

Kiggavik Project Environmental Impact Statement

Appendix 8A

Ecological and Human Health Risk Assessment

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1 INTRODUCTION

1.1 BACKGROUND

The Kiggavik Project includes a series of uranium deposits located in the Kivalliq region of Nunavut, approximately 80 km west of the community of Baker Lake. The Kiggavik Project includes two properties, Kiggavik and Sissons, that are associated with resources representing approximately 51,000 t U with a grade of approximately 0.46%. It is recognized that with continued exploration in the vicinity of the known economic reserves, there is the potential for additional ore deposits to be identified over the proposed life of the project. Ownership of the project is through a joint venture comprising AREVA Resources Canada Inc (ARC), UG Canada (collectively, "AREVA"), Japan-Canada Uranium Co. Ltd. ("JCU") and Daewoo International Corp. ("Daewoo"). ARC is the operator of the project (AREVA 2007).

The following section presents a brief description of the Kiggavik Project and the relevant activities that may impact on environmental quality in the study area.

1.1.1 Project Activities

The Project encompasses the mining of five deposits: East Zone, Centre Zone and Main Zone at Kiggavik, and Andrew Lake and End Grid at Sissons. Mining will proceed via open pit methods at the three Kiggavik deposits. The East Zone pit is mined out prior to mill commissioning to provide an initial Tailings Management Facility. Following preparation of the East Zone TMF, the mill will be commissioned at Kiggavik and processing of stockpiled ore will commence. Mining continues at Centre Zone, followed by Main Zone. These pits will both be converted into TMFs once mining is complete. A purpose-built-pit has been included as a water storage reservoir, allowing significant volumes of site and stockpile drainage to be stored for use in the mill.

Mining of the two Sissons deposits incorporates underground mining via overhand drift-and-fill at End Grid and open pit mining at Andrew Lake.

On completion of mining and milling activities, the project site area will be returned as close as practical to its natural state. The decommissioning plans include demolition and removal of site facilities and cleaning of all site areas that may have become contaminated. Closure of the three TMFs will include the placement of a layer of waste rock to promote consolidation followed by a layer of sand and an erosion barrier of waste rock over the tailings. The surface of the final cover will be graded to blend into the existing topography. Closure of the waste rock pile will

include the placement of a layer of compacted waste rock. The final surface of the waste rock pile will be regraded to blend into the existing topography and to allow for wildlife access.

For the Kiggavik Project, reagents, fuel and supplies will be containerized and shipped to Baker Lake via barge and then transported to site by truck over a winter road. The uranium product (yellowcake) will be shipped out to southern Canada by airlift. Power will be generