for EPCs is an extremely conservative estimate as individuals will not be eating food or drinking water with maximum concentrations every day.

The EPCs were derived from the data collected from the two-year (2011 and 2012) EARMP Community program (CanNorth 2013) for the seven study areas. The measured concentrations of all three species of fish sampled (lake trout, lake whitefish and northern pike) were combined to generate EPCs for fish flesh. Similarly, the measured concentrations in berries (blueberry and bog cranberry) were pooled to generate EPCs for berries. The data for berries were measured on a dry weight (dw) basis while intake rates are calculated on a wet weight (ww) basis. Thus, to estimate exposure, the dry weight concentrations were converted to wet weight using the mean reported moisture contents of the samples. The EPCs for uranium-238 were estimated from the chemical uranium concentrations using a conversion factor of 12.347 Bq of uranium-238 per mg of chemical uranium.

To be consistent with the EARMP report (CanNorth 2013), all values that were less than the MDL were set equal to the MDL value. This is a conservative approach that likely leads to overestimates of exposure to the residents as the concentrations in the food items are generally below the MDL. In these types of evaluations it is more appropriate to use ½ MDL. Two lead measurements (0.31 and 0.48 µg/g ww) from the Black Lake barren-ground caribou flesh samples were much higher than other samples; the CanNorth report (2013) indicates that these samples are probably contaminated by lead shot used in hunting. Therefore, these two measurements were not included in the development of EPCs used in this study. Similarly, one selenium measurement (2.6 µg/g ww) from a lake whitefish sample collected in Uranium City (Crackingstone River Inlet) was substantially higher than all other fish samples collected and was considered to be an anomaly and was not considered in the calculations. The mean and maximum EPCs are summarized in Table 4.1-1 for drinking water and country foods (i.e., moose meat, caribou meat, fish and berries).

Table 4.1-1 Summary of Exposure Point Concentrations for Country Foods

COPC	Water		Fish Flesh		Berries [(a)]		Moose Flesh		Caribou Flesh	
	Maximum	Mean	Maximum	Mean	Maximum	Mean	Maximum	Mean	Maximum	Mean
Black Lake										
Arsenic	1.0×10^{-4}	1.0×10^{-4}	0.40	0.13	7.3×10^{-3}	7.3×10^{-3}	ND	ND	4.0×10^{-2}	2.2×10^{-2}
Cobalt	1.0×10^{-4}	1.0×10^{-4}	5.0×10^{-3}	2.4×10^{-3}	7.3×10^{-3}	2.0×10^{-3}	ND	ND	8.0×10^{-3}	4.4×10^{-3}
Copper	2.0×10^{-4}	2.0×10^{-4}	1.0	0.28	0.55	0.47	ND	ND	4.3	3.3
Lead	1.0×10^{-4}	1.0×10^{-4}	4.0×10^{-3}	2.3×10^{-3}	1.0×10^{-2}	3.9×10^{-3}	ND	ND	0.01	6.1×10^{-3}
Molybdenum	2.0×10^{-4}	1.5×10^{-4}	2.0×10^{-2}	2.0×10^{-2}	2.9×10^{-2}	1.9×10^{-2}	ND	ND	0.20	0.11
Nickel	2.0×10^{-4}	1.5×10^{-4}	1.0×10^{-2}	1.0×10^{-2}	9.9×10^{-2}	8.0×10^{-2}	ND	ND	2.0×10^{-2}	1.3×10^{-2}
Selenium	1.0×10^{-4}	1.0×10^{-4}	0.36	0.21	1.2×10^{-2}	7.9×10^{-3}	ND	ND	0.27	0.19
Uranium	1.0×10^{-4}	1.0×10^{-4}	2.0×10^{-3}	1.1×10^{-3}	1.5×10^{-3}	1.5×10^{-3}	ND	ND	1.0×10^{-3}	1.0×10^{-3}
Uranium-238 [(b)]	1.2×10^{-3}	1.2×10^{-3}	2.5×10^{-5}	1.4×10^{-5}	1.8×10^{-5}	1.8×10^{-5}	ND	ND	1.2×10^{-5}	1.2×10^{-5}
Lead-210	2.0×10^{-2}	2.0×10^{-2}	4.0×10^{-3}	1.4×10^{-3}	1.8×10^{-3}	7.3×10^{-4}	ND	ND	1.0×10^{-3}	1.0×10^{-3}
Polonium-210	5.0×10^{-3}	5.0×10^{-3}	1.0×10^{-3}	3.2×10^{-4}	3.5×10^{-4}	2.2×10^{-4}	ND	ND	1.1×10^{-2}	8.0×10^{-3}
Radium-226	9.0×10^{-3}	7.0×10^{-3}	2.0×10^{-3}	2.1×10^{-4}	5.8×10^{-4}	2.8×10^{-4}	ND	ND	8.0×10^{-3}	2.8×10^{-3}
Thorium-230	1.0×10^{-2}	1.0×10^{-2}	2.0×10^{-3}	2.9×10^{-4}	2.9×10^{-4}	2.3×10^{-4}	ND	ND	1.0×10^{-3}	5.5×10^{-4}
Camsell Portage										
Arsenic	2.0×10^{-4}	1.5×10^{-4}	0.38	0.17	7.3×10^{-3}	7.3×10^{-3}	1.0×10^{-2}	1.0×10^{-2}	1.0×10^{-2}	1.0×10^{-2}
Cobalt	1.0×10^{-4}	1.0×10^{-4}	7.0×10^{-3}	2.5×10^{-3}	2.9×10^{-3}	1.6×10^{-3}	2.2×10^{-2}	1.4×10^{-2}	2.0×10^{-3}	2.0×10^{-3}
Copper	2.0×10^{-4}	2.0×10^{-4}	0.58	0.28	0.72	0.55	2.0	1.7	3.7	3.7
Lead	1.0×10^{-4}	1.0×10^{-4}	3.0×10^{-3}	2.0×10^{-3}	5.8×10^{-3}	2.0×10^{-3}	1.9×10^{-2}	1.0×10^{-2}	2.0×10^{-3}	2.0×10^{-3}
Molybdenum	2.0×10^{-4}	2.0×10^{-4}	2.0×10^{-2}	2.0×10^{-2}	2.9×10^{-2}	2.0×10^{-2}	2.0×10^{-2}	2.0×10^{-2}	0.20	0.20
Nickel	2.0×10^{-4}	2.0×10^{-4}	3.0×10^{-2}	1.1×10^{-2}	0.12	7.4×10^{-2}	2.0×10^{-2}	1.5×10^{-2}	1.0×10^{-2}	1.0×10^{-2}
Selenium	1.0×10^{-4}	1.0×10^{-4}	0.31	0.20	7.3×10^{-3}	7.3×10^{-3}	0.20	0.12	0.23	0.23
Uranium	1.0×10^{-4}	1.0×10^{-4}	1.4×10^{-2}	1.6×10^{-3}	1.2×10^{-2}	2.6×10^{-3}	1.0×10^{-3}	1.0×10^{-3}	1.0×10^{-3}	1.0×10^{-3}
Uranium-238 [(b)]	1.2×10^{-3}	1.2×10^{-3}	1.7×10^{-4}	2.0×10^{-5}	1.4×10^{-4}	3.2×10^{-5}	1.2×10^{-5}	1.2×10^{-5}	1.2×10^{-5}	1.2×10^{-5}
Lead-210	2.0×10^{-2}	2.0×10^{-2}	2.0×10^{-3}	1.0×10^{-3}	2.9×10^{-3}	1.1×10^{-3}	1.0×10^{-3}	8.3×10^{-4}	1.0×10^{-3}	1.0×10^{-3}
Polonium-210	5.0×10^{-3}	5.0×10^{-3}	8.0×10^{-4}	2.8×10^{-4}	4.4×10^{-4}	2.6×10^{-4}	1.9×10^{-3}	8.7×10^{-4}	1.7×10^{-2}	1.6×10^{-2}
Radium-226	5.0×10^{-3}	5.0×10^{-3}	3.0×10^{-4}	9.0×10^{-5}	8.8×10^{-4}	5.1×10^{-4}	1.0×10^{-4}	7.8×10^{-5}	8.0×10^{-5}	8.0×10^{-5}
Thorium-230	2.0×10^{-2}	1.5×10^{-2}	3.0×10^{-3}	2.6×10^{-4}	2.9×10^{-4}	2.2×10^{-4}	2.0×10^{-4}	1.3×10^{-4}	2.0×10^{-4}	2.0×10^{-4}

Table 4.1-1 Summary of Exposure Point Concentrations for Country Foods (Cont'd)

COPC	Water		Fish Flesh		Berries [(a)]		Moose Flesh		Caribou Flesh	
	Maximum	Mean	Maximum	Mean	Maximum	Mean	Maximum	Mean	Maximum	Mean
Fond-du-Lac										
Arsenic	$1.0x10^{-4}$	$1.0x10^{-4}$	0.52	0.17	$7.3x10^{-3}$	$7.3x10^{-3}$	ND	ND	$2.0x10^{-2}$	$1.5x10^{-2}$
Cobalt	$1.0x10^{-4}$	$1.0x10^{-4}$	$1.5x10^{-2}$	$3.1x10^{-3}$	$2.9x10^{-3}$	$1.9x10^{-3}$	ND	ND	$1.3x10^{-2}$	$4.6x10^{-3}$
Copper	$2.0x10^{-4}$	$2.0x10^{-4}$	0.40	0.23	0.57	0.48	ND	ND	4.3	3.2
Lead	$1.0x10^{-4}$	$1.0x10^{-4}$	$4.0x10^{-3}$	$2.4x10^{-3}$	$4.4x10^{-3}$	$2.2x10^{-3}$	ND	ND	$1.4x10^{-2}$	$5.1x10^{-3}$
Molybdenum	$1.0x10^{-4}$	$1.0x10^{-4}$	$2.0x10^{-2}$	$2.0x10^{-2}$	$5.8x10^{-2}$	$3.8x10^{-2}$	ND	ND	$2.0x10^{-2}$	$2.0x10^{-2}$
Nickel	$2.0x10^{-4}$	$2.0x10^{-4}$	$2.0x10^{-2}$	$1.1x10^{-2}$	0.14	$9.6x10^{-2}$	ND	ND	$8.0x10^{-2}$	$1.7x10^{-2}$
Selenium	$1.0x10^{-4}$	$1.0x10^{-4}$	0.29	0.18	$1.2x10^{-2}$	$8.0x10^{-3}$	ND	ND	0.34	0.17
Uranium	$1.0x10^{-4}$	$1.0x10^{-4}$	$3.0x10^{-3}$	$1.2x10^{-3}$	$2.9x10^{-3}$	$1.6x10^{-3}$	ND	ND	$2.0x10^{-3}$	$1.2x10^{-3}$
Uranium-238 [(b)]	$1.2x10^{-3}$	$1.2x10^{-3}$	$3.7x10^{-5}$	$1.5x10^{-5}$	$3.6x10^{-5}$	$2.0x10^{-5}$	ND	ND	$2.5x10^{-5}$	$1.5x10^{-5}$
Lead-210	$2.0x10^{-2}$	$2.0x10^{-2}$	$4.0x10^{-3}$	$1.4x10^{-3}$	$1.6x10^{-3}$	$6.3x10^{-4}$	ND	ND	$8.0x10^{-3}$	$2.0x10^{-3}$
Polonium-210	$5.0x10^{-3}$	$5.0x10^{-3}$	$1.0x10^{-3}$	$2.8x10^{-4}$	$5.8x10^{-4}$	$2.4x10^{-4}$	ND	ND	$2.1x10^{-2}$	$1.2x10^{-2}$
Radium-226	$5.0x10^{-3}$	$5.0x10^{-3}$	$2.0x10^{-3}$	$2.1x10^{-4}$	$7.3x10^{-4}$	$3.9x10^{-4}$	ND	ND	$2.0x10^{-4}$	$8.0x10^{-5}$
Thorium-230	$1.0x10^{-2}$	$1.0x10^{-2}$	$2.0x10^{-3}$	$3.1x10^{-4}$	$2.9x10^{-4}$	$2.0x10^{-4}$	ND	ND	$3.0x10^{-4}$	$1.3x10^{-4}$
Stony Rapids										
Arsenic	$2.0x10^{-4}$	$2.0x10^{-4}$	0.18	$5.6x10^{-2}$	$7.3x10^{-3}$	$7.3x10^{-3}$	ND	ND	$2.0x10^{-2}$	$1.2x10^{-2}$
Cobalt	$1.0x10^{-4}$	$1.0x10^{-4}$	$1.2x10^{-2}$	$4.3x10^{-3}$	$1.0x10^{-2}$	$2.5x10^{-3}$	ND	ND	$6.0x10^{-3}$	$4.0x10^{-3}$
Copper	$2.0x10^{-4}$	$2.0x10^{-4}$	0.78	0.25	0.47	0.36	ND	ND	4.7	4.1
Lead	$1.0x10^{-4}$	$1.0x10^{-4}$	$2.0x10^{-3}$	$2.0x10^{-3}$	$1.5x10^{-2}$	$3.9x10^{-3}$	ND	ND	$6.5x10^{-2}$	$1.7x10^{-2}$
Molybdenum	$2.0x10^{-4}$	$2.0x10^{-4}$	$2.0x10^{-2}$	$2.0x10^{-2}$	$5.8x10^{-2}$	$2.6x10^{-2}$	ND	ND	$2.0x10^{-2}$	$2.0x10^{-2}$
Nickel	$2.0x10^{-4}$	$1.5x10^{-4}$	$5.0x10^{-2}$	$1.2x10^{-2}$	0.12	$8.7x10^{-2}$	ND	ND	$1.0x10^{-2}$	$1.0x10^{-2}$
Selenium	$1.0x10^{-4}$	$1.0x10^{-4}$	0.27	0.15	$7.3x10^{-3}$	$7.3x10^{-3}$	ND	ND	0.26	0.22
Uranium	$1.0x10^{-4}$	$1.0x10^{-4}$	$2.0x10^{-3}$	$1.1x10^{-3}$	$2.9x10^{-3}$	$1.8x10^{-3}$	ND	ND	$2.0x10^{-3}$	$1.2x10^{-3}$
Uranium-238 [(b)]	$1.2x10^{-3}$	$1.2x10^{-3}$	$2.5x10^{-5}$	$1.3x10^{-5}$	$3.6x10^{-5}$	$2.2x10^{-5}$	ND	ND	$2.5x10^{-5}$	$1.5x10^{-5}$
Lead-210	$2.0x10^{-2}$	$2.0x10^{-2}$	$1.0x10^{-3}$	$1.0x10^{-3}$	$1.8x10^{-3}$	$1.2x10^{-3}$	ND	ND	$2.0x10^{-3}$	$1.2x10^{-3}$
Polonium-210	$6.0x10^{-3}$	$5.5x10^{-3}$	$1.0x10^{-3}$	$2.5x10^{-4}$	$4.4x10^{-4}$	$2.3x10^{-4}$	ND	ND	$2.6x10^{-2}$	$1.3x10^{-2}$
Radium-226	$1.0x10^{-2}$	$7.5x10^{-3}$	$1.0x10^{-3}$	$1.1x10^{-4}$	$8.8x10^{-4}$	$3.8x10^{-4}$	ND	ND	$2.0x10^{-3}$	$1.4x10^{-3}$
Thorium-230	$1.0x10^{-2}$	$1.0x10^{-2}$	$2.0x10^{-3}$	$2.1x10^{-4}$	$2.9x10^{-4}$	$2.9x10^{-4}$	ND	ND	$2.0x10^{-3}$	$2.0x10^{-3}$

Table 4.1-1 Summary of Exposure Point Concentrations for Country Foods (Cont'd)

COPC	Water		Fish Flesh		Berries [(a)]		Moose Flesh		Caribou Flesh	
	Maximum	Mean	Maximum	Mean	Maximum	Mean	Maximum	Mean	Maximum	Mean
Uranium City (Crackingstone River Inlet)										
Arsenic	$2.0x10^{-4}$	$2.0x10^{-4}$	0.30	$8.9x10^{-2}$	ND	ND	ND	ND	ND	ND
Cobalt	$1.0x10^{-4}$	$1.0x10^{-4}$	$9.0x10^{-3}$	$2.5x10^{-3}$	ND	ND	ND	ND	ND	ND
Copper	$2.0x10^{-4}$	$2.0x10^{-4}$	0.30	0.20	ND	ND	ND	ND	ND	ND
Lead	$1.0x10^{-4}$	$1.0x10^{-4}$	$2.0x10^{-3}$	$2.0x10^{-3}$	ND	ND	ND	ND	ND	ND
Molybdenum	$6.0x10^{-4}$	$4.0x10^{-4}$	$2.0x10^{-2}$	$2.0x10^{-2}$	ND	ND	ND	ND	ND	ND
Nickel	$2.0x10^{-4}$	$2.0x10^{-4}$	$8.0x10^{-2}$	$1.6x10^{-2}$	ND	ND	ND	ND	ND	ND
Selenium	$2.0x10^{-4}$	$1.5x10^{-4}$	0.85	0.34	ND	ND	ND	ND	ND	ND
Uranium	$1.4x10^{-2}$	$7.3x10^{-3}$	$1.2x10^{-2}$	$2.0x10^{-3}$	ND	ND	ND	ND	ND	ND
Uranium-238 [(b)]	0.17	$9.0x10^{-2}$	$1.5x10^{-4}$	$2.4x10^{-5}$	ND	ND	ND	ND	ND	ND
Lead-210	$2.0x10^{-2}$	$2.0x10^{-2}$	$1.0x10^{-3}$	$1.0x10^{-3}$	ND	ND	ND	ND	ND	ND
Polonium-210	$5.0x10^{-3}$	$5.0x10^{-3}$	$1.8x10^{-3}$	$5.0x10^{-4}$	ND	ND	ND	ND	ND	ND
Radium-226	$5.0x10^{-3}$	$5.0x10^{-3}$	$4.0x10^{-4}$	$9.3x10^{-5}$	ND	ND	ND	ND	ND	ND
Thorium-230	$1.0x10^{-2}$	$1.0x10^{-2}$	$6.0x10^{-4}$	$1.6x10^{-4}$	ND	ND	ND	ND	ND	ND
Uranium City (Fredette River/Prospector's Bay)										
Arsenic	$2.0x10^{-4}$	$1.5x10^{-4}$	0.13	$7.7x10^{-2}$	$7.3x10^{-3}$	$7.3x10^{-3}$	$2.0x10^{-2}$	$1.1x10^{-2}$	ND	ND
Cobalt	$1.0x10^{-4}$	$1.0x10^{-4}$	$1.3x10^{-2}$	$3.9x10^{-3}$	$2.0x10^{-2}$	$4.1x10^{-3}$	$1.7x10^{-2}$	$1.2x10^{-2}$	ND	ND
Copper	$2.0x10^{-4}$	$2.0x10^{-4}$	0.27	0.20	0.86	0.52	3.8	1.8	ND	ND
Lead	$1.0x10^{-4}$	$1.0x10^{-4}$	$2.0x10^{-3}$	$2.0x10^{-3}$	$2.9x10^{-3}$	$1.8x10^{-3}$	$5.0x10^{-3}$	$3.3x10^{-3}$	ND	ND
Molybdenum	$4.0x10^{-4}$	$4.0x10^{-4}$	$2.0x10^{-2}$	$2.0x10^{-2}$	$5.8x10^{-2}$	$2.5x10^{-2}$	$5.0x10^{-2}$	$2.4x10^{-2}$	ND	ND
Nickel	$1.0x10^{-4}$	$1.0x10^{-4}$	$1.0x10^{-2}$	$1.0x10^{-2}$	0.16	$8.2x10^{-2}$	$2.0x10^{-2}$	$1.3x10^{-2}$	ND	ND
Selenium	$1.0x10^{-4}$	$1.0x10^{-4}$	0.32	0.22	$7.3x10^{-3}$	$7.3x10^{-3}$	0.18	0.12	ND	ND
Uranium	$3.5x10^{-3}$	$2.4x10^{-3}$	$1.0x10^{-3}$	$1.0x10^{-3}$	$2.9x10^{-3}$	$1.6x10^{-3}$	$3.0x10^{-3}$	$1.4x10^{-3}$	ND	ND
Uranium-238 [(b)]	$4.3x10^{-2}$	$3.0x10^{-2}$	$1.2x10^{-5}$	$1.2x10^{-5}$	$3.6x10^{-5}$	$2.0x10^{-5}$	$3.7x10^{-5}$	$1.8x10^{-5}$	ND	ND
Lead-210	$2.0x10^{-2}$	$2.0x10^{-2}$	$1.0x10^{-3}$	$1.0x10^{-3}$	$2.9x10^{-3}$	$1.2x10^{-3}$	$2.0x10^{-3}$	$7.2x10^{-4}$	ND	ND
Polonium-210	$5.0x10^{-3}$	$5.0x10^{-3}$	$6.0x10^{-4}$	$2.4x10^{-4}$	$1.9x10^{-3}$	$5.8x10^{-4}$	$2.3x10^{-3}$	$5.9x10^{-4}$	ND	ND
Radium-226	$1.0x10^{-2}$	$9.0x10^{-3}$	$8.0x10^{-5}$	$6.1x10^{-5}$	$1.5x10^{-2}$	$1.8x10^{-3}$	$1.0x10^{-4}$	$7.4x10^{-5}$	ND	ND
Thorium-230	$1.0x10^{-2}$	$1.0x10^{-2}$	$2.0x10^{-4}$	$1.1x10^{-4}$	$2.9x10^{-4}$	$2.3x10^{-4}$	$2.0x10^{-4}$	$1.4x10^{-4}$	ND	ND

Table 4.1-1 Summary of Exposure Point Concentrations for Country Foods (Cont'd)

COPC	Water		Fish Flesh		Berries [(a)]		Moose Flesh		Caribou Flesh	
	Maximum	Mean	Maximum	Mean	Maximum	Mean	Maximum	Mean	Maximum	Mean
Wollaston Lake/Hatchet Lake										
Arsenic	$1.0x10^{-4}$	$1.0x10^{-4}$	0.24	$1.0x10^{-1}$	$7.3x10^{-3}$	$7.3x10^{-3}$	ND	ND	$2.0x10^{-2}$	$1.4x10^{-2}$
Cobalt	$1.0x10^{-4}$	$1.0x10^{-4}$	$5.0x10^{-3}$	$2.2x10^{-3}$	$2.9x10^{-3}$	$1.6x10^{-3}$	ND	ND	$8.0x10^{-3}$	$5.2x10^{-3}$
Copper	$2.0x10^{-4}$	$2.0x10^{-4}$	0.69	0.31	0.51	0.41	ND	ND	4.4	3.2
Lead	$1.0x10^{-4}$	$1.0x10^{-4}$	$2.0x10^{-3}$	$2.0x10^{-3}$	$5.8x10^{-3}$	$2.5x10^{-3}$	ND	ND	$5.1x10^{-2}$	$1.5x10^{-2}$
Molybdenum	$1.2x10^{-3}$	$1.2x10^{-3}$	$2.0x10^{-2}$	$2.0x10^{-2}$	$4.4x10^{-2}$	$2.0x10^{-2}$	ND	ND	$2.0x10^{-2}$	$2.0x10^{-2}$
Nickel	$1.0x10^{-4}$	$1.0x10^{-4}$	$2.0x10^{-2}$	$1.1x10^{-2}$	$9.9x10^{-2}$	$8.1x10^{-2}$	ND	ND	$2.0x10^{-2}$	$1.1x10^{-2}$
Selenium	$1.0x10^{-4}$	$1.0x10^{-4}$	0.68	0.33	$7.3x10^{-3}$	$7.3x10^{-3}$	ND	ND	0.19	0.16
Uranium	$1.0x10^{-4}$	$1.0x10^{-4}$	$1.0x10^{-3}$	$1.0x10^{-3}$	$2.9x10^{-3}$	$1.6x10^{-3}$	ND	ND	$1.0x10^{-3}$	$1.0x10^{-3}$
Uranium-238 [(b)]	$1.2x10^{-3}$	$1.2x10^{-3}$	$1.2x10^{-5}$	$1.2x10^{-5}$	$3.6x10^{-5}$	$2.0x10^{-5}$	ND	ND	$1.2x10^{-5}$	$1.2x10^{-5}$
Lead-210	$2.0x10^{-2}$	$2.0x10^{-2}$	$4.0x10^{-3}$	$1.5x10^{-3}$	$1.5x10^{-3}$	$7.3x10^{-4}$	ND	ND	$2.0x10^{-3}$	$1.1x10^{-3}$
Polonium-210	$5.0x10^{-3}$	$5.0x10^{-3}$	$1.0x10^{-3}$	$3.5x10^{-4}$	$5.8x10^{-4}$	$3.2x10^{-4}$	ND	ND	$1.9x10^{-2}$	$1.3x10^{-2}$
Radium-226	$9.0x10^{-3}$	$7.0x10^{-3}$	$2.0x10^{-3}$	$3.1x10^{-4}$	$8.8x10^{-4}$	$4.2x10^{-4}$	ND	ND	$1.0x10^{-4}$	$6.7x10^{-5}$
Thorium-230	$1.0x10^{-2}$	$1.0x10^{-2}$	$2.0x10^{-3}$	$3.9x10^{-4}$	$2.9x10^{-4}$	$2.3x10^{-4}$	ND	ND	$2.0x10^{-4}$	$1.1x10^{-4}$

Notes:

ND No data available.

(a) Dry weight concentrations of individual berry samples were converted to wet weight concentrations using the reported sample moisture contents (on average 85.4%).

(b) Uranium-238 concentrations were estimated from chemical uranium concentrations using a conversion factor of 12.347 Bq of uranium-238 per mg chemical uranium.

4.1.2 Non-Country Foods

For the general population, exposure to COPC from ingestion is from the consumption of supermarket foods and not country foods. As discussed previously, two typical Canadians were considered: a typical Canadian with a mixed diet and a typical Canadian with a high fish diet. The same EPCs for supermarket foods were used for both individuals, as well as for the Athabasca Basin residents to assess exposure not accounted for by country foods.

The EPCs for supermarket foods were developed from data from the TDS from Health Canada (2011). As part of the TDS, approximately 210 individual food items were purchased from supermarkets and were prepared and processed as they 'would be consumed' in the average household kitchen. The processed foods were then mixed to produce approximately 150 different food composites for chemical analysis, the results of which are available online at http://www.hc-sc.gc.ca/fn-an/surveill/total-diet/concentration/index-eng.php for trace elements from 1993-2007 (Health Canada 2011). The most recent data (from 2005-2007) were used preferentially for this evaluation, with the exception of molybdenum for which Health Canada only provides data from 1993-1999. Mean concentrations were calculated and selected as the EPCs for supermarket foods, with values below the MDL being set equal to the MDL value. There is very little information available for radionuclides in supermarket food and therefore the radionuclide dose from supermarket food was not calculated. This does not affect the calculations as incremental dose rates above baseline are evaluated for radionuclides. Intake rates are required to evaluate exposure from the food components, and thus EPCs were only developed for 112 of the 150 food composites (i.e., the foods for which intake rates were available, as discussed in Section 3.3.2). Due to the large list of food composites, the EPCs are presented in Annex A.

4.2 Exposure Equations

The methodology for estimating exposure to humans as a result of food and water ingestion is discussed in the following sections. Sample calculations are provided in Annex D. The exposure assessment considered the ingestion pathway using the characteristics provided in Section 3.3. The exposure equations used in the exposure assessment are provided below.

4.2.1 Non-Radiological Intake

Intake of non-radiological COPC (i.e. arsenic, cobalt, copper, lead, molybdenum, nickel, selenium and uranium) from ingestion of country and supermarket foods by humans was calculated using the following equation from Health Canada (2010a):

$$I_{foodx} = \frac{C_x \times IR_x \times AF_{ing} \times CF}{BW} \quad (4\text{-}1)$$

Where:

- I_{foodx} = Intake of COPC through the ingestion of 'x' food/water [mg/(kg-d)]
- C_x = Concentration of COPC in 'x' food/water [µg/(g ww)]
- IR_x = Ingestion rate of 'x' food/water [(g ww)/d]
- AF_{ing} = Ingestion absorption factor [-] {assumed to be 1}
- BW = Body weight [kg]
- CF = Conversion factor 1.0×10^{-3} [mg/µg]

4.2.2 Radiological Dose

For radiological COPC (i.e., lead-210, polonium-210, radium-226, thorium-230 and uranium-238), dose coefficients (DCs) are used to estimate radiological dose (in µSv/y) from ingestion using Equation 4-2:

$$D_{foodx} = C_x \times IR_x \times DC \times AF_{ing} \times CF \quad (4\text{-}2)$$

Where:

- D_{foodx} = Dose of COPC through the ingestion of 'x' food/water [µSv/y]
- C_x = Concentration of COPC in 'x' food/water [Bq/(g ww)]
- IR_x = Ingestion rate of 'x' food/water [(g ww)/d]
- DC = Dose coefficient [µSv/Bq]
- AF_{ing} = Ingestion absorption factor [-] {assumed to be 1}
- CF = Conversion factor 365 [d/y]

The DCs used in the assessment are shown in Table 4.2-1. Ingestion DCs depend on the chemical form of the radionuclide and the consequent gut-to-blood transfer factor (f_1). The values selected reflect the International Commission on Radiological Protection (ICRP) Publication 72 (1996) recommended f_1 values and DCs for members of the public.

Table 4.2-1 ICRP Ingestion Dose Coefficients used for Humans

COPC	Gut-to-Blood Transfer Factor (f_1)	Ingestion Dose Coefficient	
		Child [(a)]	Adult [(b)]
Lead-210	0.2	2.2	0.69
Polonium-210	0.5	4.4	1.2
Radium-226	0.2	0.62	0.28
Thorium-230	5.0×10^{-4}	0.31	0.21
Uranium-238	0.02	0.185	0.0995

Notes: Values are in units of microSieverts per Becquerel (µSv/Bq) and are from ICRP 72 (1996).
(a) Default values recommended for a 5-year old child.
(b) Default values recommended for adult members of the public.

5.0 TOXICITY ASSESSMENT

The evaluation of adverse effects in humans to COPC is conventionally assessed against toxicological reference values (TRVs). Toxicity is the potential of a constituent to cause some type of damage, either permanent or temporary, to the structure or functioning of any part of the body. The toxicity depends on the amount of the constituent taken into the body (generally termed the intake) and the length of time a person is exposed. Every constituent has a specific intake and duration of exposure that is necessary to produce a toxic effect in humans. Toxicity assessments generally involve the evaluation of scientific studies, based either on laboratory animal tests or on workplace exposure investigations, by a number of experienced scientists in a wide range of scientific disciplines in order to determine the maximum dose that a human can be exposed to without having an adverse health effect. Levels that are likely to result in no appreciable risks or no measurable adverse effects are selected as the TRV. It should be noted that exposure above a TRV does not mean that an effect will occur, but instead means that there is an increased risk of an adverse effect occurring.

5.1 NON-RADIONUCLIDES

With the exception of arsenic, all of the non-radioactive COPC included in the assessment are non-carcinogenic, indicating that there are no human or animal data to indicate that they cause cancer. For non-carcinogens, protective biological mechanisms must be overcome before an adverse effect from exposure to the chemical is manifested. For this reason, scientists generally agree that there is a level (“threshold”) below which no adverse effects would be measurable or expected to occur. Carcinogenesis is generally assumed to be a "non-threshold" type phenomenon whereby it is assumed that any level of exposure to a carcinogen poses a finite probability of generating a response cancer.

These TRVs are generally derived for sensitive individuals in the public (i.e. people with compromised health such as the elderly or infants) using the most sensitive endpoint available. Additionally, TRVs involve the incorporation of “safety factors” by regulatory agencies to provide additional protection for members of the public. There are several regulatory sources that report TRVs. Some of the most used sources include Health Canada, the U.S. EPA Integrated Risk Information System (IRIS) database (U.S. EPA 2012), the California Environmental Protection Agency (CalEPA) and the Agency for Toxic Substances and Disease Registry (ATSDR). For this assessment, TRVs provided by Health Canada (2010b), were preferentially selected for evaluation of the potential adverse effects on humans. Details on the derivation of these values were provided by Health Canada (Health Canada 2009) and are summarized briefly in this section.

Table 5.1-1 provides a summary of the selected TRVs. The value, toxicological endpoint and reference for each TRV are provided in the table. More details on the TRVs are presented in Annex C.

Table 5.1-1 Summary of Toxicological Reference Values for Non-Radiological COPC

COPC	Oral Toxicological Reference Value		Endpoint
	TRV_o $(mg/(kg\text{-}d))^{-1}$	Reference	
Arsenic	0.003	JECFA 2010	Lung cancer
Cobalt	0.01	ATSDR (updated 2004)	Haematological effects (polycythemia)
Copper	0.11 (child) 0.14 (adult)	HC 2010b; 2009	Gastrointestinal effects
Lead	0.0036	HC 2010b; 2009	Increased concentration of lead in blood
Molybdenum	0.023 (child) 0.028 (adult)	HC 2010b; 2009	Reproductive effects
Nickel	0.011	HC 2010b; 2009	Perinatal lethality
Selenium	0.00063 (child) 0.00057 (adult)	HC 2010b; 2009	Selenosis
Uranium	$6.0x10^{-4}$	HC 2010b; 2009	Nephrotoxicity, hepatotoxicity

Notes: TRV – toxicity reference value; HC - Health Canada.

5.2 RADIONUCLIDES

Assessment of radiation exposures to members of the public is commonly based on estimation of the incremental (above-background) effects of the project or site. Such assessments consider the radiation dose received from direct exposure to gamma radiation as well as the dose received from the ingestion of radionuclides. The human receptor model converts radionuclide intake of all COPC (lead-210, polonium-210, radium-226, thorium-230 and uranium-238) by the humans from the ingestion pathway into a radiation dose using the DCs discussed in Section 4.2.2, and the incremental doses are then compared to acceptable dose limits. Potential effects from radiation were assessed against an incremental dose limit of 1000 µSv/y (1 mSv/y) recommended by the CNSC for the protection of members of the public.

In this assessment, Camsell Portage theoretically could be considered as background for calculation of incremental doses. The levels of radionuclides at Camsell Portage are often similar to or below those from the other community study areas. As caribou is a significant component of the country food diet in Athabasca Basin communities according to the Hatchet Lake survey, a non-parametric Kruskal-Wallis test was performed on radionuclide concentrations in barren-ground caribou flesh to test if levels from other community study areas (Black Lake, Fond-du- Lac, Stony Rapids and Wollaston Lake/Hatchet Lake) are above those at Camsell Portage. The test concluded that the levels of lead-210, polonium-210 and uranium-238 from the four community study areas are either similar or below those at Camsell Portage and thus, the incremental doses associated with these 3 radionuclides in caribou are essentially zero.

6.0 RISK CHARACTERIZATION

Risk characterization involves the integration of the information from the exposure assessment and the toxicity assessment. For the Athabasca Basin residents, both non-radionuclides and radionuclides were evaluated.

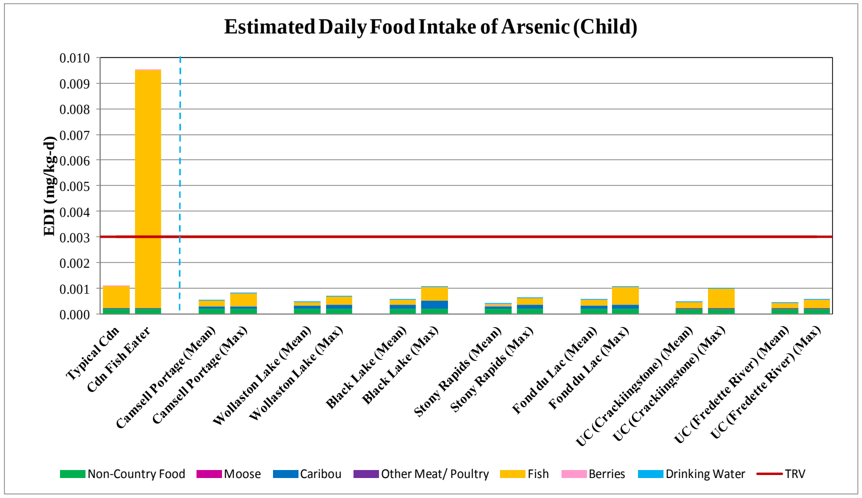
6.1 NON-RADIOLOGICAL EFFECTS

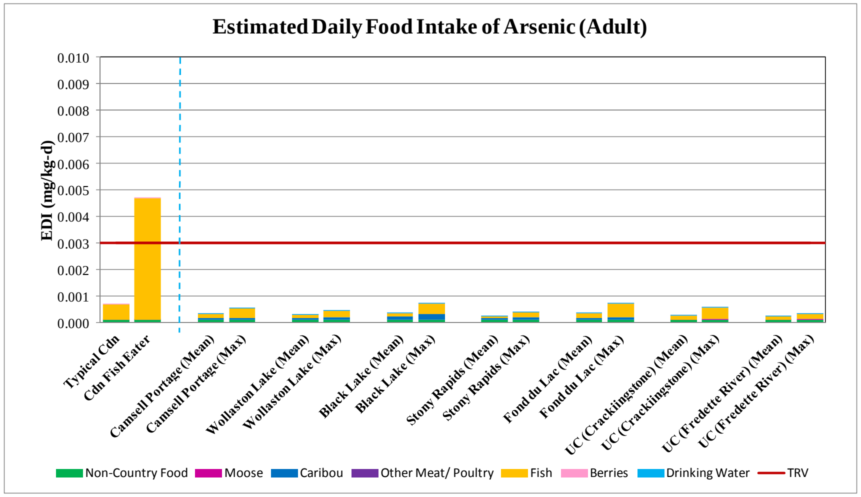
The estimated daily intakes (EDIs) of non-radiological COPC from food consumption are shown graphically in Figure 6.1-1 to Figure 6.1-4 for the two typical Canadian receptors and the seven study areas. Also shown are the TRVs for each COPC (red line), as presented in Section 5.1. The breakdown by pathways is shown in Annex B, while the detailed breakdown of non-country (supermarket) foods is provided in Annex A.

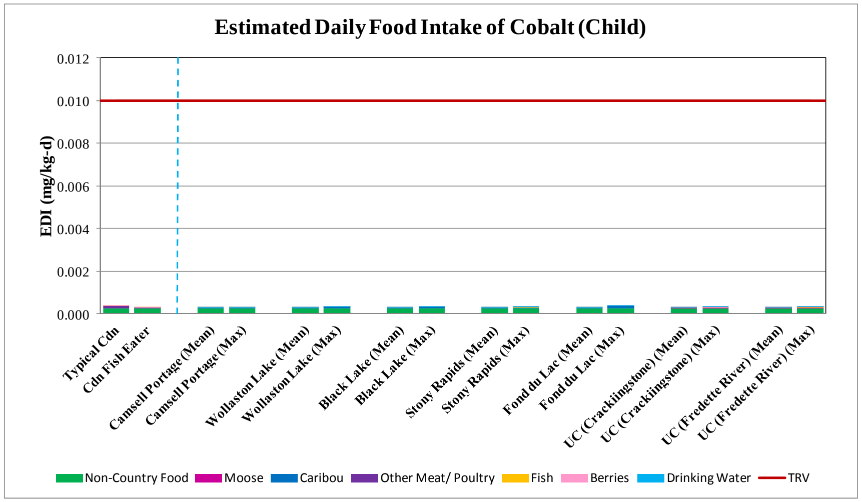
From the figures, it can be seen that all of the EDIs for all of the non-radiological COPC associated with food consumption at all the communities monitored by the EARMP are below the toxicity values. The typical Canadian high fish eater has an EDI for arsenic that is above the toxicity value. Total EDIs of selenium for the child receptor in all seven study areas are close to the TRV with about half of the exposure associated with supermarket foods. Fish is the next major contributor for the two Uranium City areas, and for the other five study areas, intake of selenium associated with ingestion of caribou flesh is the highest among all the country foods.

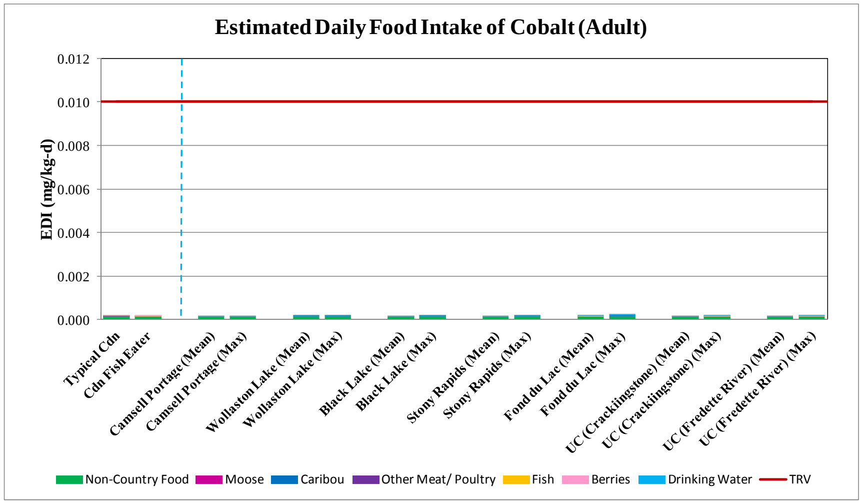
In summary, the results show that from a non-radiological perspective, adverse health effects are not expected for Athabasca Basin residents from the consumption of country foods.

Figure 6.1-1 Estimated Daily Intakes of Non-Radiological COPC from Food Consumption – Arsenic and Cobalt



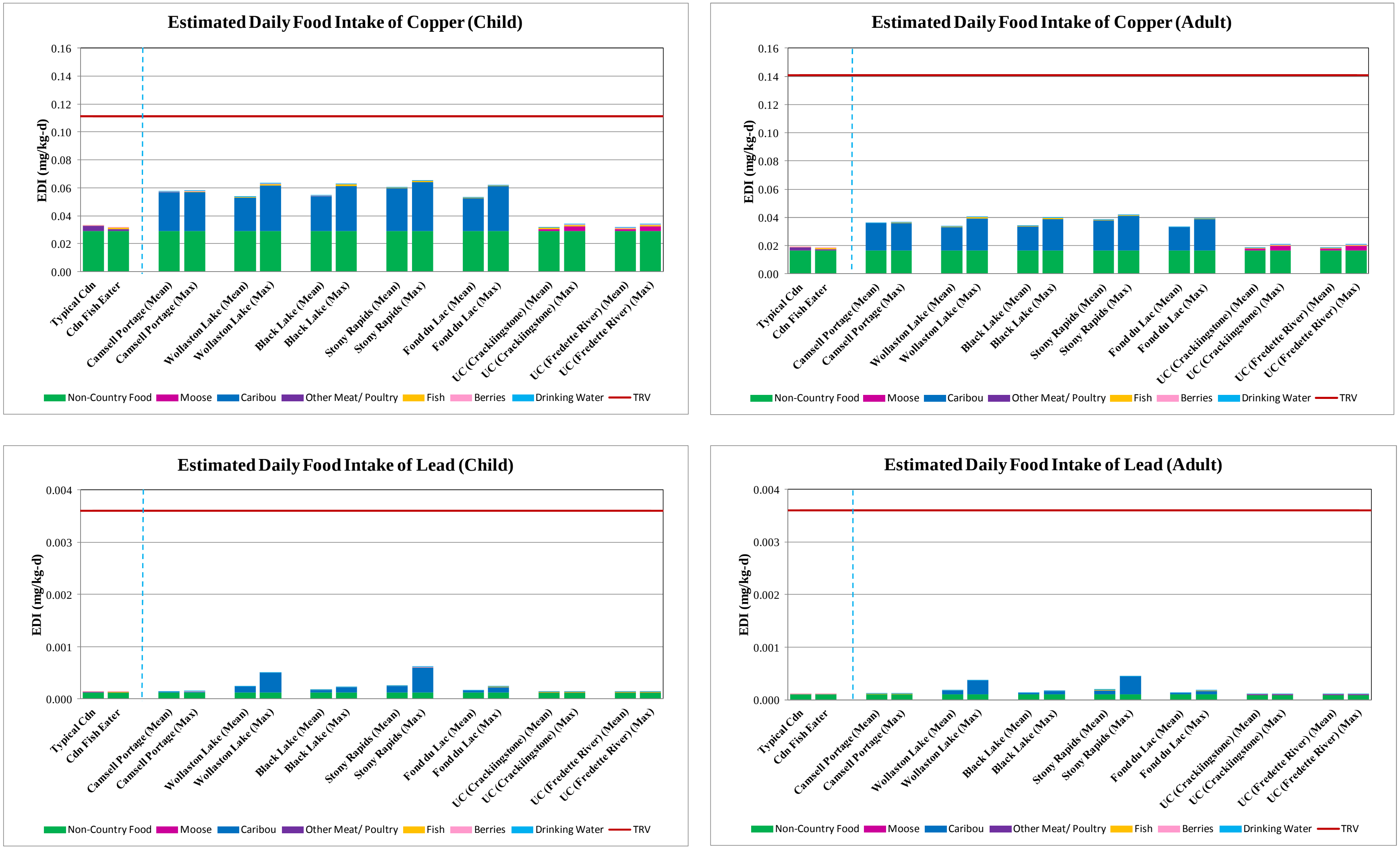






TRV Toxicological Reference Value (see Section 5.1)

Figure 6.1-2 Estimated Daily Intakes of Non-Radiological COPC from Food Consumption – Copper and Lead



Note: TRV - Toxicological Reference Value (see Section 5.1)

Figure 6.1-3 Estimated Daily Intakes of Non-Radiological COPC from Food Consumption - Molybdenum and Nickel

Note: TRVToxicological Reference Value (see Section 5.1)

Figure 6.1-4 Estimated Daily Intakes of Non-Radiological COPC from Food Consumption - Selenium and Uranium

<u>Note:</u> TRV - Toxicological Reference Value (see Section 5.1)

6.2 RADIOLOGICAL EFFECTS

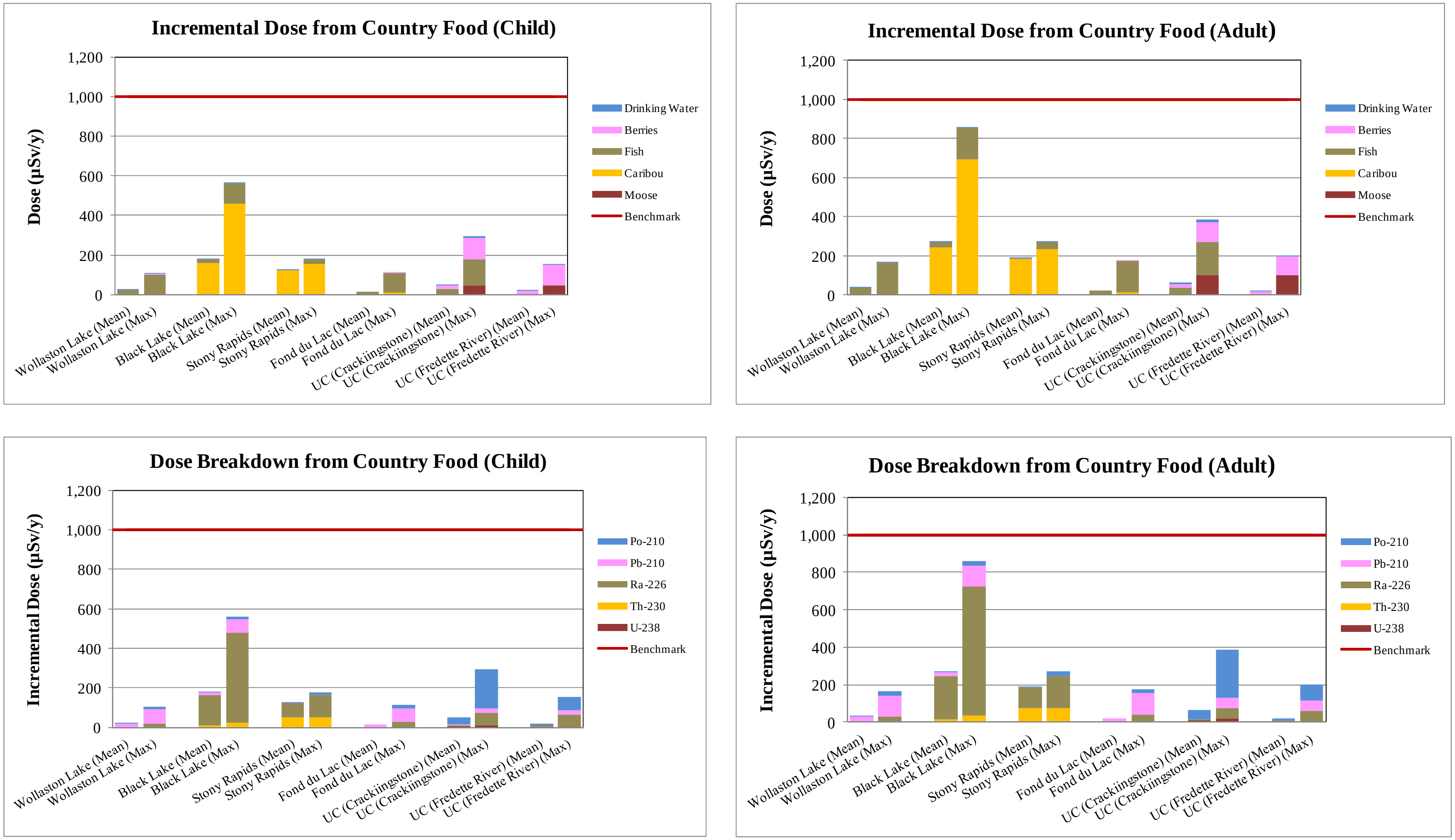
As discussed in Section 4.2.2, dose coefficients (DCs) were used to estimate the doses to humans as a result of ingestion. As discussed in Section 5.2, incremental doses (i.e., excludes the contribution from background) were calculated for each exposure scenario and compared to the incremental dose limit of 1000 µSv/y.

Radiological dose was not assessed for supermarket foods (and hence the typical Canadian receptors) since data on concentrations of radionuclides in supermarket foods are no available and considered to be representative of baseline. Incremental doses were also not calculated for Camsell Portage as it was considered to represent background and hence, the incremental doses for all food items in Camsell Portage were zero.

Figure 6.2-1 shows the results of the human health radiological dose calculations for the child and adult residents. The results are presented as a breakdown of the dose by country food item and also by radionuclide. From these figures, it can be seen that the incremental radiological doses for all areas are below the limit of 1000 µSv/y. Detailed results are provided in Annex B.

The maximum incremental doses are associated with an adult in Black Lake and are approximately 850 µSv/y. Caribou is the major contributor to the total dose accounting for about 600 µSv/y. Radium-226 in caribou flesh accounts for most of the dose. Since the doses from country foods in all 7 study areas are below the limit of 1000 µSv/y, it can be concluded that consuming country foods in all 7 study areas containing radionuclides is not a cause for concern.

Figure 6.2-1 Radiological Doses from Country Food Consumption



6.3 UNCERTAINTIES

There are areas of uncertainty in the risk evaluation due to the fact that assumptions have to be made either due to data gaps, or in the generalization of receptor characteristics. To be able to place a level of confidence in the results, an accounting of the uncertainty, the magnitude and type of which are important in determining the significance of the results, was completed. In recognition of these uncertainties, conservative assumptions were used throughout the assessment to ensure that the potential for an adverse effect would not be underestimated. The major assumptions are outlined below.

The COPC concentrations used in the assessment were solely based on measured data from a single two-year period. Due to the limited data, the maximum measured concentrations in country foods from this study were used to assess exposure to residents. This approach likely overestimates exposures, since residents would not be expected to consume all foods with the maximum concentrations at every meal. Thus, a more realistic exposure scenario was also evaluated whereby mean values of the measured concentrations were used to assess exposure from country food consumption. In deriving the EPCs, several measurements were below the MDLs and were subsequently set equal to the detection limit. This is a conservative measure and likely leads to an overestimate of exposure, especially for those country foods for which all measurements were below the MDL.

It is not feasible to evaluate exposure from every single food item consumed, and the 2-year EARMP Study (CanNorth 2013) only collected data for those food items most commonly consumed by residents in the study area. The use of caribou (moose for Uranium City) data to represent all mammals and birds in Black Lake, Fond-du-Lac, Stony Rapids, Camsell Portage and Wollaston Lake/Hatchet Lake leads to uncertainty in the exposure, since ground birds, water birds, beaver and other small mammals have very different diets and exposure characteristics from caribou and moose. According to the Hatchet Lake Dietary Survey as shown in Table 2.2-1, the mean annual consumption rates of birds and other mammals contribute minimally to the total annual consumption of meat and poultry as more than 97% is contributed from caribou alone. However, as seen in Table 2.2-2, moose only accounts for around 50% of annual consumption rates of meat and poultry, and thus the use of moose data to represent all intakes from meat and poultry in the two Uranium City communities leads to uncertainty in the exposure estimates.

The data base for each country food at each location was limited (zero to five samples were collected in each year). This may result in either an overestimate or underestimate of the exposure; however, since the evaluation was conducted using both mean and maximum concentrations, the overall exposure and results are not expected to be affected.

Toxicological Reference Values (TRVs) are obtained from reputable sources (e.g., Health Canada); nonetheless, they are always associated with uncertainty due to the extrapolation of testing on lab species (e.g., rats) to field conditions as well as a range of receptors. Additionally, toxicity information for a COPC was used regardless of its form in the test procedure, even though this may not be the same form used in the assessment (e.g., an oxide form compared to a more soluble form). It is difficult to determine the effect of these assumptions.

Another area of uncertainty is the use of a single value for toxicity. The TRVs represent an exposure day-after-day for a lifetime. The use of an upper bound for the toxicity values ensures that the risk to humans is not underestimated. It is currently not possible or practical to develop approaches to evaluate the validity of the TRV assumptions on the overall assessment. As improvements occur in toxicological/human health research and assessments, the uncertainties may be reduced.

Another area of uncertainty in the evaluation is the effect of multiple COPC. When dealing with toxic chemicals, there is potential interaction with other chemicals that may be found at the same location. It is well established that synergism, potentiation, antagonism or additivity of toxic effects occurs in the environment. As none of the COPC have the same toxicological endpoints, this is not considered to substantially affect the assessment.

Table 6.3-1 provides a summary of the uncertainties discussed above. It can be seen from the table that, in general, the uncertainties lead to an over-estimate of exposures and thus the conclusions of the evaluation would remain unchanged.

Table 6.3-1 Summary of Uncertainties in the Risk Evaluation

Uncertainty	Likely Leads to Overestimate	Either Overestimate or Underestimate
Use of maximum concentrations to characterize exposures	X	
Use of MDL for concentrations below detection limit	X	
Limited data set		X
Inclusion of select country foods		X
Single value for toxicity for receptors	X	
Synergism, potentiation, antagonism, additivity of toxic effects		X

7.0 CONCLUSIONS

Many communities within the Athabasca Basin in northern Saskatchewan occur downstream of uranium mining and milling operations. In 2011 and 2012, a community program was completed to monitor the safety of traditionally harvested country foods by collecting and testing water, fish, berry, and mammal chemistry from six Athabasca Basin communities: Camsell Portage, Uranium City (includes two community study areas), Fond-du-Lac, Stony Rapids, Black Lake, and Wollaston Lake/Hatchet Lake. This report presented the results of an evaluation that was conducted to assess exposure to the residents of each community mentioned above to constituents measured in country foods.

The results of the evaluation indicated that the non-radiological exposures to residents as a result of country food consumption are similar to those to members of the general Canadian population and are below values that are considered to be protective of health effects and therefore do not represent a cause for concern. Similarly, the radiological doses are below the public dose limit and as such are not a concern from a human health perspective.

Overall, the results indicate that traditional harvesting of country foods does not present health risks to Athabasca Basin residents.

8.0 REFERENCES

Askergren A and M. Mellgren 1975. *Changes in the Nasal Mucosa after Exposure to Copper Salt Dust. A Preliminary Report*. Scand J Work Environ Health 1:45-49.

ATSDR (Agency for Toxic Substances and Disease Registry) 2011. *Draft Toxicological Profile for Uranium*. U.S. Department of Health and Human Services, Public Health Service, Atlanta, Georgia. May.

ATSDR (Agency for Toxic Substances and Disease Registry) 2004. *Toxicological Profile for Copper*. U.S. Department of Health and Human Services, Public Health Service, Atlanta, Georgia. September.

CanNorth (Canada North Environmental Services) 2013. *Eastern Athabasca Regional Monitoring Program 2012 Report*. Draft report prepared for the Boreal Watershed Initiative. August.

CanNorth (Canada North Environmental Services) 2011. *Country Foods Study Uranium City, Saskatchewan Year 1 (And Former Beaverlodge Properties*). Final report (revision 2) prepared for Cameco Corporation. July.

CanNorth (Canada North Environmental Services) 2000. *Hatchet Lake Dietary Study*. Final report prepared for the Atomic Energy Control Board. March.

CCME (Canadian Council of Ministers of the Environment) 2009. *Canadian Soil Quality Guidelines – Selenium – Environmental and Human Health Effects*. Scientific Criteria Document, PN 1438.

Fungwe, T.V., F. Buddingh, D.S. Demick, C.D. Lox, M.T. Yang, and S.P. Yang 1990. *The Role of Dietary Molybdenum on Estrous Activity, Fertility, Reproduction and Molybdenum and Copper Enzyme Activities of Female Rats*. Nutr. Res. 10:515–524. {cited in Health Canada 2009b}

Gamberg, M. 2011. Personal communication via e-mail on July 12.

Health Canada 2011. *Total Diet Study – Concentration of Contaminants & Other Chemicals in Food Composites*. Accessed April 30, 2012 from http://www.hc-sc.gc.ca/fn-an/surveill/total-diet/concentration/index-eng.php.

Health Canada 2010a. *Federal Contaminated Site Risk Assessment in Canada. Part I: Guidance on Human Health Preliminary Quantitative Risk Assessment (PQRA).* Version 2.0 September. Revised 2012.

Health Canada 2010b. *Federal Contaminated Site Risk Assessment in Canada. Part II: Health Canada Toxicological Reference Values (TRVs) and Chemical-Specific Factors.* Version 2.0, September.

Health Canada 2009. *Federal Contaminated Site Risk Assessment in Canada. Part IV: Spreadsheet Tool for Human Health Preliminary Quantitative Risk Assessment (PQRA).* March 16.

Health Canada 1994. *Human Health Risk Assessment for Priority Substances*. Cat. No. En40-215. Ottawa.

Health Canada 1992. *Guidelines for Canadian Drinking Water Quality - Supporting Documentation for Lead.* Ottawa, ON. April. Edited July 1992. Last accessed March 25, 2011 at http://www.hc-sc.gc.ca/ewh-semt/alt_formats/hecs-sesc/pdf/pubs/water-eau/lead/lead-plomb-eng.pdf.

ICRP (International Commission on Radiological Protection) 1996. *Age-dependent Doses to Members of the Public from Intake of Radionuclides: Parts Compilation of Ingestion and Inhalation Dose Coefficients.* ICRP Publication 72. Vol. 26, No. 1, Elsevier Science Ltd., Oxford.

Richardson, G.M. 1997. *Compendium of Canadian Human Exposure Factors for Risk Assessment*. O'Connor Associates Environmental Inc.

SENES Consultants (SENES) 2013. *Pathways Assessment Rabbit Lake North Pit Expansion Project.* Final report prepared for Cameco Corporation. September.

SENES Consultants (SENES) 2012a. *Environmental Effects and Human Health and Ecological Risk Assessment of the Breaching the B-Zone Pit Lake Dike at Rabbit Lake Operation.* Draft report prepared for Cameco Corporation. July.

SENES Consultants (SENES) 2012b. *Risk Evaluation for Uranium City Country Foods Study*. Final report prepared for Cameco Corporation. June.

Shearer, R.R., and D.M. Hadjimarkos 1975. *Geographic Distribution of Selenium in Human Milk.* Arch. Environ. Health 30: 230–233. {cited in Health Canada 2009b}

U.S. EPA (United States Environmental Protection Agency) 2012 (various updates). *Integrated Risk Information System - IRIS*. On-line database. Last accessed May 2012 at http://www.epa.gov/iris/.

WHO (World Health Organization) 1987. *Evaluation of Certain Food Additives and Contaminants (Thirtieth report of the Joint FAO/WHO Expert Committee on Food Additives)*. WHO Technical Report Series, No. 751. Last accessed May 2011 at http://whqlibdoc.who.int/trs/WHO_TRS_751.pdf.

Yang, G.-Q. and Zhou, R.-H., 1994. *Further Observations on the Human Maximum Safe Dietary Selenium Intake in a Seleniferous Area of China*. J. Trace Elem. Electrolytes Hlth. Dis 8:159–165.

ANNEX A

DETAILED NON-COUNTRY FOOD INTAKE RATES, CONCENTRATIONS AND ESTIMATED DAILY INTAKES

Table A.1 Country and Non-Country Food Intake Rates Used in the Assessment

Food Group	Composite Food Item [(a)]	Mean Composite Food Intake Rate (g/d)					
		Child			Adult		
		TC	TCFE	UCR	TC	TCFE	UCR
Country Foods and Comparable Supermarket Foods							
Meat / Snowshoe Hare & Moose	Beef, Steak	7.37	2.13	6.44	14	7.33	14.0
	Beef, Roast And Stewing	12.21	3.53		27	11.38	
	Beef, Hamburg	19.23	5.56		21.61	9.11	
	Pork, Fresh	11.98	3.46		22.73	9.58	
	Pork, Cured	3.96	1.14		7.78	3.28	
	Veal	0.33	0.1		2.16	0.91	
	Lamb	1.8	0.52		0.78	0.33	
	Cold Cuts And Luncheon Meats	7.85	2.27		9.27	3.91	
	Luncheon Meats, Canned	0.97	0.28		2.1	0.89	
	Soups, Meat, Canned	42.77	12.36		54.76	23.09	
	Wieners	6.35	1.84		2.41	1.02	
	Organ Meats/Moose Organs	1.85	1.85	1.85	2.81	2.81	2.81
	Moose Meat	0	0	15.5	0	0	33.8
Poultry / Spruce Grouse	Chicken and Turkey/Spruce Grouse	16.72	16.72	9.23	21.17	21.17	20.1
Fish/Lake Trout	Fish, Marine, Fresh Or Frozen	4.81	51.72	81.8	6.59	52.82	106
	Fish, Fresh Water, Fresh Or Frozen	1.08	11.61		1.26	10.1	
	Fish, Canned	1.84	19.78		4.07	32.62	
	Shellfish, Fresh Or Frozen	0.64	6.88		1.93	15.47	
Berries	Strawberries	7.56	7.56	19.4	7.75	7.75	18.0
	Blueberries	1	1		1.99	1.99	
Medicinal Plants	Labrador Tea	0	0	0	0	0	0.56
Supermarket Foods not Considered Country Foods							
Alcoholic Drinks	Alcoholic Drinks, Wine	0.73			23.54		
	Alcoholic Drinks, Beer	1.93			121.05		
Cereals and Grains	Bread, White	76.8			67.45		
	Bread, Whole Wheat And Rye	6.47			19.76		
	Rolls And Biscuits	11.63			10		
	Flour, Wheat	10.38			6.93		
	Cake	25.62			20.37		
	Cookies	26			15.58		
	Danish And Donuts	5.39			5.49		
	Crackers	5.14			3.45		
	Pancakes	2.93			2.04		
	Cereals, Cooked Wheat	5.72			6.53		
	Cereals, Oatmeal	19.95			16.44		
	Cereals, Corn	5.37			1.82		
	Cereals, Wheat And Bran	3.37			2.31		
	Rice	13.98			15.14		

Table A.1 Country and Non-Country Food Intake Rates Used in the Assessment (Cont'd)

<table>
<tr><th rowspan="3">Food Group</th><th rowspan="3">Composite Food Item [a]</th><th colspan="6">Mean Composite Food Intake Rate (g/d)</th></tr>
<tr><th colspan="3">Child</th><th colspan="3">Adult</th></tr>
<tr><th>TC</th><th>TCFE</th><th>UCR</th><th>TC</th><th>TCFE</th><th>UCR</th></tr>
<tr><td rowspan="6">Cereals and Grains (Cont'd)</td><td>Pie, Apple</td><td colspan="3">3.87</td><td colspan="3">9.25</td></tr>
<tr><td>Pie, Other</td><td colspan="3">10.35</td><td colspan="3">11.7</td></tr>
<tr><td>Pizza</td><td colspan="3">3.09</td><td colspan="3">1.74</td></tr>
<tr><td>Pasta</td><td colspan="3">36.9</td><td colspan="3">15.81</td></tr>
<tr><td>Pasta, Ordinary</td><td colspan="3">26.24</td><td colspan="3">13.47</td></tr>
<tr><td>Muffins</td><td colspan="3">0.53</td><td colspan="3">1.56</td></tr>
<tr><td>Eggs</td><td>Eggs</td><td colspan="3">21.05</td><td colspan="3">32.29</td></tr>
<tr><td rowspan="3">Fats, Nuts and Oils</td><td>Cooking Fats & Salad Oils</td><td colspan="3">2.21</td><td colspan="3">4.95</td></tr>
<tr><td>Margarine</td><td colspan="3">6.13</td><td colspan="3">6.23</td></tr>
<tr><td>Peanut Butter & Peanuts</td><td colspan="3">6.08</td><td colspan="3">3.52</td></tr>
<tr><td rowspan="11">Milk and Dairy</td><td>Milk, Whole</td><td colspan="3">323.16</td><td colspan="3">138.24</td></tr>
<tr><td>Milk, 2%</td><td colspan="3">185.61</td><td colspan="3">60.64</td></tr>
<tr><td>Milk, Skim</td><td colspan="3">55.57</td><td colspan="3">30.83</td></tr>
<tr><td>Evaporated Milk, Canned</td><td colspan="3">6.54</td><td colspan="3">11.46</td></tr>
<tr><td>Cream, 10-12% Butter Fat</td><td colspan="3">2.83</td><td colspan="3">10.19</td></tr>
<tr><td>Ice Cream</td><td colspan="3">25.59</td><td colspan="3">12.8</td></tr>
<tr><td>Yogurt</td><td colspan="3">0.48</td><td colspan="3">1.54</td></tr>
<tr><td>Cheese</td><td colspan="3">3.18</td><td colspan="3">8.33</td></tr>
<tr><td>Cheese, Cottage</td><td colspan="3">1.33</td><td colspan="3">5.35</td></tr>
<tr><td>Cheese, Processed Cheddar</td><td colspan="3">4.92</td><td colspan="3">3.81</td></tr>
<tr><td>Butter</td><td colspan="3">12.94</td><td colspan="3">13.61</td></tr>
<tr><td rowspan="3">Non-Alcoholic Drinks</td><td>Coffee</td><td colspan="3">11.99</td><td colspan="3">347.77</td></tr>
<tr><td>Tea</td><td colspan="3">22.2</td><td colspan="3">354.13</td></tr>
<tr><td>Soft Drinks</td><td colspan="3">193.57</td><td colspan="3">109.91</td></tr>
<tr><td rowspan="16">Other Fruits and Juices</td><td>Citrus Fruit [b]</td><td colspan="3">24.87</td><td colspan="3">33.41</td></tr>
<tr><td>Citrus Juice</td><td colspan="3">22.54</td><td colspan="3">35.01</td></tr>
<tr><td>Citrus Juice, Canned</td><td colspan="3">12.96</td><td colspan="3">13.38</td></tr>
<tr><td>Apples, Raw</td><td colspan="3">41.38</td><td colspan="3">20.52</td></tr>
<tr><td>Apple Juice, Canned, Unsweetened</td><td colspan="3">26.66</td><td colspan="3">13.3</td></tr>
<tr><td>Applesauce, Canned, Sweetened</td><td colspan="3">8.81</td><td colspan="3">5.97</td></tr>
<tr><td>Bananas</td><td colspan="3">21.42</td><td colspan="3">12.82</td></tr>
<tr><td>Grapes</td><td colspan="3">1.52</td><td colspan="3">2.94</td></tr>
<tr><td>Grape Juice, Bottled</td><td colspan="3">2.52</td><td colspan="3">2.15</td></tr>
<tr><td>Peaches</td><td colspan="3">10.27</td><td colspan="3">10.17</td></tr>
<tr><td>Pears</td><td colspan="3">6.7</td><td colspan="3">7.73</td></tr>
<tr><td>Plums, Dried Prunes & Canned Plums</td><td colspan="3">2.72</td><td colspan="3">4.74</td></tr>
<tr><td>Cherries</td><td colspan="3">1.15</td><td colspan="3">1.64</td></tr>
<tr><td>Melons</td><td colspan="3">7.39</td><td colspan="3">9.53</td></tr>
<tr><td>Pineapple</td><td colspan="3">1.68</td><td colspan="3">2.22</td></tr>
<tr><td>Raisins</td><td colspan="3">0.53</td><td colspan="3">0.62</td></tr>
</table>

Table A.1 Country and Non-Country Food Intake Rates Used in the Assessment (Cont'd)

Food Group	Composite Food Item [a]	Mean Composite Food Intake Rate (g/d)					
		Child			Adult		
		TC	TCFE	UCR	TC	TCFE	UCR
Other Vegetables	Soups, Other [c]	31.63			37.43		
	Soups, Dehydrated	7.98			7.65		
	Corn	17.6			8.16		
	Cabbage	5.05			10.26		
	Celery	2.43			8.34		
	Peppers	0.27			1.28		
	Lettuce	4.49			12.7		
	Cauliflower	0.11			1.46		
	Broccoli	1.34			2.19		
	Beans	4.27			6.82		
	Peas	6.09			9.34		
	Tomatoes	7.47			17.9		
	Tomato Juice, Canned	4.52			10.02		
	Tomatoes/sauce, Canned & Ketchup	7.15			6.4		
	Mushrooms, Canned	0.86			1.63		
	Cucumbers	8.27			11.37		
	Baked Beans	7.27			8.12		
Root Vegetables	Potatoes [d]	82.42			92.5		
	Potatoes, French Fried, Frozen	22.78			20.68		
	Potatoes, Chips	5.18			1.31		
	Carrots	10.34			14.19		
	Onion	2.45			6.15		
	Rutabagas Or Turnip	3.51			5.69		
	Beets	1.26			1.8		
Sugar and Sweets	Sugar, White	11.66			19.2		
	Syrup	6.45			4.94		
	Jams	6.76			6.14		
	Honey	2.02			2.17		
	Puddings	8.85			8.78		
	Candy, Chocolate Bars	5.45			3.58		
	Candy, Others	8.47			4.58		
	Gelatin Dessert	7.49			7.8		

Notes: Mean composite food consumption rates from Health Canada 1994 for the typical Canadian; adjusted for the fish eater using fish intake rates from Richardson 1997.

TC Typical Canadian; intake rates from Health Canada 1994.

TCFE Typical Canadian – Fish Eater; intake rates from Health Canada 1994, adjusted for increased fish intake rate from Richardson 1997.

UCR Uranium City Resident; intake rates for country foods from CanNorth 2011a and for supermarket foods from Health Canada 1994.

(a) Food groups developed by Health Canada 1994.

(b) Includes raw and canned citrus fruits.

(c) Includes canned pea and canned tomato soups.

(d) Includes raw, baked and boiled (skins on and skins off) potatoes.

Table A.2 Mean Exposure Point Concentrations of Non-Radiological COPC in Non-Country Foods

Food Group [(a)]	Food Composite Item	Mean Food Concentration (µg/g ww)							
		Arsenic	Cobalt	Copper	Lead	Selenium	Molybdenum	Nickel	Uranium
Supermarket Foods Comparable to Country Foods									
Meat	Beef, Steak	$5.4x10^{-3}$	$3.5x10^{-3}$	1.1	$3.0x10^{-3}$	0.28	$1.6x10^{-2}$	0.46	$9.7x10^{-5}$
	Beef, Roast And Stewing	$5.4x10^{-3}$	$4.0x10^{-3}$	1.2	$3.8x10^{-3}$	0.36	$2.0x10^{-2}$	0.57	$2.5x10^{-4}$
	Beef, Hamburg	$5.5x10^{-3}$	0.14	0.92	$3.6x10^{-3}$	0.29	$2.0x10^{-2}$	1.1	$1.9x10^{-4}$
	Pork, Fresh	$4.0x10^{-3}$	$1.4x10^{-3}$	0.92	$1.7x10^{-3}$	0.48	$2.4x10^{-2}$	0.18	$3.4x10^{-4}$
	Pork, Cured	$9.6x10^{-3}$	$7.2x10^{-3}$	0.89	$6.0x10^{-3}$	0.47	$3.2x10^{-2}$	0.41	$1.9x10^{-3}$
	Veal	$3.6x10^{-3}$	$6.7x10^{-3}$	1.1	$3.8x10^{-3}$	0.27	$8.4x10^{-3}$	$7.4x10^{-2}$	$3.9x10^{-4}$
	Lamb	$3.1x10^{-3}$	$4.6x10^{-3}$	1.4	$2.8x10^{-3}$	0.13	$1.7x10^{-2}$	0.21	$9.3x10^{-5}$
	Cold Cuts And Luncheon Meats	$6.7x10^{-3}$	$2.9x10^{-3}$	4.6	$6.4x10^{-3}$	0.16	$5.5x10^{-2}$	$3.3x10^{-2}$	$9.6x10^{-4}$
	Luncheon Meats, Canned	$6.8x10^{-3}$	$3.7x10^{-3}$	0.60	$3.4x10^{-3}$	0.16	$4.8x10^{-2}$	$4.1x10^{-2}$	$8.0x10^{-4}$
	Soups, Meat, Canned	$2.6x10^{-3}$	$1.1x10^{-3}$	0.25	$4.1x10^{-3}$	$3.5x10^{-2}$	$2.8x10^{-2}$	$4.7x10^{-2}$	$2.5x10^{-3}$
	Wieners	$5.5x10^{-3}$	$3.4x10^{-3}$	0.87	$5.9x10^{-3}$	0.22	$9.0x10^{-2}$	0.12	$2.2x10^{-3}$
	Organ Meats, Liver, Kidney	$6.3x10^{-3}$	$7.5x10^{-2}$	135.9	$1.9x10^{-2}$	1.1	1.1	$4.3x10^{-2}$	$1.6x10^{-4}$
Poultry	Poultry, Chicken And Turkey	$9.3x10^{-3}$	$1.9x10^{-3}$	0.58	$2.1x10^{-3}$	0.42	$4.5x10^{-2}$	$1.8x10^{-2}$	$4.0x10^{-4}$
Fish	Fish, Marine, Fresh Or Frozen	5.5	$4.5x10^{-3}$	0.29	$3.8x10^{-3}$	0.61	$4.6x10^{-3}$	$2.0x10^{-2}$	$2.2x10^{-3}$
	Fish, Fresh Water, Fresh Or Frozen	0.44	$4.0x10^{-3}$	0.33	$1.4x10^{-3}$	0.43	$4.7x10^{-3}$	$1.7x10^{-2}$	$2.5x10^{-4}$
	Fish, Canned	0.80	$2.7x10^{-3}$	0.44	$2.8x10^{-3}$	0.72	$4.5x10^{-3}$	$1.6x10^{-2}$	$1.6x10^{-3}$
	Shellfish, Fresh Or Frozen	0.31	$4.1x10^{-3}$	1.7	$5.5x10^{-3}$	0.36	$1.1x10^{-2}$	$2.2x10^{-2}$	$9.3x10^{-3}$
Berries	Strawberries	$4.2x10^{-3}$	$1.4x10^{-2}$	0.34	$2.1x10^{-3}$	$9.7x10^{-3}$	0.14	$6.2x10^{-2}$	$4.5x10^{-4}$
	Blueberries	$1.1x10^{-2}$	$1.8x10^{-3}$	0.42	$3.1x10^{-3}$	$1.7x10^{-3}$	$5.2x10^{-2}$	$8.0x10^{-2}$	$4.8x10^{-4}$
Supermarket Foods Not Considered Country Foods									
Alcoholic Drinks	Alcoholic Drinks, Wine	$8.6x10^{-3}$	$3.3x10^{-3}$	$7.4x10^{-2}$	$1.3x10^{-2}$	$1.4x10^{-3}$	$1.8x10^{-2}$	$2.0x10^{-2}$	$7.4x10^{-4}$
	Alcoholic Drinks, Beer	$2.8x10^{-3}$	$7.2x10^{-4}$	$3.7x10^{-2}$	$3.3x10^{-4}$	$1.5x10^{-2}$	$1.0x10^{-2}$	$6.2x10^{-3}$	$1.6x10^{-4}$
Cereals and Grains	Bread, White	$5.5x10^{-3}$	$9.2x10^{-3}$	0.93	$3.4x10^{-3}$	0.31	0.23	$7.4x10^{-2}$	$2.2x10^{-3}$
	Bread, Whole Wheat And Rye	$6.5x10^{-3}$	$9.8x10^{-3}$	1.3	$4.8x10^{-3}$	0.25	0.29	$8.5x10^{-2}$	$1.8x10^{-3}$
	Rolls And Biscuits	$5.9x10^{-3}$	$1.0x10^{-2}$	1.0	$4.1x10^{-3}$	0.25	0.21	$6.7x10^{-2}$	$1.8x10^{-3}$
	Flour, Wheat	$3.1x10^{-3}$	$2.8x10^{-3}$	1.2	$1.2x10^{-3}$	0.40	0.28	$4.4x10^{-2}$	$2.0x10^{-4}$
	Cake	$6.9x10^{-3}$	$2.0x10^{-2}$	0.89	$8.8x10^{-3}$	$5.6x10^{-2}$	$7.9x10^{-2}$	0.25	$3.6x10^{-3}$
	Cookies	$7.3x10^{-3}$	$4.4x10^{-2}$	2.2	$1.1x10^{-2}$	$5.5x10^{-2}$	0.16	0.62	$9.4x10^{-4}$
	Danish And Donuts	$7.1x10^{-3}$	$8.7x10^{-3}$	0.74	$5.0x10^{-3}$	0.16	0.18	$9.8x10^{-2}$	$1.8x10^{-3}$
	Crackers	$5.9x10^{-3}$	$5.4x10^{-3}$	1.2	$2.5x10^{-3}$	0.17	0.28	$9.5x10^{-2}$	$2.7x10^{-4}$
	Pancakes	$5.6x10^{-3}$	$5.4x10^{-3}$	0.69	$3.5x10^{-3}$	0.12	0.13	$8.5x10^{-2}$	$3.9x10^{-3}$
	Cereals, Cooked Wheat	$2.5x10^{-3}$	$2.2x10^{-3}$	0.97	$1.0x10^{-2}$	$9.6x10^{-2}$	$8.7x10^{-2}$	0.12	$9.4x10^{-3}$

Table A.2 Mean Exposure Point Concentrations of Non-Radiological COPC in Non-Country Foods (Cont'd)

Food Group [(a)]	Food Composite Item	Mean Food Concentration (µg/g ww)							
		Arsenic	Cobalt	Copper	Lead	Selenium	Molybdenum	Nickel	Uranium
Cereals and Grains (Cont'd)	Cereals, Oatmeal	$3.6x10^{-3}$	$1.6x10^{-3}$	0.91	$7.2x10^{-3}$	$5.9x10^{-2}$	0.28	0.38	$8.3x10^{-3}$
	Cereals, Corn	$4.3x10^{-3}$	$1.8x10^{-2}$	0.54	$1.9x10^{-3}$	$7.8x10^{-2}$	0.15	0.13	$1.4x10^{-4}$
	Cereals, Wheat And Bran	$6.0x10^{-2}$	$2.9x10^{-2}$	3.4	$4.0x10^{-3}$	0.12	0.67	0.17	$1.0x10^{-3}$
	Rice	$9.4x10^{-2}$	$3.8x10^{-3}$	0.95	$7.7x10^{-3}$	$9.1x10^{-2}$	0.32	$8.2x10^{-2}$	$5.7x10^{-3}$
	Pie, Apple	$2.9x10^{-3}$	$1.4x10^{-3}$	0.49	$2.7x10^{-3}$	$5.8x10^{-2}$	$7.6x10^{-2}$	$4.9x10^{-2}$	$1.6x10^{-4}$
	Pie, Other	$3.3x10^{-3}$	$1.8x10^{-3}$	0.39	$3.3x10^{-3}$	$5.2x10^{-2}$	$8.2x10^{-2}$	$7.2x10^{-2}$	$3.0x10^{-4}$
	Pizza	$1.1x10^{-2}$	$9.6x10^{-3}$	0.77	$7.5x10^{-3}$	0.18	0.19	$9.0x10^{-2}$	$1.5x10^{-3}$
	Pasta	$4.0x10^{-3}$	$6.5x10^{-3}$	0.86	$6.8x10^{-3}$	0.21	$8.9x10^{-2}$	$7.6x10^{-2}$	$3.0x10^{-3}$
	Pasta, Ordinary	$1.7x10^{-3}$	$1.1x10^{-3}$	1.5	$5.2x10^{-3}$	0.38	$8.9x10^{-2}$	$5.3x10^{-2}$	$8.0x10^{-3}$
	Muffins	$7.1x10^{-3}$	$4.4x10^{-3}$	0.99	$3.8x10^{-3}$	0.11	0.21	$7.4x10^{-2}$	$2.3x10^{-3}$
Eggs	Eggs	$2.9x10^{-3}$	$3.0x10^{-3}$	0.71	$1.4x10^{-3}$	0.40	$9.3x10^{-2}$	$2.7x10^{-2}$	$2.3x10^{-4}$
Fats, Nuts and Oils	Cooking Fats & Salad Oils	$5.1x10^{-2}$	$2.4x10^{-4}$	$2.9x10^{-2}$	$9.6x10^{-4}$	0.16	0.57	0.12	$4.0x10^{-5}$
	Margarine	$3.9x10^{-2}$	$6.5x10^{-4}$	$1.2x10^{-2}$	$8.7x10^{-4}$	$7.4x10^{-2}$	0.51	$8.4x10^{-2}$	$8.3x10^{-5}$
	Peanut Butter & Peanuts	$2.2x10^{-2}$	$1.9x10^{-2}$	3.4	$4.7x10^{-3}$	$5.3x10^{-2}$	1.5	0.47	$2.9x10^{-4}$
Milk and Dairy	Milk, Whole	$2.6x10^{-3}$	$2.6x10^{-3}$	$4.7x10^{-2}$	$2.2x10^{-4}$	$3.7x10^{-2}$	$4.3x10^{-2}$	$2.3x10^{-2}$	$4.2x10^{-5}$
	Milk, 2%	$2.2x10^{-3}$	$2.5x10^{-3}$	$4.8x10^{-2}$	$2.6x10^{-4}$	$3.5x10^{-2}$	$4.0x10^{-2}$	$2.3x10^{-2}$	$2.9x10^{-5}$
	Milk, Skim	$2.1x10^{-3}$	$2.6x10^{-3}$	$4.7x10^{-2}$	$2.4x10^{-4}$	$3.6x10^{-2}$	$3.9x10^{-2}$	$2.6x10^{-2}$	$2.7x10^{-5}$
	Evaporated Milk, Canned	$5.1x10^{-3}$	$5.2x10^{-3}$	0.11	$5.6x10^{-4}$	$6.6x10^{-2}$	$9.9x10^{-2}$	$5.2x10^{-2}$	$4.5x10^{-4}$
	Cream, 10-12% Butter Fat	$4.2x10^{-3}$	$2.5x10^{-3}$	$4.6x10^{-2}$	$2.1x10^{-4}$	$3.5x10^{-2}$	$6.4x10^{-2}$	$2.7x10^{-2}$	$8.3x10^{-5}$
	Ice Cream	$4.4x10^{-3}$	$1.5x10^{-2}$	0.55	$2.3x10^{-3}$	$3.9x10^{-2}$	$9.3x10^{-2}$	0.16	$2.7x10^{-4}$
	Yogurt	$2.6x10^{-3}$	$2.9x10^{-3}$	$6.9x10^{-2}$	$6.0x10^{-4}$	$3.7x10^{-2}$	$6.2x10^{-2}$	$3.1x10^{-2}$	$1.5x10^{-4}$
	Cheese	$1.3x10^{-2}$	$1.6x10^{-2}$	0.34	$6.2x10^{-3}$	0.31	0.22	0.19	$2.0x10^{-3}$
	Cheese, Cottage	$3.5x10^{-3}$	$2.6x10^{-3}$	0.18	$9.8x10^{-4}$	0.16	$7.2x10^{-2}$	$3.2x10^{-2}$	$1.0x10^{-3}$
	Cheese, Processed Cheddar	$1.4x10^{-2}$	$1.2x10^{-2}$	0.26	$6.3x10^{-3}$	0.17	0.19	0.13	$2.4x10^{-3}$
	Butter	$2.2x10^{-2}$	$9.4x10^{-4}$	$2.6x10^{-2}$	$1.1x10^{-3}$	$4.1x10^{-2}$	$5.5x10^{-2}$	$1.3x10^{-2}$	$1.6x10^{-4}$
Non-Alcoholic Drinks	Coffee	$1.1x10^{-3}$	$4.4x10^{-3}$	0.12	$2.8x10^{-3}$	$6.1x10^{-4}$	$2.5x10^{-2}$	$2.3x10^{-2}$	$2.6x10^{-3}$
	Tea	$1.8x10^{-3}$	$2.1x10^{-3}$	0.34	$5.9x10^{-3}$	$6.0x10^{-4}$	$1.9x10^{-2}$	$8.6x10^{-2}$	$6.6x10^{-3}$
	Soft Drinks	$4.6x10^{-4}$	$2.1x10^{-4}$	$9.2x10^{-3}$	$2.8x10^{-4}$	$3.4x10^{-4}$	$4.7x10^{-3}$	$3.1x10^{-3}$	$3.4x10^{-4}$
Other Fruits and Juices	Citrus Fruit [(b)]	$1.3x10^{-3}$	$2.6x10^{-3}$	0.37	$1.2x10^{-3}$	$1.2x10^{-3}$	$3.1x10^{-2}$	$4.8x10^{-2}$	$6.0x10^{-5}$
	Citrus Juice	$1.2x10^{-3}$	$2.3x10^{-3}$	0.52	$2.0x10^{-3}$	$9.8x10^{-4}$	$4.5x10^{-2}$	$2.0x10^{-2}$	$4.7x10^{-3}$
	Citrus Juice, Canned	$7.4x10^{-4}$	$1.4x10^{-3}$	0.24	$4.9x10^{-4}$	$9.3x10^{-4}$	$3.1x10^{-2}$	$1.2x10^{-2}$	$3.6x10^{-4}$
	Apples, Raw	$4.1x10^{-3}$	$9.9x10^{-4}$	0.46	$5.1x10^{-3}$	$3.5x10^{-4}$	0.19	$8.8x10^{-3}$	$3.0x10^{-3}$
	Apple Juice, Canned, Unsweetened	$6.0x10^{-3}$	$1.1x10^{-3}$	$9.8x10^{-2}$	$1.7x10^{-3}$	$4.6x10^{-4}$	$2.7x10^{-2}$	$7.1x10^{-3}$	$1.8x10^{-4}$
	Applesauce, Canned, Sweetened	$8.3x10^{-4}$	$8.2x10^{-4}$	0.23	$3.3x10^{-3}$	$3.7x10^{-4}$	0.18	$5.3x10^{-3}$	$4.0x10^{-5}$

Table A.2 Mean Exposure Point Concentrations of Non-Radiological COPC in Non-Country Foods (Cont'd)

Food Group [a]	Food Composite Item	Mean Food Concentration (µg/g ww)							
		Arsenic	Cobalt	Copper	Lead	Selenium	Molybdenum	Nickel	Uranium
Other Fruits and Juices (Cont'd)	Bananas	1.1×10^{-3}	1.5×10^{-3}	0.98	6.8×10^{-4}	6.9×10^{-3}	0.11	3.2×10^{-2}	5.7×10^{-5}
	Grapes	5.2×10^{-3}	1.3×10^{-3}	1.1	1.5×10^{-3}	1.0×10^{-3}	5.9×10^{-2}	7.3×10^{-3}	4.9×10^{-4}
	Grape Juice, Bottled	1.3×10^{-2}	2.5×10^{-3}	7.2×10^{-2}	9.3×10^{-3}	6.8×10^{-4}	4.7×10^{-2}	1.7×10^{-2}	4.1×10^{-3}
	Peaches	4.6×10^{-3}	2.4×10^{-3}	0.51	1.0×10^{-2}	7.5×10^{-4}	4.5×10^{-2}	5.7×10^{-2}	4.6×10^{-4}
	Pears	3.6×10^{-3}	7.5×10^{-3}	0.71	1.5×10^{-3}	1.3×10^{-3}	5.1×10^{-2}	2.9×10^{-2}	1.8×10^{-4}
	Plums, Dried Prunes & Canned Plums	5.3×10^{-3}	3.7×10^{-3}	0.93	4.7×10^{-3}	1.4×10^{-3}	0.23	1.0×10^{-1}	5.0×10^{-4}
	Cherries	4.7×10^{-3}	2.4×10^{-3}	0.69	2.4×10^{-3}	1.3×10^{-3}	3.6×10^{-2}	2.3×10^{-2}	9.4×10^{-4}
	Melons	5.4×10^{-3}	3.4×10^{-3}	0.31	3.1×10^{-3}	1.3×10^{-2}	4.5×10^{-2}	5.1×10^{-2}	1.1×10^{-4}
	Pineapple	7.7×10^{-3}	9.3×10^{-3}	0.46	1.7×10^{-2}	9.1×10^{-4}	4.8×10^{-2}	0.12	4.4×10^{-4}
	Raisins	2.2×10^{-2}	8.6×10^{-3}	2.6	2.4×10^{-2}	8.8×10^{-3}	0.29	4.9×10^{-2}	2.4×10^{-3}
Other Vegetables	Soups, Other [c]	2.9×10^{-3}	2.1×10^{-3}	0.30	4.0×10^{-3}	8.6×10^{-3}	3.7×10^{-2}	6.2×10^{-2}	3.6×10^{-3}
	Soups, Dehydrated	2.0×10^{-3}	1.9×10^{-3}	0.36	5.2×10^{-3}	5.0×10^{-2}	4.7×10^{-2}	2.5×10^{-2}	6.0×10^{-3}
	Corn	1.4×10^{-3}	1.4×10^{-3}	0.41	2.7×10^{-3}	1.0×10^{-2}	0.11	3.4×10^{-2}	1.5×10^{-3}
	Cabbage	1.6×10^{-3}	5.7×10^{-3}	0.22	4.0×10^{-3}	1.1×10^{-2}	0.87	0.15	5.6×10^{-3}
	Celery	4.7×10^{-3}	2.1×10^{-3}	0.31	3.3×10^{-3}	4.5×10^{-3}	2.1×10^{-2}	3.6×10^{-2}	2.6×10^{-3}
	Peppers	7.2×10^{-4}	6.4×10^{-3}	0.75	2.5×10^{-3}	1.5×10^{-3}	2.2×10^{-2}	0.22	1.7×10^{-4}
	Lettuce	4.8×10^{-3}	7.6×10^{-3}	0.23	4.0×10^{-3}	2.7×10^{-3}	2.5×10^{-4}	8.4×10^{-2}	1.4×10^{-3}
	Cauliflower	1.9×10^{-3}	8.3×10^{-3}	0.34	4.3×10^{-3}	3.7×10^{-2}	5.5×10^{-2}	6.1×10^{-2}	4.8×10^{-3}
	Broccoli	2.9×10^{-3}	1.4×10^{-2}	0.45	3.7×10^{-3}	9.1×10^{-3}	7.0×10^{-2}	0.15	7.4×10^{-3}
	Beans	1.7×10^{-3}	6.8×10^{-3}	0.50	5.9×10^{-3}	1.5×10^{-3}	0.12	0.22	3.3×10^{-3}
	Peas	1.4×10^{-3}	5.1×10^{-3}	0.89	3.4×10^{-3}	1.5×10^{-2}	0.36	0.14	2.9×10^{-3}
	Tomatoes	5.7×10^{-4}	2.4×10^{-3}	0.29	1.4×10^{-3}	1.9×10^{-3}	5.6×10^{-2}	1.4×10^{-2}	8.3×10^{-5}
	Tomato Juice, Canned	1.7×10^{-3}	3.9×10^{-3}	0.39	1.3×10^{-3}	4.2×10^{-3}	3.6×10^{-2}	4.2×10^{-2}	2.8×10^{-4}
	Tomatoes/sauce, Canned & Ketchup	2.5×10^{-3}	4.8×10^{-3}	0.61	8.4×10^{-3}	6.1×10^{-3}	9.1×10^{-2}	5.9×10^{-2}	1.5×10^{-3}
	Mushrooms, Canned	1.2×10^{-2}	3.3×10^{-4}	2.5	3.1×10^{-3}	0.20	1.8×10^{-2}	6.2×10^{-3}	3.5×10^{-3}
	Cucumbers	4.3×10^{-3}	3.1×10^{-3}	0.31	3.2×10^{-3}	1.7×10^{-3}	3.3×10^{-2}	4.6×10^{-2}	1.4×10^{-3}
	Baked Beans	3.0×10^{-3}	1.7×10^{-2}	2.0	5.4×10^{-3}	2.4×10^{-2}	0.40	0.15	3.5×10^{-4}
Root Vegetables	Potatoes [d]	1.7×10^{-3}	1.5×10^{-2}	0.95	3.6×10^{-3}	4.3×10^{-3}	4.4×10^{-2}	0.12	2.6×10^{-3}
	Potatoes, French Fried, Frozen	1.0×10^{-2}	1.6×10^{-2}	1.0	2.0×10^{-3}	2.0×10^{-2}	7.8×10^{-2}	0.21	2.4×10^{-3}
	Potatoes, Chips	6.9×10^{-3}	3.2×10^{-2}	1.7	1.9×10^{-3}	2.3×10^{-2}	0.19	0.17	6.6×10^{-4}
	Carrots	3.2×10^{-3}	3.9×10^{-3}	0.46	1.3×10^{-2}	3.1×10^{-3}	3.8×10^{-2}	0.15	4.7×10^{-3}
	Onion	3.8×10^{-3}	2.4×10^{-3}	0.49	3.3×10^{-3}	1.8×10^{-3}	1.2×10^{-2}	3.5×10^{-2}	3.3×10^{-3}
	Rutabagas Or Turnip	1.3×10^{-3}	4.8×10^{-3}	0.21	1.7×10^{-3}	8.0×10^{-3}	3.9×10^{-2}	6.5×10^{-2}	3.4×10^{-3}
	Beets	1.8×10^{-3}	5.3×10^{-3}	0.50	6.1×10^{-3}	3.5×10^{-3}	1.6×10^{-2}	4.8×10^{-2}	1.2×10^{-3}

Table A.2 Mean Exposure Point Concentrations of Non-Radiological COPC in Non-Country Foods (Cont'd)

Food Group [(a)]	Food Composite Item	Mean Food Concentration (µg/g ww)							
		Arsenic	Cobalt	Copper	Lead	Selenium	Molybdenum	Nickel	Uranium
Sugar and Sweets	Sugar, White	$6.4x10^{-4}$	$4.9x10^{-4}$	$3.4x10^{-2}$	$3.7x10^{-4}$	$9.6x10^{-4}$	$4.6x10^{-2}$	$1.7x10^{-3}$	$1.3x10^{-5}$
	Syrup	$1.2x10^{-3}$	$9.1x10^{-4}$	$3.6x10^{-2}$	$2.8x10^{-3}$	$2.4x10^{-4}$	$3.1x10^{-2}$	$2.7x10^{-2}$	$1.0x10^{-4}$
	Jams	$3.5x10^{-3}$	$1.2x10^{-2}$	0.24	$3.9x10^{-3}$	$2.5x10^{-3}$	$4.6x10^{-2}$	$4.1x10^{-2}$	$4.1x10^{-4}$
	Honey	$1.6x10^{-3}$	$2.3x10^{-3}$	$7.9x10^{-2}$	$7.7x10^{-3}$	$1.4x10^{-3}$	$6.8x10^{-2}$	$1.5x10^{-2}$	$8.3x10^{-5}$
	Puddings	$2.1x10^{-3}$	$1.2x10^{-2}$	0.49	$2.0x10^{-3}$	$1.4x10^{-2}$	$7.7x10^{-2}$	0.14	$6.9x10^{-4}$
	Candy, Chocolate Bars	$8.9x10^{-3}$	$6.1x10^{-2}$	2.6	$9.4x10^{-3}$	$3.4x10^{-2}$	0.59	0.72	$4.2x10^{-4}$
	Candy, Others	$4.0x10^{-3}$	$3.6x10^{-3}$	0.18	$4.6x10^{-3}$	$9.4x10^{-3}$	0.47	$2.3x10^{-2}$	$5.5x10^{-4}$
	Gelatin Dessert	$3.0x10^{-3}$	$7.4x10^{-4}$	0.12	$4.0x10^{-3}$	$2.0x10^{-3}$	$6.6x10^{-2}$	$1.1x10^{-2}$	$6.2x10^{-3}$

Notes: Mean concentrations calculated from data from 2005-2007 from Health Canada (2011), with the exception of molybdenum which are from 1993-1999 data; values below the Method Detection Limit (MDL) were set equal to the MDL value.

(a) Food groups developed by Health Canada 1994.

(b) Includes raw and canned citrus fruits.

(c) Includes raw, baked and boiled (skins on and skins off) potatoes.

(d) Includes canned pea and canned tomato soups.

Table A.3 Detailed Breakdown of Estimated Daily Intakes of Non-Radiological COPC from Consumption of Non-Country Foods - Child

Food Group [(a)]	Food Composite Item	EDIs of Food - Child (mg/kg-d)							
		Arsenic	Cobalt	Copper	Lead	Molybdenum	Nickel	Selenium	Uranium
For all Child Receptors									
Alcoholic Drinks	Alcoholic Drinks, Wine	1.90E-07	7.21E-08	1.63E-06	2.78E-07	3.94E-07	4.53E-07	3.15E-08	1.64E-08
	Alcoholic Drinks, Beer	1.66E-07	4.24E-08	2.17E-06	1.94E-08	6.02E-07	3.66E-07	8.62E-07	9.58E-09
	Total Alcoholic Drinks	**3.56E-07**	**1.15E-07**	**3.80E-06**	**2.97E-07**	**9.96E-07**	**8.20E-07**	**8.94E-07**	**2.60E-08**
Cereals and Grains	Bread, White	1.28E-05	2.14E-05	2.16E-03	7.94E-06	5.47E-04	1.72E-04	7.15E-04	5.13E-06
	Bread, Whole Wheat And Rye	1.27E-06	1.93E-06	2.52E-04	9.51E-07	5.66E-05	1.68E-05	4.83E-05	3.56E-07
	Rolls And Biscuits	2.09E-06	3.68E-06	3.57E-04	1.44E-06	7.32E-05	2.38E-05	8.93E-05	6.41E-07
	Flour, Wheat	9.74E-07	8.97E-07	3.77E-04	3.78E-07	8.72E-05	1.39E-05	1.25E-04	6.42E-08
	Cake	5.36E-06	1.53E-05	6.94E-04	6.89E-06	6.13E-05	1.93E-04	4.35E-05	2.83E-06
	Cookies	5.77E-06	3.46E-05	1.71E-03	8.37E-06	1.30E-04	4.92E-04	4.32E-05	7.43E-07
	Danish And Donuts	1.17E-06	1.42E-06	1.21E-04	8.20E-07	2.97E-05	1.61E-05	2.66E-05	2.94E-07
	Crackers	9.28E-07	8.44E-07	1.82E-04	3.88E-07	4.45E-05	1.48E-05	2.72E-05	4.22E-08
	Pancakes	4.94E-07	4.82E-07	6.13E-05	3.11E-07	1.15E-05	7.55E-06	1.04E-05	3.49E-07
	Cereals, Cooked Wheat	4.33E-07	3.80E-07	1.68E-04	1.76E-06	1.50E-05	2.12E-05	1.67E-05	1.64E-06
	Cereals, Oatmeal	2.19E-06	9.44E-07	5.54E-04	4.34E-06	1.70E-04	2.32E-04	3.55E-05	5.03E-06
	Cereals, Corn	7.01E-07	2.89E-06	8.82E-05	3.06E-07	2.48E-05	2.11E-05	1.27E-05	2.23E-08
	Cereals, Wheat And Bran	6.19E-06	2.95E-06	3.44E-04	4.09E-07	6.86E-05	1.75E-05	1.24E-05	1.03E-07
	Rice	3.99E-05	1.59E-06	4.03E-04	3.26E-06	1.34E-04	3.46E-05	3.85E-05	2.44E-06
	Pie, Apple	3.44E-07	1.66E-07	5.75E-05	3.23E-07	8.94E-06	5.76E-06	6.80E-06	1.92E-08
	Pie, Other	1.05E-06	5.51E-07	1.23E-04	1.04E-06	2.58E-05	2.28E-05	1.65E-05	9.33E-08
	Pizza	9.96E-07	8.99E-07	7.24E-05	7.07E-07	1.75E-05	8.48E-06	1.72E-05	1.38E-07
	Pasta	4.48E-06	7.24E-06	9.68E-04	7.59E-06	9.93E-05	8.56E-05	2.31E-04	3.33E-06
	Pasta, Ordinary	1.39E-06	9.12E-07	1.20E-03	4.12E-06	7.10E-05	4.22E-05	3.04E-04	6.39E-06
	Muffins	1.14E-07	7.11E-08	1.59E-05	6.12E-08	3.38E-06	1.19E-06	1.80E-06	3.77E-08
	Total Cereals & Grains	**8.86E-05**	**9.92E-05**	**9.90E-03**	**5.14E-05**	**1.68E-03**	**1.44E-03**	**1.82E-03**	**2.97E-05**
Eggs	Eggs	1.84E-06	1.89E-06	4.57E-04	9.19E-07	5.97E-05	1.75E-05	2.56E-04	1.47E-07
	Total Eggs	**1.84E-06**	**1.89E-06**	**4.57E-04**	**9.19E-07**	**5.97E-05**	**1.75E-05**	**2.56E-04**	**1.47E-07**

Table A.3 Detailed Breakdown of Estimated Daily Intakes of Non-Radiological COPC from Consumption of Non-Country Foods – Child (Cont'd)

Food Group [(a)]	Food Composite Item	EDIs of Food - Child (mg/kg-d)							
		Arsenic	**Cobalt**	**Copper**	**Lead**	**Molybdenum**	**Nickel**	**Selenium**	**Uranium**
Fats, Nuts and Oils	Cooking Fats & Salad Oils	3.45E-06	1.59E-08	1.91E-06	6.43E-08	3.84E-05	8.27E-06	1.04E-05	2.69E-09
	Margarine	7.23E-06	1.20E-07	2.19E-06	1.61E-07	9.50E-05	1.57E-05	1.38E-05	1.55E-08
	Peanut Butter & Peanuts	4.15E-06	3.44E-06	6.35E-04	8.62E-07	2.68E-04	8.71E-05	9.83E-06	5.36E-08
	Total Fats, nuts & oils	**1.48E-05**	**3.57E-06**	**6.39E-04**	**1.09E-06**	**4.01E-04**	**1.11E-04**	**3.41E-05**	**7.18E-08**
Milk and Dairy	Milk, Whole	2.58E-05	2.52E-05	4.63E-04	2.13E-06	4.21E-04	2.23E-04	3.68E-04	4.09E-07
	Milk, 2%	1.26E-05	1.41E-05	2.73E-04	1.49E-06	2.28E-04	1.30E-04	1.99E-04	1.65E-07
	Milk, Skim	3.53E-06	4.44E-06	7.95E-05	4.11E-07	6.56E-05	4.40E-05	6.15E-05	4.50E-08
	Evaporated Milk, Canned	1.02E-06	1.03E-06	2.10E-05	1.11E-07	1.98E-05	1.04E-05	1.32E-05	9.01E-08
	Cream, 10-12% Butter Fat	3.64E-07	2.14E-07	3.96E-06	1.81E-08	5.47E-06	2.33E-06	3.00E-06	7.17E-09
	Ice Cream	3.39E-06	1.16E-05	4.29E-04	1.82E-06	7.25E-05	1.22E-04	3.03E-05	2.13E-07
	Yogurt	3.77E-08	4.19E-08	1.01E-06	8.80E-09	8.98E-07	4.55E-07	5.33E-07	2.19E-09
	Cheese	1.25E-06	1.50E-06	3.33E-05	5.96E-07	2.11E-05	1.83E-05	3.00E-05	1.89E-07
	Cheese, Cottage	1.41E-07	1.04E-07	7.22E-06	3.98E-08	2.91E-06	1.29E-06	6.29E-06	4.18E-08
	Cheese, Processed Cheddar	2.12E-06	1.74E-06	3.85E-05	9.48E-07	2.81E-05	1.92E-05	2.47E-05	3.63E-07
	Butter	8.60E-06	3.71E-07	1.03E-05	4.38E-07	2.18E-05	5.00E-06	1.63E-05	6.42E-08
	Total Milk & Dairy	**5.88E-05**	**6.03E-05**	**1.36E-03**	**8.00E-06**	**8.87E-04**	**5.75E-04**	**7.53E-04**	**1.59E-06**
Non-Alcoholic Drinks	Coffee	4.09E-07	1.59E-06	4.38E-05	1.01E-06	9.03E-06	8.20E-06	2.24E-07	9.60E-07
	Tea	1.19E-06	1.42E-06	2.30E-04	3.97E-06	1.29E-05	5.80E-05	4.07E-07	4.43E-06
	Soft Drinks	2.71E-06	1.22E-06	5.42E-05	1.67E-06	2.78E-05	1.81E-05	2.02E-06	2.02E-06
	Total Non-Alcoholic Drinks	**4.30E-06**	**4.23E-06**	**3.28E-04**	**6.65E-06**	**4.98E-05**	**8.43E-05**	**2.65E-06**	**7.41E-06**
Other Fruits and Juices	Citrus Fruit [(b)]	1.01E-06	1.99E-06	2.81E-04	9.07E-07	2.32E-05	3.60E-05	9.35E-07	4.54E-08
	Citrus Juice	8.22E-07	1.56E-06	3.54E-04	1.36E-06	3.08E-05	1.37E-05	6.71E-07	3.25E-06
	Citrus Juice, Canned	2.92E-07	5.66E-07	9.60E-05	1.92E-07	1.23E-05	4.58E-06	3.66E-07	1.40E-07
	Apples, Raw	5.14E-06	1.25E-06	5.83E-04	6.45E-06	2.44E-04	1.11E-05	4.40E-07	3.75E-06
	Apple Juice, Canned, Unsweetened	4.90E-06	8.94E-07	7.97E-05	1.36E-06	2.20E-05	5.79E-06	3.75E-07	1.46E-07
	Applesauce, Canned, Sweetened	2.23E-07	2.20E-07	6.27E-05	8.83E-07	4.85E-05	1.42E-06	9.82E-08	1.07E-08
	Bananas	7.23E-07	9.94E-07	6.35E-04	4.45E-07	7.00E-05	2.06E-05	4.52E-06	3.69E-08

Table A.3 Detailed Breakdown of Estimated Daily Intakes of Non-Radiological COPC from Consumption of Non-Country Foods – Child (Cont'd)

Food Group [(a)]	Food Composite Item	EDIs of Food - Child (mg/kg-d)							
		Arsenic	**Cobalt**	**Copper**	**Lead**	**Molybdenum**	**Nickel**	**Selenium**	**Uranium**
Other Fruits and Juices (Cont'd)	Grapes	2.41E-07	5.79E-08	5.11E-05	6.79E-08	2.71E-06	3.37E-07	4.77E-08	2.26E-08
	Grape Juice, Bottled	1.01E-06	1.93E-07	5.50E-06	7.15E-07	3.64E-06	1.33E-06	5.18E-08	3.10E-07
	Peaches	1.45E-06	7.50E-07	1.60E-04	3.24E-06	1.40E-05	1.79E-05	2.35E-07	1.43E-07
	Pears	7.36E-07	1.53E-06	1.45E-04	3.14E-07	1.03E-05	5.88E-06	2.66E-07	3.67E-08
	Plums, Dried Prunes & Canned Plums	4.38E-07	3.10E-07	7.68E-05	3.85E-07	1.92E-05	8.23E-06	1.13E-07	4.13E-08
	Cherries	1.66E-07	8.45E-08	2.40E-05	8.26E-08	1.25E-06	7.95E-07	4.64E-08	3.29E-08
	Melons	1.22E-06	7.54E-07	6.96E-05	7.01E-07	1.01E-05	1.14E-05	2.85E-06	2.40E-08
	Pineapple	3.91E-07	4.74E-07	2.37E-05	8.92E-07	2.43E-06	6.18E-06	4.66E-08	2.26E-08
	Raisins	3.53E-07	1.38E-07	4.15E-05	3.92E-07	4.74E-06	7.93E-07	1.41E-07	3.86E-08
	Total Other Fruits & Juices	**1.91E-05**	**1.18E-05**	**2.69E-03**	**1.84E-05**	**5.20E-04**	**1.46E-04**	**1.12E-05**	**8.04E-06**
Other Vegetables	Soups, Other [(c)]	2.80E-06	2.00E-06	2.92E-04	3.82E-06	3.52E-05	5.92E-05	8.23E-06	3.51E-06
	Soups, Dehydrated	4.84E-07	4.62E-07	8.68E-05	1.26E-06	1.15E-05	6.02E-06	1.21E-05	1.46E-06
	Corn	7.67E-07	7.60E-07	2.22E-04	1.43E-06	6.10E-05	1.80E-05	5.51E-06	7.81E-07
	Cabbage	2.47E-07	8.79E-07	3.42E-05	6.12E-07	1.34E-04	2.27E-05	1.73E-06	8.54E-07
	Celery	3.44E-07	1.57E-07	2.31E-05	2.46E-07	1.58E-06	2.68E-06	3.33E-07	1.88E-07
	Peppers	5.88E-09	5.25E-08	6.14E-06	2.06E-08	1.80E-07	1.77E-06	1.22E-08	1.42E-09
	Lettuce	6.51E-07	1.03E-06	3.08E-05	5.50E-07	3.41E-08	1.15E-05	3.67E-07	1.90E-07
	Cauliflower	6.29E-09	2.77E-08	1.12E-06	1.43E-08	1.83E-07	2.06E-07	1.25E-07	1.60E-08
	Broccoli	1.19E-07	5.52E-07	1.85E-05	1.52E-07	2.84E-06	6.01E-06	3.71E-07	3.00E-07
	Beans	2.15E-07	8.83E-07	6.43E-05	7.70E-07	1.53E-05	2.83E-05	1.93E-07	4.34E-07
	Peas	2.51E-07	9.35E-07	1.65E-04	6.37E-07	6.62E-05	2.55E-05	2.75E-06	5.40E-07
	Tomatoes	1.29E-07	5.51E-07	6.64E-05	3.25E-07	1.28E-05	3.25E-06	4.40E-07	1.89E-08
	Tomato Juice, Canned	2.33E-07	5.40E-07	5.39E-05	1.78E-07	4.96E-06	5.83E-06	5.77E-07	3.85E-08
	Tomatoes/sauce, Canned & Ketchup	5.42E-07	1.04E-06	1.33E-04	1.83E-06	1.97E-05	1.29E-05	1.34E-06	3.18E-07
	Mushrooms, Canned	3.11E-07	8.63E-09	6.51E-05	8.00E-08	4.73E-07	1.63E-07	5.19E-06	9.10E-08
	Cucumbers	1.07E-06	7.69E-07	7.69E-05	8.03E-07	8.40E-06	1.16E-05	4.39E-07	3.61E-07
	Baked Beans	6.72E-07	3.73E-06	4.32E-04	1.18E-06	8.88E-05	3.35E-05	5.29E-06	7.73E-08
	Total Other Vegetables	**8.85E-06**	**1.44E-05**	**1.77E-03**	**1.39E-05**	**4.63E-04**	**2.49E-04**	**4.50E-05**	**9.17E-06**

Table A.3 Detailed Breakdown of Estimated Daily Intakes of Non-Radiological COPC from Consumption of Non-Country Foods – Child (Cont'd)

Food Group [(a)]	Food Composite Item	EDIs of Food - Child (mg/kg-d)							
		Arsenic	**Cobalt**	**Copper**	**Lead**	**Molybdenum**	**Nickel**	**Selenium**	**Uranium**
Root Vegetables	Potatoes [(d)]	4.15E-06	3.85E-05	2.39E-03	8.94E-06	1.10E-04	3.05E-04	1.08E-05	6.40E-06
	Potatoes, French Fried, Frozen	7.05E-06	1.14E-05	7.21E-04	1.37E-06	5.38E-05	1.44E-04	1.37E-05	1.67E-06
	Potatoes, Chips	1.09E-06	5.07E-06	2.69E-04	2.95E-07	2.97E-05	2.67E-05	3.68E-06	1.03E-07
	Carrots	1.01E-06	1.24E-06	1.45E-04	4.01E-06	1.19E-05	4.67E-05	9.69E-07	1.46E-06
	Onion	2.83E-07	1.81E-07	3.64E-05	2.48E-07	8.96E-07	2.60E-06	1.34E-07	2.48E-07
	Rutabagas Or Turnip	1.38E-07	5.10E-07	2.23E-05	1.84E-07	4.12E-06	6.91E-06	8.53E-07	3.63E-07
	Beets	6.97E-08	2.03E-07	1.90E-05	2.33E-07	6.19E-07	1.82E-06	1.35E-07	4.56E-08
	Total Root Vegetables	**1.38E-05**	**5.70E-05**	**3.60E-03**	**1.53E-05**	**2.11E-04**	**5.34E-04**	**3.03E-05**	**1.03E-05**
Sugar and Sweets	Sugar, White	2.28E-07	1.74E-07	1.19E-05	1.30E-07	1.63E-05	5.89E-07	3.39E-07	4.73E-09
	Syrup	2.33E-07	1.79E-07	6.97E-06	5.54E-07	6.03E-06	5.27E-06	4.71E-08	1.96E-08
	Jams	7.27E-07	2.50E-06	4.91E-05	7.92E-07	9.45E-06	8.33E-06	5.05E-07	8.42E-08
	Honey	9.76E-08	1.40E-07	4.87E-06	4.72E-07	4.18E-06	9.01E-07	8.62E-08	5.12E-09
	Puddings	5.76E-07	3.34E-06	1.33E-04	5.29E-07	2.07E-05	3.68E-05	3.84E-06	1.87E-07
	Candy, Chocolate Bars	1.48E-06	1.00E-05	4.30E-04	1.56E-06	9.69E-05	1.20E-04	5.62E-06	6.96E-08
	Candy, Others	1.02E-06	9.39E-07	4.55E-05	1.17E-06	1.20E-04	5.96E-06	2.41E-06	1.42E-07
	Gelatin Dessert	6.81E-07	1.69E-07	2.80E-05	9.05E-07	1.50E-05	2.44E-06	4.55E-07	1.40E-06
	Total Sugar & Sweets	**5.04E-06**	**1.75E-05**	**7.09E-04**	**6.12E-06**	**2.89E-04**	**1.80E-04**	**1.33E-05**	**1.91E-06**
Organs	Organ Meats, Liver, Kidney	3.56E-07	4.20E-06	7.64E-03	1.05E-06	6.06E-05	2.41E-06	6.39E-05	8.81E-09
	Total Organs	**3.56E-07**	**4.20E-06**	**7.64E-03**	**1.05E-06**	**6.06E-05**	**2.41E-06**	**6.39E-05**	**8.81E-09**
Total Non-Country Foods		**2.16E-04**	**2.74E-04**	**2.91E-02**	**1.23E-04**	**4.62E-03**	**3.34E-03**	**3.03E-03**	**6.84E-05**

Notes:
(a) Food groups developed by Health Canada 1994.
(b) Includes raw and canned citrus fruits.
(c) Includes raw, baked and boiled (skins on and skins off) potatoes.
(d) Includes canned pea and canned tomato soups.

Table A.4 Detailed Breakdown of Estimated Daily Intakes of Non-Radiological COPC from Consumption of Non-Country Foods - Adult

Food Group [(a)]	Food Composite Item	EDIs of Food - Adult (mg/kg-d)							
		Arsenic	Cobalt	Copper	Lead	Molybdenum	Nickel	Selenium	Uranium
For all Adult Receptors									
Alcoholic Drinks	Alcoholic Drinks, Wine	2.85E-06	1.08E-06	2.45E-05	4.17E-06	5.91E-06	6.80E-06	4.73E-07	2.46E-07
	Alcoholic Drinks, Beer	4.84E-06	1.24E-06	6.33E-05	5.65E-07	1.76E-05	1.07E-05	2.52E-05	2.80E-07
	Total Alcoholic Drinks	**7.69E-06**	**2.32E-06**	**8.78E-05**	**4.74E-06**	**2.35E-05**	**1.75E-05**	**2.56E-05**	**5.26E-07**
Cereals and Grains	Bread, White	5.22E-06	8.74E-06	8.84E-04	3.25E-06	2.24E-04	7.02E-05	2.92E-04	2.10E-06
	Bread, Whole Wheat And Rye	1.81E-06	2.75E-06	3.57E-04	1.35E-06	8.05E-05	2.38E-05	6.87E-05	5.05E-07
	Rolls And Biscuits	8.36E-07	1.47E-06	1.43E-04	5.76E-07	2.93E-05	9.53E-06	3.57E-05	2.56E-07
	Flour, Wheat	3.03E-07	2.79E-07	1.17E-04	1.17E-07	2.71E-05	4.32E-06	3.88E-05	1.99E-08
	Cake	1.98E-06	5.67E-06	2.57E-04	2.55E-06	2.27E-05	7.14E-05	1.61E-05	1.05E-06
	Cookies	1.61E-06	9.66E-06	4.76E-04	2.33E-06	3.61E-05	1.37E-04	1.20E-05	2.07E-07
	Danish And Donuts	5.53E-07	6.72E-07	5.72E-05	3.89E-07	1.41E-05	7.64E-06	1.26E-05	1.39E-07
	Crackers	2.90E-07	2.64E-07	5.67E-05	1.21E-07	1.39E-05	4.62E-06	8.49E-06	1.32E-08
	Pancakes	1.60E-07	1.56E-07	1.99E-05	1.01E-07	3.73E-06	2.44E-06	3.36E-06	1.13E-07
	Cereals, Cooked Wheat	2.30E-07	2.02E-07	8.94E-05	9.37E-07	7.99E-06	1.13E-05	8.86E-06	8.72E-07
	Cereals, Oatmeal	8.40E-07	3.62E-07	2.13E-04	1.66E-06	6.52E-05	8.90E-05	1.36E-05	1.93E-06
	Cereals, Corn	1.11E-07	4.57E-07	1.39E-05	4.82E-08	3.91E-06	3.32E-06	2.01E-06	3.52E-09
	Cereals, Wheat And Bran	1.97E-06	9.40E-07	1.10E-04	1.30E-07	2.19E-05	5.58E-06	3.96E-06	3.28E-08
	Rice	2.01E-05	8.04E-07	2.03E-04	1.64E-06	6.76E-05	1.75E-05	1.94E-05	1.23E-06
	Pie, Apple	3.83E-07	1.84E-07	6.39E-05	3.59E-07	9.94E-06	6.40E-06	7.56E-06	2.14E-08
	Pie, Other	5.53E-07	2.90E-07	6.49E-05	5.49E-07	1.36E-05	1.20E-05	8.66E-06	4.91E-08
	Pizza	2.61E-07	2.36E-07	1.90E-05	1.85E-07	4.59E-06	2.22E-06	4.50E-06	3.61E-08
	Pasta	8.93E-07	1.44E-06	1.93E-04	1.51E-06	1.98E-05	1.71E-05	4.61E-05	6.63E-07
	Pasta, Ordinary	3.31E-07	2.18E-07	2.85E-04	9.84E-07	1.70E-05	1.01E-05	7.26E-05	1.53E-06
	Muffins	1.56E-07	9.75E-08	2.18E-05	8.38E-08	4.63E-06	1.63E-06	2.46E-06	5.17E-08
	Total Cereals & Grains	**3.86E-05**	**3.49E-05**	**3.64E-03**	**1.89E-05**	**6.87E-04**	**5.07E-04**	**6.78E-04**	**1.08E-05**
Eggs	Eggs	1.32E-06	1.35E-06	3.26E-04	6.56E-07	4.26E-05	1.25E-05	1.82E-04	1.05E-07
	Total Eggs	**1.32E-06**	**1.35E-06**	**3.26E-04**	**6.56E-07**	**4.26E-05**	**1.25E-05**	**1.82E-04**	**1.05E-07**

Table A.4 Detailed Breakdown of Estimated Daily Intakes of Non-Radiological COPC from Consumption of Non-Country Foods – Adult (Cont'd)

Food Group [(a)]	Food Composite Item	EDIs of Food - Adult (mg/kg-d)							
		Arsenic	Cobalt	Copper	Lead	Molybdenum	Nickel	Selenium	Uranium
Fats, Nuts and Oils	Cooking Fats & Salad Oils	3.60E-06	1.66E-08	2.00E-06	6.70E-08	4.00E-05	8.62E-06	1.09E-05	2.80E-09
	Margarine	3.42E-06	5.70E-08	1.04E-06	7.64E-08	4.49E-05	7.44E-06	6.55E-06	7.34E-09
	Peanut Butter & Peanuts	1.12E-06	9.26E-07	1.71E-04	2.32E-07	7.22E-05	2.35E-05	2.65E-06	1.44E-08
	Total Fats, nuts & oils	**8.13E-06**	**1.00E-06**	**1.74E-04**	**3.76E-07**	**1.57E-04**	**3.95E-05**	**2.01E-05**	**2.46E-08**
Milk and Dairy	Milk, Whole	5.13E-06	5.02E-06	9.22E-05	4.24E-07	8.39E-05	4.43E-05	7.32E-05	8.15E-08
	Milk, 2%	1.92E-06	2.15E-06	4.15E-05	2.26E-07	3.47E-05	1.98E-05	3.03E-05	2.52E-08
	Milk, Skim	9.11E-07	1.15E-06	2.05E-05	1.06E-07	1.69E-05	1.14E-05	1.59E-05	1.16E-08
	Evaporated Milk, Canned	8.28E-07	8.36E-07	1.71E-05	9.08E-08	1.61E-05	8.47E-06	1.07E-05	7.35E-08
	Cream, 10-12% Butter Fat	6.09E-07	3.58E-07	6.63E-06	3.03E-08	9.17E-06	3.91E-06	5.02E-06	1.20E-08
	Ice Cream	7.89E-07	2.69E-06	9.98E-05	4.23E-07	1.69E-05	2.83E-05	7.06E-06	4.95E-08
	Yogurt	5.63E-08	6.25E-08	1.51E-06	1.31E-08	1.34E-06	6.80E-07	7.96E-07	3.27E-09
	Cheese	1.52E-06	1.83E-06	4.06E-05	7.27E-07	2.57E-05	2.23E-05	3.66E-05	2.31E-07
	Cheese, Cottage	2.63E-07	1.95E-07	1.35E-05	7.44E-08	5.45E-06	2.42E-06	1.18E-05	7.82E-08
	Cheese, Processed Cheddar	7.65E-07	6.29E-07	1.39E-05	3.41E-07	1.01E-05	6.91E-06	8.89E-06	1.31E-07
	Butter	4.21E-06	1.82E-07	5.04E-06	2.14E-07	1.07E-05	2.44E-06	7.97E-06	3.14E-08
	Total Milk & Dairy	**1.70E-05**	**1.51E-05**	**3.52E-04**	**2.67E-06**	**2.31E-04**	**1.51E-04**	**2.08E-04**	**7.27E-07**
Non-Alcoholic Drinks	Coffee	5.53E-06	2.14E-05	5.91E-04	1.37E-05	1.22E-04	1.11E-04	3.02E-06	1.30E-05
	Tea	8.80E-06	1.06E-05	1.70E-03	2.95E-05	9.61E-05	4.30E-04	3.02E-06	3.29E-05
	Soft Drinks	7.15E-07	3.21E-07	1.43E-05	4.40E-07	7.35E-06	4.78E-06	5.34E-07	5.34E-07
	Total Non-Alcoholic Drinks	**1.50E-05**	**3.23E-05**	**2.31E-03**	**4.36E-05**	**2.25E-04**	**5.46E-04**	**6.57E-06**	**4.64E-05**
Other Fruits and Juices	Citrus Fruit [(b)]	6.33E-07	1.25E-06	1.76E-04	5.67E-07	1.45E-05	2.25E-05	5.84E-07	2.84E-08
	Citrus Juice	5.94E-07	1.12E-06	2.56E-04	9.80E-07	2.22E-05	9.94E-06	4.85E-07	2.35E-06
	Citrus Juice, Canned	1.40E-07	2.72E-07	4.61E-05	9.21E-08	5.92E-06	2.20E-06	1.76E-07	6.75E-08
	Apples, Raw	1.19E-06	2.87E-07	1.35E-04	1.49E-06	5.64E-05	2.56E-06	1.02E-07	8.65E-07
	Apple Juice, Canned, Unsweetened	1.14E-06	2.08E-07	1.85E-05	3.16E-07	5.11E-06	1.34E-06	8.72E-08	3.39E-08
	Applesauce, Canned, Sweetened	7.04E-08	6.95E-08	1.98E-05	2.78E-07	1.53E-05	4.47E-07	3.10E-08	3.38E-09
	Bananas	2.01E-07	2.77E-07	1.77E-04	1.24E-07	1.95E-05	5.74E-06	1.26E-06	1.03E-08

Table A.4 Detailed Breakdown of Estimated Daily Intakes of Non-Radiological COPC from Consumption of Non-Country Foods – Adult (Cont'd)

Food Group [(a)]	Food Composite Item	EDIs of Food – Adult (mg/kg-d)							
		Arsenic	Cobalt	Copper	Lead	Molybdenum	Nickel	Selenium	Uranium
Other Fruits and Juices (Cont'd)	Grapes	2.17E-07	5.21E-08	4.60E-05	6.11E-08	2.44E-06	3.04E-07	4.30E-08	2.04E-08
	Grape Juice, Bottled	4.02E-07	7.65E-08	2.18E-06	2.84E-07	1.44E-06	5.26E-07	2.06E-08	1.23E-07
	Peaches	6.68E-07	3.46E-07	7.36E-05	1.49E-06	6.44E-06	8.24E-06	1.08E-07	6.57E-08
	Pears	3.95E-07	8.24E-07	7.79E-05	1.68E-07	5.55E-06	3.16E-06	1.43E-07	1.97E-08
	Plums, Dried Prunes & Canned Plums	3.55E-07	2.51E-07	6.23E-05	3.12E-07	1.56E-05	6.67E-06	9.14E-08	3.35E-08
	Cherries	1.10E-07	5.61E-08	1.60E-05	5.48E-08	8.28E-07	5.27E-07	3.08E-08	2.18E-08
	Melons	7.30E-07	4.52E-07	4.18E-05	4.21E-07	6.08E-06	6.86E-06	1.71E-06	1.44E-08
	Pineapple	2.40E-07	2.91E-07	1.45E-05	5.48E-07	1.50E-06	3.80E-06	2.87E-08	1.39E-08
	Raisins	1.92E-07	7.52E-08	2.26E-05	2.13E-07	2.58E-06	4.32E-07	7.69E-08	2.10E-08
	Total Other Fruits & Juices	**7.27E-06**	**5.91E-06**	**1.18E-03**	**7.40E-06**	**1.81E-04**	**7.53E-05**	**4.97E-06**	**3.69E-06**
Other Vegetables	Soups, Other [(c)]	1.54E-06	1.10E-06	1.61E-04	2.11E-06	1.94E-05	3.26E-05	4.53E-06	1.93E-06
	Soups, Dehydrated	2.16E-07	2.06E-07	3.87E-05	5.62E-07	5.13E-06	2.68E-06	5.38E-06	6.51E-07
	Corn	1.65E-07	1.64E-07	4.79E-05	3.09E-07	1.32E-05	3.88E-06	1.19E-06	1.69E-07
	Cabbage	2.33E-07	8.31E-07	3.24E-05	5.79E-07	1.27E-04	2.15E-05	1.64E-06	8.08E-07
	Celery	5.50E-07	2.50E-07	3.68E-05	3.93E-07	2.53E-06	4.28E-06	5.31E-07	3.01E-07
	Peppers	1.30E-08	1.16E-07	1.35E-05	4.54E-08	3.97E-07	3.90E-06	2.70E-08	3.14E-09
	Lettuce	8.56E-07	1.36E-06	4.05E-05	7.23E-07	4.49E-08	1.51E-05	4.83E-07	2.50E-07
	Cauliflower	3.88E-08	1.71E-07	6.95E-06	8.80E-08	1.13E-06	1.27E-06	7.71E-07	9.91E-08
	Broccoli	9.07E-08	4.20E-07	1.40E-05	1.15E-07	2.16E-06	4.57E-06	2.82E-07	2.28E-07
	Beans	1.59E-07	6.57E-07	4.78E-05	5.72E-07	1.14E-05	2.10E-05	1.44E-07	3.23E-07
	Peas	1.79E-07	6.68E-07	1.18E-04	4.54E-07	4.72E-05	1.82E-05	1.96E-06	3.85E-07
	Tomatoes	1.43E-07	6.14E-07	7.40E-05	3.63E-07	1.43E-05	3.63E-06	4.90E-07	2.11E-08
	Tomato Juice, Canned	2.40E-07	5.57E-07	5.56E-05	1.84E-07	5.12E-06	6.01E-06	5.95E-07	3.97E-08
	Tomatoes/sauce, Canned & Ketchup	2.26E-07	4.33E-07	5.52E-05	7.64E-07	8.22E-06	5.36E-06	5.56E-07	1.32E-07
	Mushrooms, Canned	2.74E-07	7.61E-09	5.75E-05	7.05E-08	4.17E-07	1.44E-07	4.58E-06	8.02E-08
	Cucumbers	6.87E-07	4.92E-07	4.92E-05	5.14E-07	5.37E-06	7.40E-06	2.81E-07	2.31E-07
	Baked Beans	3.50E-07	1.94E-06	2.24E-04	6.14E-07	4.62E-05	1.74E-05	2.75E-06	4.02E-08
	Total Other Vegetables	**5.96E-06**	**9.99E-06**	**1.07E-03**	**8.46E-06**	**3.09E-04**	**1.69E-04**	**2.62E-05**	**5.69E-06**

Table A.4 Detailed Breakdown of Estimated Daily Intakes of Non-Radiological COPC from Consumption of Non-Country Foods – Adult (Cont'd)

Food Group [(a)]	Food Composite Item	EDIs of Food - Adult (mg/kg-d)							
		Arsenic	Cobalt	Copper	Lead	Molybdenum	Nickel	Selenium	Uranium
Root Vegetables	Potatoes [(d)]	2.17E-06	2.01E-05	1.25E-03	4.67E-06	5.77E-05	1.59E-04	5.66E-06	3.34E-06
	Potatoes, French Fried, Frozen	2.98E-06	4.80E-06	3.04E-04	5.80E-07	2.27E-05	6.08E-05	5.77E-06	7.05E-07
	Potatoes, Chips	1.29E-07	5.96E-07	3.17E-05	3.47E-08	3.49E-06	3.14E-06	4.34E-07	1.22E-08
	Carrots	6.43E-07	7.91E-07	9.23E-05	2.56E-06	7.59E-06	2.98E-05	6.19E-07	9.35E-07
	Onion	3.30E-07	2.11E-07	4.25E-05	2.90E-07	1.05E-06	3.04E-06	1.56E-07	2.90E-07
	Rutabagas Or Turnip	1.04E-07	3.84E-07	1.68E-05	1.39E-07	3.11E-06	5.22E-06	6.43E-07	2.74E-07
	Beets	4.63E-08	1.35E-07	1.26E-05	1.55E-07	4.11E-07	1.21E-06	8.95E-08	3.03E-08
	Total Root Vegetables	**6.40E-06**	**2.70E-05**	**1.75E-03**	**8.43E-06**	**9.61E-05**	**2.62E-04**	**1.34E-05**	**5.59E-06**
Sugar and Sweets	Sugar, White	1.75E-07	1.33E-07	9.14E-06	9.96E-08	1.25E-05	4.52E-07	2.60E-07	3.62E-09
	Syrup	8.29E-08	6.38E-08	2.48E-06	1.97E-07	2.15E-06	1.88E-06	1.68E-08	6.99E-09
	Jams	3.07E-07	1.06E-06	2.08E-05	3.35E-07	3.99E-06	3.52E-06	2.14E-07	3.56E-08
	Honey	4.88E-08	7.00E-08	2.43E-06	2.36E-07	2.09E-06	4.50E-07	4.31E-08	2.56E-09
	Puddings	2.66E-07	1.54E-06	6.13E-05	2.44E-07	9.58E-06	1.70E-05	1.77E-06	8.61E-08
	Candy, Chocolate Bars	4.52E-07	3.07E-06	1.31E-04	4.78E-07	2.96E-05	3.66E-05	1.72E-06	2.13E-08
	Candy, Others	2.58E-07	2.36E-07	1.14E-05	2.95E-07	3.02E-05	1.50E-06	6.07E-07	3.56E-08
	Gelatin Dessert	3.30E-07	8.20E-08	1.36E-05	4.39E-07	7.26E-06	1.18E-06	2.21E-07	6.80E-07
	Total Sugar & Sweets	**1.92E-06**	**6.26E-06**	**2.53E-04**	**2.32E-06**	**9.74E-05**	**6.25E-05**	**4.85E-06**	**8.72E-07**
Organs	Organ Meats, Liver, Kidney	2.52E-07	2.97E-06	5.40E-03	7.42E-07	4.28E-05	1.70E-06	4.52E-05	6.23E-09
	Total Organs	**2.52E-07**	**2.97E-06**	**5.40E-03**	**7.42E-07**	**4.28E-05**	**1.70E-06**	**4.52E-05**	**6.23E-09**
Total Non-Country Foods		**1.10E-04**	**1.39E-04**	**1.66E-02**	**9.83E-05**	**2.09E-03**	**1.84E-03**	**1.22E-03**	**7.44E-05**

Notes:
(a) Food groups developed by Health Canada 1994.
(b) Includes raw and canned citrus fruits.
(c) Includes raw, baked and boiled (skins on and skins off) potatoes.
(d) Includes canned pea and canned tomato soups.

ANNEX B

DETAILED RESULTS

Table B.6.3-1 Estimated Daily Intakes of Arsenic from Food Consumption

Receptor	Arsenic EDIs (mg/kg-d)							
	Non-Country Food	Moose	Caribou	Other Meat/ Poultry	Fish	Berries	Drinking Water	Total
Child								
Typical Cdn	2.16E-04	0.00E+00	0.00E+00	2.02E-05	8.62E-04	1.31E-06	0.00E+00	1.10E-03
Cdn Fish Eater	2.16E-04	0.00E+00	0.00E+00	9.19E-06	9.27E-03	1.31E-06	0.00E+00	9.50E-03
Camsell Portage (Mean)	2.16E-04	0.00E+00	7.42E-05	0.00E+00	2.26E-04	1.89E-06	3.65E-06	5.21E-04
Camsell Portage (Max)	2.16E-04	0.00E+00	7.42E-05	0.00E+00	5.06E-04	1.89E-06	4.86E-06	8.03E-04
Wollaston Lake (Mean)	2.16E-04	0.00E+00	1.04E-04	0.00E+00	1.33E-04	1.89E-06	2.43E-06	4.57E-04
Wollaston Lake (Max)	2.16E-04	0.00E+00	1.48E-04	0.00E+00	3.20E-04	1.89E-06	2.43E-06	6.88E-04
Black Lake (Mean)	2.16E-04	0.00E+00	1.63E-04	0.00E+00	1.66E-04	1.89E-06	2.43E-06	5.50E-04
Black Lake (Max)	2.16E-04	0.00E+00	2.97E-04	0.00E+00	5.33E-04	1.89E-06	2.43E-06	1.05E-03
Stony Rapids (Mean)	2.16E-04	0.00E+00	8.90E-05	0.00E+00	7.50E-05	1.89E-06	4.86E-06	3.87E-04
Stony Rapids (Max)	2.16E-04	0.00E+00	1.48E-04	0.00E+00	2.40E-04	1.89E-06	4.86E-06	6.11E-04
Fond du Lac (Mean)	2.16E-04	0.00E+00	1.08E-04	0.00E+00	2.25E-04	1.89E-06	2.43E-06	5.53E-04
Fond du Lac (Max)	2.16E-04	0.00E+00	1.48E-04	0.00E+00	6.92E-04	1.89E-06	2.43E-06	1.06E-03
UC (Crackiingstone) (Mean)	2.15E-04	1.08E-05	0.00E+00	0.00E+00	2.20E-04	4.32E-06	4.86E-06	4.55E-04
UC (Crackiingstone) (Max)	2.15E-04	1.90E-05	0.00E+00	0.00E+00	7.46E-04	4.32E-06	4.86E-06	9.89E-04
UC (Fredette River) (Mean)	2.15E-04	1.08E-05	0.00E+00	0.00E+00	1.91E-04	4.32E-06	3.65E-06	4.25E-04
UC (Fredette River) (Max)	2.15E-04	1.90E-05	0.00E+00	0.00E+00	3.23E-04	4.32E-06	4.86E-06	5.66E-04
Adult								
Typical Cdn	1.10E-04	0.00E+00	0.00E+00	1.36E-05	5.71E-04	7.79E-07	0.00E+00	6.94E-04
Cdn Fish Eater	1.10E-04	0.00E+00	0.00E+00	7.34E-06	4.57E-03	7.79E-07	0.00E+00	4.69E-03
Camsell Portage (Mean)	1.09E-04	0.00E+00	5.21E-05	0.00E+00	1.68E-04	1.86E-07	3.18E-06	3.33E-04
Camsell Portage (Max)	1.09E-04	0.00E+00	5.21E-05	0.00E+00	3.76E-04	1.86E-07	4.24E-06	5.42E-04
Wollaston Lake (Mean)	1.09E-04	0.00E+00	7.30E-05	0.00E+00	9.90E-05	1.86E-07	2.12E-06	2.84E-04
Wollaston Lake (Max)	1.09E-04	0.00E+00	1.04E-04	0.00E+00	2.38E-04	1.86E-07	2.12E-06	4.53E-04
Black Lake (Mean)	1.09E-04	0.00E+00	1.15E-04	0.00E+00	1.24E-04	1.86E-07	2.12E-06	3.50E-04
Black Lake (Max)	1.09E-04	0.00E+00	2.08E-04	0.00E+00	3.96E-04	1.86E-07	2.12E-06	7.16E-04
Stony Rapids (Mean)	1.09E-04	0.00E+00	6.25E-05	0.00E+00	5.58E-05	1.86E-07	4.24E-06	2.32E-04
Stony Rapids (Max)	1.09E-04	0.00E+00	1.04E-04	0.00E+00	1.78E-04	1.86E-07	4.24E-06	3.96E-04
Fond du Lac (Mean)	1.09E-04	0.00E+00	7.58E-05	0.00E+00	1.67E-04	1.86E-07	2.12E-06	3.55E-04
Fond du Lac (Max)	1.09E-04	0.00E+00	1.04E-04	0.00E+00	5.15E-04	1.86E-07	2.12E-06	7.31E-04
UC (Crackiingstone) (Mean)	1.09E-04	1.10E-05	0.00E+00	0.00E+00	1.33E-04	1.86E-06	4.24E-06	2.59E-04
UC (Crackiingstone) (Max)	1.09E-04	1.92E-05	0.00E+00	0.00E+00	4.51E-04	1.86E-06	4.24E-06	5.85E-04
UC (Fredette River) (Mean)	1.09E-04	1.10E-05	0.00E+00	0.00E+00	1.16E-04	1.86E-06	3.18E-06	2.40E-04
UC (Fredette River) (Max)	1.09E-04	1.92E-05	0.00E+00	0.00E+00	1.95E-04	1.86E-06	4.24E-06	3.29E-04

Table B.6.3-2 Estimated Daily Intakes of Cobalt from Food Consumption

Receptor	Cobalt EDIs (mg/kg-d)							
	Non-Country Food	Moose	Caribou	Other Meat/ Poultry	Fish	Berries	Drinking Water	Total
Child								
Typical Cdn	2.74E-04	0.00E+00	0.00E+00	9.00E-05	1.02E-06	3.26E-06	0.00E+00	3.68E-04
Cdn Fish Eater	2.74E-04	0.00E+00	0.00E+00	2.67E-05	1.10E-05	3.26E-06	0.00E+00	3.15E-04
Camsell Portage (Mean)	2.74E-04	0.00E+00	1.48E-05	0.00E+00	3.33E-06	4.15E-07	2.43E-06	2.95E-04
Camsell Portage (Max)	2.74E-04	0.00E+00	1.48E-05	0.00E+00	9.32E-06	7.54E-07	2.43E-06	3.02E-04
Wollaston Lake (Mean)	2.74E-04	0.00E+00	3.86E-05	0.00E+00	2.93E-06	4.15E-07	2.43E-06	3.19E-04
Wollaston Lake (Max)	2.74E-04	0.00E+00	5.94E-05	0.00E+00	6.66E-06	7.54E-07	2.43E-06	3.43E-04
Black Lake (Mean)	2.74E-04	0.00E+00	3.26E-05	0.00E+00	3.20E-06	5.28E-07	2.43E-06	3.13E-04
Black Lake (Max)	2.74E-04	0.00E+00	5.94E-05	0.00E+00	6.66E-06	1.89E-06	2.43E-06	3.45E-04
Stony Rapids (Mean)	2.74E-04	0.00E+00	2.97E-05	0.00E+00	5.75E-06	6.41E-07	2.43E-06	3.13E-04
Stony Rapids (Max)	2.74E-04	0.00E+00	4.45E-05	0.00E+00	1.60E-05	2.64E-06	2.43E-06	3.40E-04
Fond du Lac (Mean)	2.74E-04	0.00E+00	3.44E-05	0.00E+00	4.13E-06	4.90E-07	2.43E-06	3.16E-04
Fond du Lac (Max)	2.74E-04	0.00E+00	9.65E-05	0.00E+00	2.00E-05	7.54E-07	2.43E-06	3.94E-04
UC (Crackiingstone) (Mean)	2.74E-04	1.15E-05	0.00E+00	0.00E+00	6.13E-06	2.42E-06	2.43E-06	2.96E-04
UC (Crackiingstone) (Max)	2.74E-04	1.61E-05	0.00E+00	0.00E+00	2.24E-05	1.21E-05	2.43E-06	3.27E-04
UC (Fredette River) (Mean)	2.74E-04	1.15E-05	0.00E+00	0.00E+00	9.70E-06	2.42E-06	2.43E-06	3.00E-04
UC (Fredette River) (Max)	2.74E-04	1.61E-05	0.00E+00	0.00E+00	3.23E-05	1.21E-05	2.43E-06	3.36E-04
Adult								
Typical Cdn	1.39E-04	0.00E+00	0.00E+00	4.89E-05	7.57E-07	1.58E-06	0.00E+00	1.90E-04
Cdn Fish Eater	1.39E-04	0.00E+00	0.00E+00	2.09E-05	6.07E-06	1.58E-06	0.00E+00	1.68E-04
Camsell Portage (Mean)	1.39E-04	0.00E+00	1.04E-05	0.00E+00	2.48E-06	4.09E-08	2.12E-06	1.54E-04
Camsell Portage (Max)	1.39E-04	0.00E+00	1.04E-05	0.00E+00	6.93E-06	7.43E-08	2.12E-06	1.58E-04
Wollaston Lake (Mean)	1.39E-04	0.00E+00	2.71E-05	0.00E+00	2.18E-06	4.09E-08	2.12E-06	1.70E-04
Wollaston Lake (Max)	1.39E-04	0.00E+00	4.17E-05	0.00E+00	4.95E-06	7.43E-08	2.12E-06	1.88E-04
Black Lake (Mean)	1.39E-04	0.00E+00	2.29E-05	0.00E+00	2.38E-06	5.20E-08	2.12E-06	1.66E-04
Black Lake (Max)	1.39E-04	0.00E+00	4.17E-05	0.00E+00	4.95E-06	1.86E-07	2.12E-06	1.88E-04
Stony Rapids (Mean)	1.39E-04	0.00E+00	2.08E-05	0.00E+00	4.27E-06	6.32E-08	2.12E-06	1.66E-04
Stony Rapids (Max)	1.39E-04	0.00E+00	3.13E-05	0.00E+00	1.19E-05	2.60E-07	2.12E-06	1.84E-04
Fond du Lac (Mean)	1.39E-04	0.00E+00	2.42E-05	0.00E+00	3.07E-06	4.83E-08	2.12E-06	1.68E-04
Fond du Lac (Max)	1.39E-04	0.00E+00	6.77E-05	0.00E+00	1.49E-05	7.43E-08	2.12E-06	2.24E-04
UC (Crackiingstone) (Mean)	1.38E-04	1.17E-05	0.00E+00	0.00E+00	3.71E-06	1.04E-06	2.12E-06	1.57E-04
UC (Crackiingstone) (Max)	1.38E-04	1.63E-05	0.00E+00	0.00E+00	1.35E-05	5.21E-06	2.12E-06	1.75E-04
UC (Fredette River) (Mean)	1.38E-04	1.17E-05	0.00E+00	0.00E+00	5.86E-06	1.04E-06	2.12E-06	1.59E-04
UC (Fredette River) (Max)	1.38E-04	1.63E-05	0.00E+00	0.00E+00	1.95E-05	5.21E-06	2.12E-06	1.82E-04

Table B.6.3-3 Estimated Daily Intakes of Copper from Food Consumption

Receptor	Copper EDIs (mg/kg-d)							
	Non-Country Food	Moose	Caribou	Other Meat/ Poultry	Fish	Berries	Drinking Water	Total
Child								
Typical Cdn	2.91E-02	0.00E+00	0.00E+00	3.65E-03	1.10E-04	9.21E-05	0.00E+00	3.29E-02
Cdn Fish Eater	2.91E-02	0.00E+00	0.00E+00	1.26E-03	1.19E-03	9.21E-05	0.00E+00	3.16E-02
Camsell Portage (Mean)	2.91E-02	0.00E+00	2.75E-02	0.00E+00	3.70E-04	1.43E-04	4.86E-06	5.71E-02
Camsell Portage (Max)	2.91E-02	0.00E+00	2.75E-02	0.00E+00	7.72E-04	1.85E-04	4.86E-06	5.75E-02
Wollaston Lake (Mean)	2.91E-02	0.00E+00	2.37E-02	0.00E+00	4.07E-04	1.06E-04	4.86E-06	5.34E-02
Wollaston Lake (Max)	2.91E-02	0.00E+00	3.26E-02	0.00E+00	9.19E-04	1.32E-04	4.86E-06	6.28E-02
Black Lake (Mean)	2.91E-02	0.00E+00	2.46E-02	0.00E+00	3.75E-04	1.21E-04	4.86E-06	5.42E-02
Black Lake (Max)	2.91E-02	0.00E+00	3.19E-02	0.00E+00	1.33E-03	1.43E-04	4.86E-06	6.25E-02
Stony Rapids (Mean)	2.91E-02	0.00E+00	3.07E-02	0.00E+00	3.27E-04	9.32E-05	4.86E-06	6.02E-02
Stony Rapids (Max)	2.91E-02	0.00E+00	3.49E-02	0.00E+00	1.04E-03	1.21E-04	4.86E-06	6.51E-02
Fond du Lac (Mean)	2.91E-02	0.00E+00	2.34E-02	0.00E+00	3.04E-04	1.25E-04	4.86E-06	5.29E-02
Fond du Lac (Max)	2.91E-02	0.00E+00	3.19E-02	0.00E+00	5.33E-04	1.47E-04	4.86E-06	6.17E-02
UC (Crackiingstone) (Mean)	2.89E-02	1.69E-03	0.00E+00	0.00E+00	4.99E-04	3.05E-04	4.86E-06	3.15E-02
UC (Crackiingstone) (Max)	2.89E-02	3.61E-03	0.00E+00	0.00E+00	7.46E-04	5.09E-04	4.86E-06	3.38E-02
UC (Fredette River) (Mean)	2.89E-02	1.69E-03	0.00E+00	0.00E+00	4.85E-04	3.05E-04	4.86E-06	3.14E-02
UC (Fredette River) (Max)	2.89E-02	3.61E-03	0.00E+00	0.00E+00	6.71E-04	5.09E-04	4.86E-06	3.37E-02
Adult								
Typical Cdn	1.66E-02	0.00E+00	0.00E+00	2.46E-03	1.04E-04	4.97E-05	0.00E+00	1.92E-02
Cdn Fish Eater	1.66E-02	0.00E+00	0.00E+00	1.14E-03	8.32E-04	4.97E-05	0.00E+00	1.86E-02
Camsell Portage (Mean)	1.65E-02	0.00E+00	1.93E-02	0.00E+00	2.75E-04	1.41E-05	4.24E-06	3.61E-02
Camsell Portage (Max)	1.65E-02	0.00E+00	1.93E-02	0.00E+00	5.74E-04	1.82E-05	4.24E-06	3.64E-02
Wollaston Lake (Mean)	1.65E-02	0.00E+00	1.67E-02	0.00E+00	3.03E-04	1.04E-05	4.24E-06	3.35E-02
Wollaston Lake (Max)	1.65E-02	0.00E+00	2.29E-02	0.00E+00	6.83E-04	1.30E-05	4.24E-06	4.01E-02
Black Lake (Mean)	1.65E-02	0.00E+00	1.73E-02	0.00E+00	2.79E-04	1.19E-05	4.24E-06	3.41E-02
Black Lake (Max)	1.65E-02	0.00E+00	2.24E-02	0.00E+00	9.90E-04	1.41E-05	4.24E-06	3.99E-02
Stony Rapids (Mean)	1.65E-02	0.00E+00	2.16E-02	0.00E+00	2.43E-04	9.18E-06	4.24E-06	3.83E-02
Stony Rapids (Max)	1.65E-02	0.00E+00	2.45E-02	0.00E+00	7.72E-04	1.19E-05	4.24E-06	4.18E-02
Fond du Lac (Mean)	1.65E-02	0.00E+00	1.64E-02	0.00E+00	2.26E-04	1.23E-05	4.24E-06	3.32E-02
Fond du Lac (Max)	1.65E-02	0.00E+00	2.24E-02	0.00E+00	3.96E-04	1.45E-05	4.24E-06	3.93E-02
UC (Crackiingstone) (Mean)	1.64E-02	1.71E-03	0.00E+00	0.00E+00	3.02E-04	1.31E-04	4.24E-06	1.86E-02
UC (Crackiingstone) (Max)	1.64E-02	3.65E-03	0.00E+00	0.00E+00	4.51E-04	2.19E-04	4.24E-06	2.07E-02
UC (Fredette River) (Mean)	1.64E-02	1.71E-03	0.00E+00	0.00E+00	2.93E-04	1.31E-04	4.24E-06	1.85E-02
UC (Fredette River) (Max)	1.64E-02	3.65E-03	0.00E+00	0.00E+00	4.06E-04	2.19E-04	4.24E-06	2.07E-02

Table B.6.3-4 Estimated Daily Intakes of Lead from Food Consumption

Receptor	Lead EDIs (mg/kg-d)							
	Non-Country Food	Moose	Caribou	Other Meat/ Poultry	Fish	Berries	Drinking Water	Total
Child								
Typical Cdn	1.23E-04	0.00E+00	0.00E+00	1.48E-05	8.63E-07	5.69E-07	0.00E+00	1.39E-04
Cdn Fish Eater	1.23E-04	0.00E+00	0.00E+00	5.06E-06	9.28E-06	5.69E-07	0.00E+00	1.38E-04
Camsell Portage (Mean)	1.23E-04	0.00E+00	1.48E-05	0.00E+00	2.72E-06	5.28E-07	2.43E-06	1.44E-04
Camsell Portage (Max)	1.23E-04	0.00E+00	1.48E-05	0.00E+00	3.99E-06	1.51E-06	2.43E-06	1.46E-04
Wollaston Lake (Mean)	1.23E-04	0.00E+00	1.13E-04	0.00E+00	2.66E-06	6.41E-07	2.43E-06	2.42E-04
Wollaston Lake (Max)	1.23E-04	0.00E+00	3.78E-04	0.00E+00	2.66E-06	1.51E-06	2.43E-06	5.08E-04
Black Lake (Mean)	1.23E-04	0.00E+00	4.54E-05	0.00E+00	3.06E-06	1.02E-06	2.43E-06	1.75E-04
Black Lake (Max)	1.23E-04	0.00E+00	9.65E-05	0.00E+00	5.33E-06	2.64E-06	2.43E-06	2.30E-04
Stony Rapids (Mean)	1.23E-04	0.00E+00	1.23E-04	0.00E+00	2.66E-06	1.02E-06	2.43E-06	2.52E-04
Stony Rapids (Max)	1.23E-04	0.00E+00	4.82E-04	0.00E+00	2.66E-06	3.77E-06	2.43E-06	6.14E-04
Fond du Lac (Mean)	1.23E-04	0.00E+00	3.78E-05	0.00E+00	3.13E-06	5.66E-07	2.43E-06	1.67E-04
Fond du Lac (Max)	1.23E-04	0.00E+00	1.04E-04	0.00E+00	5.33E-06	1.13E-06	2.43E-06	2.36E-04
UC (Crackiingstone) (Mean)	1.22E-04	3.12E-06	0.00E+00	0.00E+00	4.97E-06	1.04E-06	2.43E-06	1.34E-04
UC (Crackiingstone) (Max)	1.22E-04	4.74E-06	0.00E+00	0.00E+00	4.97E-06	1.73E-06	2.43E-06	1.36E-04
UC (Fredette River) (Mean)	1.22E-04	3.12E-06	0.00E+00	0.00E+00	4.97E-06	1.04E-06	2.43E-06	1.34E-04
UC (Fredette River) (Max)	1.22E-04	4.74E-06	0.00E+00	0.00E+00	4.97E-06	1.73E-06	2.43E-06	1.36E-04
Adult								
Typical Cdn	9.83E-05	0.00E+00	0.00E+00	9.56E-06	6.88E-07	3.14E-07	0.00E+00	1.09E-04
Cdn Fish Eater	9.83E-05	0.00E+00	0.00E+00	4.40E-06	5.51E-06	3.14E-07	0.00E+00	1.08E-04
Camsell Portage (Mean)	9.79E-05	0.00E+00	1.04E-05	0.00E+00	2.03E-06	5.20E-08	2.12E-06	1.13E-04
Camsell Portage (Max)	9.79E-05	0.00E+00	1.04E-05	0.00E+00	2.97E-06	1.49E-07	2.12E-06	1.14E-04
Wollaston Lake (Mean)	9.79E-05	0.00E+00	7.92E-05	0.00E+00	1.98E-06	6.32E-08	2.12E-06	1.81E-04
Wollaston Lake (Max)	9.79E-05	0.00E+00	2.66E-04	0.00E+00	1.98E-06	1.49E-07	2.12E-06	3.68E-04
Black Lake (Mean)	9.79E-05	0.00E+00	3.19E-05	0.00E+00	2.28E-06	1.00E-07	2.12E-06	1.34E-04
Black Lake (Max)	9.79E-05	0.00E+00	6.77E-05	0.00E+00	3.96E-06	2.60E-07	2.12E-06	1.72E-04
Stony Rapids (Mean)	9.79E-05	0.00E+00	8.65E-05	0.00E+00	1.98E-06	1.00E-07	2.12E-06	1.89E-04
Stony Rapids (Max)	9.79E-05	0.00E+00	3.39E-04	0.00E+00	1.98E-06	3.72E-07	2.12E-06	4.41E-04
Fond du Lac (Mean)	9.79E-05	0.00E+00	2.65E-05	0.00E+00	2.33E-06	5.58E-08	2.12E-06	1.29E-04
Fond du Lac (Max)	9.79E-05	0.00E+00	7.30E-05	0.00E+00	3.96E-06	1.12E-07	2.12E-06	1.77E-04
UC (Crackiingstone) (Mean)	9.73E-05	3.15E-06	0.00E+00	0.00E+00	3.01E-06	4.46E-07	2.12E-06	1.06E-04
UC (Crackiingstone) (Max)	9.73E-05	4.80E-06	0.00E+00	0.00E+00	3.01E-06	7.44E-07	2.12E-06	1.08E-04
UC (Fredette River) (Mean)	9.73E-05	3.15E-06	0.00E+00	0.00E+00	3.01E-06	4.46E-07	2.12E-06	1.06E-04
UC (Fredette River) (Max)	9.73E-05	4.80E-06	0.00E+00	0.00E+00	3.01E-06	7.44E-07	2.12E-06	1.08E-04

Table B.6.3-5 Estimated Daily Intakes of Molybdenum from Food Consumption

Receptor	Molybdenum EDIs (mg/kg-d)							
	Non-Country Food	Moose	Caribou	Other Meat/ Poultry	Fish	Berries	Drinking Water	Total
Child								
Typical Cdn	4.62E-03	0.00E+00	0.00E+00	1.28E-04	1.29E-06	3.38E-05	0.00E+00	4.79E-03
Cdn Fish Eater	4.62E-03	0.00E+00	0.00E+00	5.33E-05	1.38E-05	3.38E-05	0.00E+00	4.72E-03
Camsell Portage (Mean)	4.62E-03	0.00E+00	1.48E-03	0.00E+00	2.66E-05	5.28E-06	4.86E-06	6.14E-03
Camsell Portage (Max)	4.62E-03	0.00E+00	1.48E-03	0.00E+00	2.66E-05	7.54E-06	4.86E-06	6.15E-03
Wollaston Lake (Mean)	4.62E-03	0.00E+00	1.48E-04	0.00E+00	2.66E-05	5.28E-06	2.92E-05	4.83E-03
Wollaston Lake (Max)	4.62E-03	0.00E+00	1.48E-04	0.00E+00	2.66E-05	1.13E-05	2.92E-05	4.84E-03
Black Lake (Mean)	4.62E-03	0.00E+00	8.16E-04	0.00E+00	2.66E-05	4.90E-06	3.65E-06	5.47E-03
Black Lake (Max)	4.62E-03	0.00E+00	1.48E-03	0.00E+00	2.66E-05	7.54E-06	4.86E-06	6.15E-03
Stony Rapids (Mean)	4.62E-03	0.00E+00	1.48E-04	0.00E+00	2.66E-05	6.79E-06	4.86E-06	4.81E-03
Stony Rapids (Max)	4.62E-03	0.00E+00	1.48E-04	0.00E+00	2.66E-05	1.51E-05	4.86E-06	4.82E-03
Fond du Lac (Mean)	4.62E-03	0.00E+00	1.48E-04	0.00E+00	2.66E-05	9.81E-06	2.43E-06	4.81E-03
Fond du Lac (Max)	4.62E-03	0.00E+00	1.48E-04	0.00E+00	2.66E-05	1.51E-05	2.43E-06	4.82E-03
UC (Crackiingstone) (Mean)	4.59E-03	2.30E-05	0.00E+00	0.00E+00	4.97E-05	1.47E-05	9.73E-06	4.69E-03
UC (Crackiingstone) (Max)	4.59E-03	4.74E-05	0.00E+00	0.00E+00	4.97E-05	3.45E-05	1.46E-05	4.74E-03
UC (Fredette River) (Mean)	4.59E-03	2.30E-05	0.00E+00	0.00E+00	4.97E-05	1.47E-05	9.73E-06	4.69E-03
UC (Fredette River) (Max)	4.59E-03	4.74E-05	0.00E+00	0.00E+00	4.97E-05	3.45E-05	9.73E-06	4.73E-03
Adult								
Typical Cdn	2.09E-03	0.00E+00	0.00E+00	7.66E-05	1.07E-06	1.68E-05	0.00E+00	2.19E-03
Cdn Fish Eater	2.09E-03	0.00E+00	0.00E+00	4.01E-05	8.58E-06	1.68E-05	0.00E+00	2.16E-03
Camsell Portage (Mean)	2.09E-03	0.00E+00	1.04E-03	0.00E+00	1.98E-05	5.20E-07	4.24E-06	3.15E-03
Camsell Portage (Max)	2.09E-03	0.00E+00	1.04E-03	0.00E+00	1.98E-05	7.43E-07	4.24E-06	3.15E-03
Wollaston Lake (Mean)	2.09E-03	0.00E+00	1.04E-04	0.00E+00	1.98E-05	5.20E-07	2.55E-05	2.23E-03
Wollaston Lake (Max)	2.09E-03	0.00E+00	1.04E-04	0.00E+00	1.98E-05	1.12E-06	2.55E-05	2.24E-03
Black Lake (Mean)	2.09E-03	0.00E+00	5.73E-04	0.00E+00	1.98E-05	4.83E-07	3.18E-06	2.68E-03
Black Lake (Max)	2.09E-03	0.00E+00	1.04E-03	0.00E+00	1.98E-05	7.43E-07	4.24E-06	3.15E-03
Stony Rapids (Mean)	2.09E-03	0.00E+00	1.04E-04	0.00E+00	1.98E-05	6.69E-07	4.24E-06	2.21E-03
Stony Rapids (Max)	2.09E-03	0.00E+00	1.04E-04	0.00E+00	1.98E-05	1.49E-06	4.24E-06	2.21E-03
Fond du Lac (Mean)	2.09E-03	0.00E+00	1.04E-04	0.00E+00	1.98E-05	9.66E-07	2.12E-06	2.21E-03
Fond du Lac (Max)	2.09E-03	0.00E+00	1.04E-04	0.00E+00	1.98E-05	1.49E-06	2.12E-06	2.21E-03
UC (Crackiingstone) (Mean)	2.07E-03	2.33E-05	0.00E+00	0.00E+00	3.01E-05	6.32E-06	8.49E-06	2.14E-03
UC (Crackiingstone) (Max)	2.07E-03	4.80E-05	0.00E+00	0.00E+00	3.01E-05	1.49E-05	1.27E-05	2.18E-03
UC (Fredette River) (Mean)	2.07E-03	2.33E-05	0.00E+00	0.00E+00	3.01E-05	6.32E-06	8.49E-06	2.14E-03
UC (Fredette River) (Max)	2.07E-03	4.80E-05	0.00E+00	0.00E+00	3.01E-05	1.49E-05	8.49E-06	2.17E-03

Table B.6.3-6 Estimated Daily Intakes of Nickel from Food Consumption

Receptor	Nickel EDIs (mg/kg-d)							
	Non-Country Food	Moose	Caribou	Other Meat/ Poultry	Fish	Berries	Drinking Water	Total
Child								
Typical Cdn	3.34E-03	0.00E+00	0.00E+00	1.19E-03	4.75E-06	1.67E-05	0.00E+00	4.56E-03
Cdn Fish Eater	3.34E-03	0.00E+00	0.00E+00	3.52E-04	5.11E-05	1.67E-05	0.00E+00	3.76E-03
Camsell Portage (Mean)	3.34E-03	0.00E+00	7.42E-05	0.00E+00	1.51E-05	1.91E-05	4.86E-06	3.46E-03
Camsell Portage (Max)	3.34E-03	0.00E+00	7.42E-05	0.00E+00	3.99E-05	2.98E-05	4.86E-06	3.49E-03
Wollaston Lake (Mean)	3.34E-03	0.00E+00	8.16E-05	0.00E+00	1.40E-05	2.10E-05	2.43E-06	3.46E-03
Wollaston Lake (Max)	3.34E-03	0.00E+00	1.48E-04	0.00E+00	2.66E-05	2.56E-05	2.43E-06	3.54E-03
Black Lake (Mean)	3.34E-03	0.00E+00	9.65E-05	0.00E+00	1.33E-05	2.07E-05	3.65E-06	3.48E-03
Black Lake (Max)	3.34E-03	0.00E+00	1.48E-04	0.00E+00	1.33E-05	2.56E-05	4.86E-06	3.53E-03
Stony Rapids (Mean)	3.34E-03	0.00E+00	7.42E-05	0.00E+00	1.61E-05	2.24E-05	3.65E-06	3.46E-03
Stony Rapids (Max)	3.34E-03	0.00E+00	7.42E-05	0.00E+00	6.66E-05	3.17E-05	4.86E-06	3.52E-03
Fond du Lac (Mean)	3.34E-03	0.00E+00	1.28E-04	0.00E+00	1.40E-05	2.49E-05	4.86E-06	3.51E-03
Fond du Lac (Max)	3.34E-03	0.00E+00	5.94E-04	0.00E+00	2.66E-05	3.66E-05	4.86E-06	4.00E-03
UC (Crackiingstone) (Mean)	3.33E-03	1.22E-05	0.00E+00	0.00E+00	4.06E-05	4.87E-05	4.86E-06	3.44E-03
UC (Crackiingstone) (Max)	3.33E-03	1.90E-05	0.00E+00	0.00E+00	1.99E-04	9.49E-05	4.86E-06	3.65E-03
UC (Fredette River) (Mean)	3.33E-03	1.22E-05	0.00E+00	0.00E+00	2.49E-05	4.87E-05	2.43E-06	3.42E-03
UC (Fredette River) (Max)	3.33E-03	1.90E-05	0.00E+00	0.00E+00	2.49E-05	9.49E-05	2.43E-06	3.47E-03
Adult								
Typical Cdn	1.84E-03	0.00E+00	0.00E+00	8.31E-04	3.66E-06	9.05E-06	0.00E+00	2.69E-03
Cdn Fish Eater	1.84E-03	0.00E+00	0.00E+00	3.53E-04	2.93E-05	9.05E-06	0.00E+00	2.24E-03
Camsell Portage (Mean)	1.84E-03	0.00E+00	5.21E-05	0.00E+00	1.13E-05	1.88E-06	4.24E-06	1.91E-03
Camsell Portage (Max)	1.84E-03	0.00E+00	5.21E-05	0.00E+00	2.97E-05	2.94E-06	4.24E-06	1.93E-03
Wollaston Lake (Mean)	1.84E-03	0.00E+00	5.73E-05	0.00E+00	1.04E-05	2.07E-06	2.12E-06	1.91E-03
Wollaston Lake (Max)	1.84E-03	0.00E+00	1.04E-04	0.00E+00	1.98E-05	2.53E-06	2.12E-06	1.97E-03
Black Lake (Mean)	1.84E-03	0.00E+00	6.77E-05	0.00E+00	9.90E-06	2.04E-06	3.18E-06	1.92E-03
Black Lake (Max)	1.84E-03	0.00E+00	1.04E-04	0.00E+00	9.90E-06	2.53E-06	4.24E-06	1.96E-03
Stony Rapids (Mean)	1.84E-03	0.00E+00	5.21E-05	0.00E+00	1.20E-05	2.21E-06	3.18E-06	1.91E-03
Stony Rapids (Max)	1.84E-03	0.00E+00	5.21E-05	0.00E+00	4.95E-05	3.12E-06	4.24E-06	1.95E-03
Fond du Lac (Mean)	1.84E-03	0.00E+00	9.00E-05	0.00E+00	1.04E-05	2.45E-06	4.24E-06	1.95E-03
Fond du Lac (Max)	1.84E-03	0.00E+00	4.17E-04	0.00E+00	1.98E-05	3.61E-06	4.24E-06	2.29E-03
UC (Crackiingstone) (Mean)	1.83E-03	1.23E-05	0.00E+00	0.00E+00	2.45E-05	2.10E-05	4.24E-06	1.90E-03
UC (Crackiingstone) (Max)	1.83E-03	1.92E-05	0.00E+00	0.00E+00	1.20E-04	4.09E-05	4.24E-06	2.02E-03
UC (Fredette River) (Mean)	1.83E-03	1.23E-05	0.00E+00	0.00E+00	1.50E-05	2.10E-05	2.12E-06	1.88E-03
UC (Fredette River) (Max)	1.83E-03	1.92E-05	0.00E+00	0.00E+00	1.50E-05	4.09E-05	2.12E-06	1.91E-03

Table B.6.3-7 Estimated Daily Intakes of Selenium from Food Consumption

Receptor	Selenium EDIs (mg/kg-d)							
	Non-Country Food	Moose	Caribou	Other Meat/ Poultry	Fish	Berries	Drinking Water	Total
Child								
Typical Cdn	3.03E-03	0.00E+00	0.00E+00	9.46E-04	1.50E-04	2.27E-06	0.00E+00	4.13E-03
Cdn Fish Eater	3.03E-03	0.00E+00	0.00E+00	4.26E-04	1.62E-03	2.27E-06	0.00E+00	5.08E-03
Camsell Portage (Mean)	3.03E-03	0.00E+00	1.67E-03	0.00E+00	2.62E-04	1.89E-06	2.43E-06	4.97E-03
Camsell Portage (Max)	3.03E-03	0.00E+00	1.71E-03	0.00E+00	4.13E-04	1.89E-06	2.43E-06	5.15E-03
Wollaston Lake (Mean)	3.03E-03	0.00E+00	1.19E-03	0.00E+00	4.42E-04	1.89E-06	2.43E-06	4.66E-03
Wollaston Lake (Max)	3.03E-03	0.00E+00	1.41E-03	0.00E+00	9.05E-04	1.89E-06	2.43E-06	5.35E-03
Black Lake (Mean)	3.03E-03	0.00E+00	1.43E-03	0.00E+00	2.79E-04	2.04E-06	2.43E-06	4.75E-03
Black Lake (Max)	3.03E-03	0.00E+00	2.00E-03	0.00E+00	4.79E-04	3.02E-06	2.43E-06	5.52E-03
Stony Rapids (Mean)	3.03E-03	0.00E+00	1.63E-03	0.00E+00	1.98E-04	1.89E-06	2.43E-06	4.87E-03
Stony Rapids (Max)	3.03E-03	0.00E+00	1.93E-03	0.00E+00	3.59E-04	1.89E-06	2.43E-06	5.32E-03
Fond du Lac (Mean)	3.03E-03	0.00E+00	1.26E-03	0.00E+00	2.43E-04	2.07E-06	2.43E-06	4.54E-03
Fond du Lac (Max)	3.03E-03	0.00E+00	2.52E-03	0.00E+00	3.86E-04	3.02E-06	2.43E-06	5.95E-03
UC (Crackiingstone) (Mean)	3.03E-03	1.15E-04	0.00E+00	0.00E+00	8.47E-04	4.32E-06	3.65E-06	4.00E-03
UC (Crackiingstone) (Max)	3.03E-03	1.71E-04	0.00E+00	0.00E+00	2.11E-03	4.32E-06	4.86E-06	5.32E-03
UC (Fredette River) (Mean)	3.03E-03	1.15E-04	0.00E+00	0.00E+00	5.42E-04	4.32E-06	2.43E-06	3.69E-03
UC (Fredette River) (Max)	3.03E-03	1.71E-04	0.00E+00	0.00E+00	7.96E-04	4.32E-06	2.43E-06	4.00E-03
Adult								
Typical Cdn	1.22E-03	0.00E+00	0.00E+00	6.93E-04	1.16E-04	1.11E-06	0.00E+00	2.02E-03
Cdn Fish Eater	1.22E-03	0.00E+00	0.00E+00	3.65E-04	9.29E-04	1.11E-06	0.00E+00	2.51E-03
Camsell Portage (Mean)	1.21E-03	0.00E+00	1.17E-03	0.00E+00	1.95E-04	1.86E-07	2.12E-06	2.58E-03
Camsell Portage (Max)	1.21E-03	0.00E+00	1.20E-03	0.00E+00	3.07E-04	1.86E-07	2.12E-06	2.72E-03
Wollaston Lake (Mean)	1.21E-03	0.00E+00	8.34E-04	0.00E+00	3.29E-04	1.86E-07	2.12E-06	2.38E-03
Wollaston Lake (Max)	1.21E-03	0.00E+00	9.90E-04	0.00E+00	6.73E-04	1.86E-07	2.12E-06	2.88E-03
Black Lake (Mean)	1.21E-03	0.00E+00	1.01E-03	0.00E+00	2.07E-04	2.01E-07	2.12E-06	2.43E-03
Black Lake (Max)	1.21E-03	0.00E+00	1.41E-03	0.00E+00	3.56E-04	2.97E-07	2.12E-06	2.98E-03
Stony Rapids (Mean)	1.21E-03	0.00E+00	1.15E-03	0.00E+00	1.47E-04	1.86E-07	2.12E-06	2.51E-03
Stony Rapids (Max)	1.21E-03	0.00E+00	1.35E-03	0.00E+00	2.67E-04	1.86E-07	2.12E-06	2.84E-03
Fond du Lac (Mean)	1.21E-03	0.00E+00	8.86E-04	0.00E+00	1.81E-04	2.04E-07	2.12E-06	2.28E-03
Fond du Lac (Max)	1.21E-03	0.00E+00	1.77E-03	0.00E+00	2.87E-04	2.97E-07	2.12E-06	3.28E-03
UC (Crackiingstone) (Mean)	1.21E-03	1.17E-04	0.00E+00	0.00E+00	5.12E-04	1.86E-06	3.18E-06	1.85E-03
UC (Crackiingstone) (Max)	1.21E-03	1.73E-04	0.00E+00	0.00E+00	1.28E-03	1.86E-06	4.24E-06	2.67E-03
UC (Fredette River) (Mean)	1.21E-03	1.17E-04	0.00E+00	0.00E+00	3.28E-04	1.86E-06	2.12E-06	1.66E-03
UC (Fredette River) (Max)	1.21E-03	1.73E-04	0.00E+00	0.00E+00	4.81E-04	1.86E-06	2.12E-06	1.87E-03

Table B.6.3-8 Estimated Daily Intakes of Uranium from Food Consumption

Receptor	Uranium EDIs (mg/kg-d)							
	Non-Country Food	Moose	Caribou	Other Meat/ Poultry	Fish	Berries	Drinking Water	Total
Child								
Typical Cdn	6.84E-05	0.00E+00	0.00E+00	4.76E-06	5.98E-07	1.18E-07	0.00E+00	7.38E-05
Cdn Fish Eater	6.84E-05	0.00E+00	0.00E+00	1.52E-06	6.43E-06	1.18E-07	0.00E+00	7.64E-05
Camsell Portage (Mean)	6.84E-05	0.00E+00	7.42E-06	0.00E+00	2.18E-06	6.79E-07	2.43E-06	8.11E-05
Camsell Portage (Max)	6.84E-05	0.00E+00	7.42E-06	0.00E+00	1.86E-05	3.02E-06	2.43E-06	9.99E-05
Wollaston Lake (Mean)	6.84E-05	0.00E+00	7.42E-06	0.00E+00	1.33E-06	4.15E-07	2.43E-06	8.00E-05
Wollaston Lake (Max)	6.84E-05	0.00E+00	7.42E-06	0.00E+00	1.33E-06	7.54E-07	2.43E-06	8.03E-05
Black Lake (Mean)	6.84E-05	0.00E+00	7.42E-06	0.00E+00	1.46E-06	3.77E-07	2.43E-06	8.01E-05
Black Lake (Max)	6.84E-05	0.00E+00	7.42E-06	0.00E+00	2.66E-06	3.77E-07	2.43E-06	8.13E-05
Stony Rapids (Mean)	6.84E-05	0.00E+00	8.90E-06	0.00E+00	1.40E-06	4.53E-07	2.43E-06	8.16E-05
Stony Rapids (Max)	6.84E-05	0.00E+00	1.48E-05	0.00E+00	2.66E-06	7.54E-07	2.43E-06	8.91E-05
Fond du Lac (Mean)	6.84E-05	0.00E+00	8.77E-06	0.00E+00	1.60E-06	4.15E-07	2.43E-06	8.16E-05
Fond du Lac (Max)	6.84E-05	0.00E+00	1.48E-05	0.00E+00	3.99E-06	7.54E-07	2.43E-06	9.04E-05
UC (Crackiingstone) (Mean)	6.79E-05	1.36E-06	0.00E+00	0.00E+00	4.89E-06	9.49E-07	1.76E-04	2.51E-04
UC (Crackiingstone) (Max)	6.79E-05	2.85E-06	0.00E+00	0.00E+00	2.98E-05	1.73E-06	3.40E-04	4.43E-04
UC (Fredette River) (Mean)	6.79E-05	1.36E-06	0.00E+00	0.00E+00	2.49E-06	9.49E-07	5.84E-05	1.31E-04
UC (Fredette River) (Max)	6.79E-05	2.85E-06	0.00E+00	0.00E+00	2.49E-06	1.73E-06	8.51E-05	1.60E-04
Adult								
Typical Cdn	7.44E-05	0.00E+00	0.00E+00	2.81E-06	5.53E-07	6.27E-08	0.00E+00	7.78E-05
Cdn Fish Eater	7.44E-05	0.00E+00	0.00E+00	1.26E-06	4.43E-06	6.27E-08	0.00E+00	8.02E-05
Camsell Portage (Mean)	7.42E-05	0.00E+00	5.21E-06	0.00E+00	1.62E-06	6.69E-08	2.12E-06	8.33E-05
Camsell Portage (Max)	7.42E-05	0.00E+00	5.21E-06	0.00E+00	1.39E-05	2.97E-07	2.12E-06	9.57E-05
Wollaston Lake (Mean)	7.42E-05	0.00E+00	5.21E-06	0.00E+00	9.90E-07	4.09E-08	2.12E-06	8.26E-05
Wollaston Lake (Max)	7.42E-05	0.00E+00	5.21E-06	0.00E+00	9.90E-07	7.43E-08	2.12E-06	8.26E-05
Black Lake (Mean)	7.42E-05	0.00E+00	5.21E-06	0.00E+00	1.09E-06	3.72E-08	2.12E-06	8.27E-05
Black Lake (Max)	7.42E-05	0.00E+00	5.21E-06	0.00E+00	1.98E-06	3.72E-08	2.12E-06	8.36E-05
Stony Rapids (Mean)	7.42E-05	0.00E+00	6.25E-06	0.00E+00	1.04E-06	4.46E-08	2.12E-06	8.37E-05
Stony Rapids (Max)	7.42E-05	0.00E+00	1.04E-05	0.00E+00	1.98E-06	7.43E-08	2.12E-06	8.88E-05
Fond du Lac (Mean)	7.42E-05	0.00E+00	6.16E-06	0.00E+00	1.19E-06	4.09E-08	2.12E-06	8.38E-05
Fond du Lac (Max)	7.42E-05	0.00E+00	1.04E-05	0.00E+00	2.97E-06	7.43E-08	2.12E-06	8.98E-05
UC (Crackiingstone) (Mean)	7.39E-05	1.37E-06	0.00E+00	0.00E+00	2.96E-06	4.09E-07	1.54E-04	2.32E-04
UC (Crackiingstone) (Max)	7.39E-05	2.88E-06	0.00E+00	0.00E+00	1.80E-05	7.44E-07	2.97E-04	3.93E-04
UC (Fredette River) (Mean)	7.39E-05	1.37E-06	0.00E+00	0.00E+00	1.50E-06	4.09E-07	5.09E-05	1.28E-04
UC (Fredette River) (Max)	7.39E-05	2.88E-06	0.00E+00	0.00E+00	1.50E-06	7.44E-07	7.43E-05	1.53E-04

Table B.6.3-9 Breakdown of Radiological Dose from Ingestion by Country Food Item

Receptor	Incremental Radiological Dose from Country Food Consumption (µSv/y)					
	Moose	Caribou	Fish	Berries	Drinking Water	Total
Child						
Wollaston Lake (Mean)	0.0	0.0	22	0.8	0.4	23
Wollaston Lake (Max)	0.0	1.1	101	2.0	0.7	105
Black Lake (Mean)	0.0	162	16	0.0	0.4	178
Black Lake (Max)	0.0	460	101	0.0	0.7	562
Stony Rapids (Mean)	0.0	123	0.2	0.9	1.1	125
Stony Rapids (Max)	0.0	156	21	0.0	2.2	179
Fond du Lac (Mean)	0.0	0.0	14	0.0	0.0	14
Fond du Lac (Max)	0.0	9.4	101	2.0	0.0	113
UC (Crackiingstone) (Mean)	0.0	0.0	29	18	4.8	51
UC (Crackiingstone) (Max)	45	0.0	133	106	9.3	294
UC (Fredette River) (Mean)	0.0	0.0	0.0	18	2.3	20
UC (Fredette River) (Max)	45	0.0	0.0	106	3.2	154
Adult						
Wollaston Lake (Mean)	0.0	0.0	34	0.2	0.7	35
Wollaston Lake (Max)	0.0	1.7	162	0.4	1.4	165
Black Lake (Mean)	0.0	244	26	0.0	0.7	271
Black Lake (Max)	0.0	694	162	0.0	1.4	857
Stony Rapids (Mean)	0.0	185	0.4	0.2	2.1	188
Stony Rapids (Max)	0.0	235	34	0.0	4.1	273
Fond du Lac (Mean)	0.0	0.0	22	0.0	0.0	22
Fond du Lac (Max)	0.0	14	162	0.4	0.0	176
UC (Crackiingstone) (Mean)	0.1	0.0	37	16	8.9	63
UC (Crackiingstone) (Max)	98	0.0	173	98	17	387
UC (Fredette River) (Mean)	0.1	0.0	0.0	16	4.2	21
UC (Fredette River) (Max)	98	0.0	0.0	98	5.9	202

Table B.6.3-10 Breakdown of Radiological Dose from Ingestion by Radionuclides

Receptor	Incremental Radiological Dose from Country Food Consumption (µSv/y)					
	Uranium-238	Thorium-230	Radium-226	Lead-210	Polonium-210	Total
Child						
Wollaston Lake (Mean)	0.0	0.6	2.6	14	5.2	23
Wollaston Lake (Max)	0.0	0.0	19	70	16	105
Black Lake (Mean)	0.0	9.8	153	12	2.7	178
Black Lake (Max)	0.0	22	455	70	14	562
Stony Rapids (Mean)	0.0	50	74	0.8	0.6	125
Stony Rapids (Max)	0.0	50	114	0.0	15	179
Fond du Lac (Mean)	0.0	0.2	1.2	12	0.0	14
Fond du Lac (Max)	0.0	2.8	23	70	16	113
UC (Crackiingstone) (Mean)	4.8	0.1	5.6	2.3	39	51
UC (Crackiingstone) (Max)	9.3	0.0	62	25	197	294
UC (Fredette River) (Mean)	1.5	0.1	6.3	2.3	9.9	20
UC (Fredette River) (Max)	2.3	0.0	61	25	66	154
Adult						
Wollaston Lake (Mean)	0.0	1.0	4.2	23	7.3	35
Wollaston Lake (Max)	0.0	0.0	30	112	23	165
Black Lake (Mean)	0.0	15	232	20	4.3	271
Black Lake (Max)	0.0	33	689	112	22	857
Stony Rapids (Mean)	0.0	75	111	0.2	1.2	188
Stony Rapids (Max)	0.0	75	173	0.0	25	273
Fond du Lac (Mean)	0.0	0.3	1.9	20	0.0	22
Fond du Lac (Max)	0.0	4.2	37	112	23	176
UC (Crackiingstone) (Mean)	9.0	0.1	5.2	2.1	46	63
UC (Crackiingstone) (Max)	17	0.0	58	55	256	387
UC (Fredette River) (Mean)	2.9	0.1	6.5	2.1	9.2	21
UC (Fredette River) (Max)	4.4	0.0	58	55	86	202

ANNEX C

TOXICOLOGICAL SUMMARIES

Arsenic

Arsenic exposure via the oral route is considered to be carcinogenic based on the incidence of skin cancers in epidemiological studies examining human exposure through drinking water (Tseng *et al.*, 1968; Tseng, 1977). The Health Canada Food Directorate currently uses a Margin of Exposure (MoE) approach when assessing health risks from inorganic arsenic intake. The MoE approach is consistent with the current Joint FAO/WHO Expert Committee on Food Additives (JECFA) and European Food Safety Authority (EFSA) approach using the low-end Benchmark Dose Level (BMDL0.5) value of 3 µg/kg bw/day for increased incidence of lung cancer that was derived by JECFA in 2010.

Cobalt

Health Canada, the CalEPA and the U.S. EPA do not provide exposure limits for cobalt.

The ATSDR (2009, updated 2004) provide an oral MRL of 0.01 mg/kg-d. The MRL is based upon a LOAEL of 1 mg/kg-d, using an uncertainty factor of 10 to account for the use of a LOAEL and an additional factor of 10 to account for human variability.

RIVM (2001) provides an oral TDI of 0.0014 mg/kg-d. However, the derivation of this value is unclear and the study is not reported. As such, it was not considered in the assessment.

Thus the ATSDR values were used in this assessment.

Copper

Toxicity resulting from acute oral exposure to copper has been shown to occur but is quite rare because copper is a potent emetic. There are very limited data available on the effects of chronic oral exposure to copper. The liver has been demonstrated to be the sensitive target organ for copper toxicity. Rat studies suggest that kidney damage is possible at doses causing liver damage, although kidney damage may be associated with a latency period (ATSDR 2004). Dermal exposure to copper has been shown to result in pruritic and contact allergic dermatitis, and eye irritation (ATSDR 2004; Askergren and Mellgren 1975).

Health Canada provides oral TRVs for copper based on various age groupings. The TRVs for children and adults are 0.111 and 0.141 mg/(kg-d), respectively (Health Canada 2010b, 2009). This is based on epidemiological studies and the endpoint is related to hepatotoxicity and gastrointestinal effects. These values were used in the assessment.

Lead

The most sensitive target organs for lead are thought to be the nervous system, the hematopoetic system, and the cardiovascular system. Toxic effects of lead are also manifested through the kidneys, immunological and reproductive systems (ATSDR 2007).

Lead has been designated as a probable human carcinogen, but currently its critical effect endpoint is considered to be neurological effects in children. Chronic exposure to lead can also lead to nephropathy in adults and children, but has not been detected at blood levels below 40 µg/dL (Health Canada 1992).

The Joint FAO/WHO Expert Committee on Food Additives (JECFA) established a provisional tolerable weekly intake (pTWI) of 0.025 mg/kg in 1986 for lead exposure to children, and has reconfirmed this value (WHO 1987). This is equivalent to a TRV of 0.0035 mg/(kg-d). This exposure limit is prescribed based on the knowledge that lead is a cumulative toxin and that any increase in lead body burdens should be avoided. The No Observable Adverse Effects Level (NOAEL) of 0.003 to 0.004 mg/(kg-d) is taken from metabolic studies in infants, and was not associated with any increases in blood lead levels or lead body burdens. A Lowest Observable Adverse Effects Level (LOAEL) of 0.005 mg/(kg-d) was identified to be associated with body retention of lead. An uncertainty factor of 2 was selected because the endpoint and receptor selected were conservative, and because the studies selected were of good quality. Health Canada (2010b, 2009) supports the JECFA pTWI of 0.025 mg/kg, equivalent to an oral TRV of 0.0036 mg/(kg-d). This value was used as the oral TRV in the assessment.

It should be noted that Health Canada is reviewing their position with respect to the toxicity of lead and how it should be assessed. However, no definitive guidance is currently available. Therefore this assessment uses the currently available information.

Molybdenum

Molybdenum occurs naturally in the environment in various ores. It is a considered an essential trace element in the human body, and it functions as an electron transport agent for various enzyme reactions within the body including xanthine oxidase, an enzyme involved in the breakdown of purines to uric acid.

Health Canada (2010b, 2009) derived TRVs for molybdenum based on different life stages. The TRVs are 0.023 mg/(kg-d) for children and 0.028 mg/(kg-d) for adults, based on reproductive effects in rats administered molybdenum in drinking water (Fungwe *et al*. 1990). These values were used in the evaluation.

Nickel

The most common harmful health effect of nickel in humans is an allergic reaction. Approximately 10-20% of the population is sensitive to nickel. The most common reaction is a skin rash at the site of contact. Some sensitized people react when they consume food or water containing nickel or breathe dust containing it. Eating or drinking large amounts of nickel has been reported to affect the stomach, blood, liver, kidneys, and immune system in rats and mice, as well as their reproduction and development. Inhalation of nickel has been reported to cause carcinogenic effects; however, this pathway is not being considered in the risk evaluation.

Health Canada (2010b, 2009) provides an oral TRV for nickel for soluble chloride and sulphate salts which has been used to develop the soil quality guideline for nickel. A value of 0.011 mg/(kg-d) was derived, based on a reproductive study in rats which resulted in a NOAEL of 1.1 mg/(kg-d). The endpoint was post-implantation perinatal lethality. This value was used as the oral TRV in the assessment.

Selenium

Selenium is a naturally occurring element. Metallic gray to black in colour, pure selenium is often found combined with other substances in the environment such as sulfide mineral, oxygen or with silver, copper, lead and nickel minerals. Selenium and selenium compounds are readily absorbed from the human gastrointestinal tract.

Health Canada (2010b, 2009) provides age-dependant TRVs for selenium of 0.0063 mg/(kg-d) for a child and 0.0057 mg/(kg-d) for an adult. These values are based on studies in adults (Yang and Zhou 1994) and in infants (Shearer and Hadjimarkos 1975). These values were selected for use in this assessment.

Uranium

Uranium is a natural and commonly occurring radioactive element, and can be found in varying amounts in rocks, soil, water, air, plants and animals. Natural uranium exists as a mixture of three isotopes, and the relative composition of each will determine how radioactive the uranium is. Health effects of natural and depleted uranium are due to chemical effects and not radiation. People are exposed to uranium from air, water, food, and soil. Food and water have small amounts of uranium, while root vegetables tend to have higher concentrations of uranium than other foods (ATSDR 2011).

Health Canada (2010b, 2009) provides an oral TRV of 0.0006 mg/(kg-d) for exposure to uranium, derived from a LOAEL of 0.06 mg/(kg-d) for nephrotoxic and hepatotoxic effects in rats administered uranium in drinking water. This value was used in the assessment.

ANNEX D

SAMPLE CALCULATIONS

Table C.1 Sample Calculation – Estimated Daily Intake of Selenium by a Child (Black Lake-Maximum)

HUMAN HEALTH RISK ASSESSMENT SAMPLE CALCULATIONS					**Selenium**
					Child
Human Characteristics					**Black Lake**
Country Food Ingestion Rate					
Fish	g/d	fir_c	43.8	Hatchet Lake Survey	
Caribou	g/d	cir_c	244.1	Hatchet Lake Survey (sum of all meat and poultry)	
Berries	g/d	beir_c	8.5	Hatchet Lake Survey	
Drinking Water	g/d	wir_c	800	Richardson 1997	
Body weight	kg	BW_c	32.9	Richardson 1997	
Estimated Daily Intake (EDI) of Non-Country Food					
Milk & Dairy	mg/(kg d)		7.53E-04	Calculated from HC 1994 and HC TDS 2005-2007	
Eggs	mg/(kg d)		2.56E-04	Calculated from HC 1994 and HC TDS 2005-2007	
Organs	mg/(kg d)		6.39E-05	Calculated from HC 1994 and HC TDS 2005-2007	
Root Vegetables	mg/(kg d)		3.03E-05	Calculated from HC 1994 and HC TDS 2005-2007	
Other Vegetables	mg/(kg d)		4.50E-05	Calculated from HC 1994 and HC TDS 2005-2007	
Cereals & Grains	mg/(kg d)		1.82E-03	Calculated from HC 1994 and HC TDS 2005-2007 (see sample calculation)	
Other Fruits & Juices	mg/(kg d)		1.12E-05	Calculated from HC 1994 and HC TDS 2005-2007 (adjusted for berries intake rate)	
Fats, nuts & oils	mg/(kg d)		3.41E-05	Calculated from HC 1994 and HC TDS 2005-2007	
Sugar & Sweets	mg/(kg d)		1.33E-05	Calculated from HC 1994 and HC TDS 2005-2007	
Non-Alcoholic Drinks	mg/(kg d)		2.65E-06	Calculated from HC 1994 and HC TDS 2005-2007	
Alcoholic Drinks	mg/(kg d)		8.94E-07	Calculated from HC 1994 and HC TDS 2005-2007	
Total	mg/(kg d)	EDI_nc	3.03E-03	Sum of all food groups	
Toxicity Data					
Reference Dose - oral exposure	mg/(kg d)	RfDo	6.30E-03	Health Canada 2009	

Table C.1 Sample Calculation – Estimated Daily Intake of Selenium by a Child (Black Lake-Maximum) (Cont'd)

Concentrations (Maximum)				
Fish	µg/g (ww)	fishc	0.36	Maximum measured fish concentration from Black Lake
Caribou	µg/g (ww)	caribouc	0.27	Maximum measured in Black Lake
Berries	µg/g (ww)	berryc	0.01168	Maximum measured in Black Lake (converted to ww)
Drinking Water	mg/L	watc	0.0001	Maximum measured in Black Lake
Intake and HQ Calculations				
Intake from fish	mg/(kg d)		4.79E-04	=fishc*fir_c/BW_c/1000 µg per mg
Intake from caribou	mg/(kg d)		2.00E-03	=caribouc*cir_c/BW_c/1000 µg per mg
Intake from Berries	mg/(kg d)		3.02E-06	=berryc*beir_c/BW_c/1000 µg per mg
Intake from drinking water	mg/(kg d)		2.43E-06	=watc*wir_c/BW_c/1000 g per L
Intake from Non-Country Food	mg/(kg d)		3.03E-03	=EDI_nc
Total Intake from food	mg/(kg d)		5.52E-03	Sum of intake from all food groups

Table C.2 Sample Calculation – Estimated Daily Intake of Selenium from Non-Country Foods (Cereals and Grains)

HC ID	HC Food Composite	TDS ID	Matching TDS Food Group	Mean Se Concentration in Food from TDS (a) (ng/g ww)			Mean Se Conc in Food (b) (µg/g ww)	Food Consumption Rate (c) (g/person/d		EDI (Estimated Daily Intake) (d) (mg/kg-d)	
				2005	2006	2007		Child	Adult	Child	Adult
32	Bread, White	FF01	Bread White	274	191	454	3.06E-01	76.8	67.45	7.15E-04	2.92E-04
33	Bread, Whole Wheat And Rye	FF02 FF03	Bread Whole Wheat Bread Rye	282 204	196 153	363 276	2.46E-01	6.47	19.76	4.83E-05	6.87E-05
34	Rolls And Biscuits	FF20	Buns & Rolls	247	164	347	2.53E-01	11.63	10	8.93E-05	3.57E-05
35	Flour, Wheat	FF12	Flour White	390	352	447	3.96E-01	10.38	6.93	1.25E-04	3.88E-05
36	Cake	FF04	Cake	58.1	47	62.5	5.59E-02	25.62	20.37	4.35E-05	1.61E-05
37	Cookies	FF09	Cookies	55.4	51	57.5	5.46E-02	26	15.58	4.32E-05	1.20E-05
38	Danish And Donuts	FF11	Danish, Donuts & croissant	160	122	205	1.62E-01	5.39	5.49	2.66E-05	1.26E-05
39	Crackers	FF10	Crackers	110	218	194	1.74E-01	5.14	3.45	2.72E-05	8.49E-06
40	Pancakes	FF14	Pancake and waffle	139	87.1	123	1.16E-01	2.93	2.04	1.04E-05	3.36E-06
41	Cereals, Cooked Wheat	FF05	Cereal, cooked wheat	110	106	71.8	9.59E-02	5.72	6.53	1.67E-05	8.86E-06
42	Cereals, Oatmeal	FF07	Cereal, Oatmeal	24.8	72.4	78.3	5.85E-02	19.95	16.44	3.55E-05	1.36E-05
43	Cereals, Corn	FF06	Cereal, corn	60.5	60.4	113	7.80E-02	5.37	1.82	1.27E-05	2.01E-06
44	Cereals, Wheat And Bran	FF08	Cereal, wheat, Rice & Bran	116	116	132	1.21E-01	3.37	2.31	1.24E-05	3.96E-06
45	Rice	FF19	Rice	113	61	97.8	9.06E-02	13.98	15.14	3.85E-05	1.94E-05
46	Pie, Apple	FF17	Pie Apple	51.3	44.6	77.5	5.78E-02	3.87	9.25	6.80E-06	7.56E-06
47	Pie, Other	FF18	Pie Other	48.3	30.1	78.5	5.23E-02	10.35	11.7	1.65E-05	8.66E-06
48	Pizza	NN01	Pizza	157	144	248	1.83E-01	3.09	1.74	1.72E-05	4.50E-06
49	Pasta	FF15	Pasta	202	204	212	2.06E-01	36.9	15.81	2.31E-04	4.61E-05
50	Pasta, Ordinary	FF16	Pasta Plain	479	295	369	3.81E-01	26.24	13.47	3.04E-04	7.26E-05
107	Muffins	FF13	Muffins	145	73.3	116	1.11E-01	0.53	1.56	1.80E-06	2.46E-06
					Total EDI from Cereals & Grains:					**1.82E-03**	**6.78E-04**

Notes:

HC Health Canada
ID Identification Code
Se Selenium
TDS Total Diet Study
(a) Food concentrations are from Health Canada (2011) Total Diet Study for years 2005-2007
(b) Calculated as the mean of all the mean concentrations from TDS, converted from ng/g ww to µg/g ww
(c) Food consumption rates are from Health Canada 1994
(d) EDI is calculated as (Food Concentration) x (Food Consumption Rate)/(1000 µg per mg)/(Body Weight: 32.9 kg for Child and 70.7 kg for Adult)

Table C.3 Sample Calculation – Estimated Incremental Dose from Radionuclides for a Child (Black Lake – Maximum)

SAMPLE HUMAN DOSE CALCULATIONS							**Black Lake Child Maximum**		
Human Characteristics									
Country Food Ingestion Rate									
Fish	g/d	fir_c	43.8	Hatchet Lake Survey					
Caribou	g/d	cir_c	244.1	Hatchet Lake Survey (sum of all meat and poultry)					
Berries	g/d	beir_c	8.5	Hatchet Lake Survey					
Drinking Water	g/d	wir_c	800	Richardson 1997					
			Uranium-238 **U-238+**	Thorium-230 **Th-230**	Radium-226 **Ra-226+**	Lead-210 **Pb-210+**	Polonium-210 **Po-210**		
DCF for ingestion	µSv/Bq	DCFing	0.185	0.31	0.62	2.2	4.4		
Caribou Meat								Total	
Maximum in Black Lake	Bq/g	Caribou_BL	1.23E-05	1.00E-03	8.00E-03	1.00E-03	1.10E-02		Maximum measured
Maximum in Background (Camsell Portage)	Bq/g	Caribou_bkgd	1.23E-05	2.00E-04	8.00E-05	1.00E-03	1.70E-02		Maximum measured
Incremental Concentration	Bq/g	Caribou_inc	0.00E+00	8.00E-04	7.92E-03	0.00E+00	0.00E+00		=Caribou_BL-Caribou_bkgd (set to 0 if negative)
Incremental Dose from caribou	µSv/yr	DCaribou	0.0	22.1	437.5	0.0	0.0	459.6	=Caribou_inc*DCFing*cir_c*365
Berries								Total	
Maximum in Black Lake	Bq/g	Berries_BL	1.80E-05	2.92E-04	5.84E-04	1.75E-03	3.50E-04		Maximum measured
Maximum in Background (Camsell Portage)	Bq/g	Berries_bkgd	1.44E-04	2.92E-04	8.76E-04	2.92E-03	4.38E-04		Maximum measured
Incremental Concentration	Bq/g	Berries_inc	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00		=Berries_BL-Berries_bkgd (set to 0 if negative)
Incremental Dose from berries	µSv/yr	DBerries	0.0	0.0	0.0	0.0	0.0	0.0	=Berries_inc*DCFing*beir_c*365
Fish								Total	
Maximum in Black Lake	Bq/g	Fish_BL	2.47E-05	2.00E-03	2.00E-03	4.00E-03	1.00E-03		Maximum measured
Maximum in Background (Camsell Portage)	Bq/g	Fish_bkgd	1.73E-04	3.00E-03	3.00E-04	2.00E-03	8.00E-04		Maximum measured
Incremental Concentration	Bq/g	Fish_inc	0.00E+00	0.00E+00	1.70E-03	2.00E-03	2.00E-04		=Fish_BL-Fish_bkgd (set to 0 if negative)
Incremental Dose from fish	µSv/yr	DFish	0.0	0.0	16.9	70.3	14.1	101.3	=Fish_inc*DCFing*fir_c*365

Table C.3 Sample Calculation – Estimated Incremental Dose from Radionuclides for a Child (Black Lake – Maximum) (Cont'd)

Drink Water								Total	
Maximum in Black Lake	Bq/L	Water_BL	1.23E-03	1.00E-02	9.00E-03	2.00E-02	5.00E-03		Maximum measured
Maximum in Background (Camsell Portage)	Bq/L	Water_bkgd	1.23E-03	2.00E-02	5.00E-03	2.00E-02	5.00E-03		Maximum measured
Incremental Concentration	Bq/L	Water_inc	0.00E+00	0.00E+00	4.00E-03	0.00E+00	0.00E+00		=Water_BL-Water_bkgd (set to 0 if negative)
Incremental Dose from fish	µSv/yr	DWater	0.0	0.0	0.7	0.0	0.0	0.7	=Water_inc*DCFing*wir_c*365/1000 (g per L)
		Total (µSv/yr)	0.0	22.1	455.1	70.3	14.1	**561.6**	=DCaribou+DBerries+DFish+DWater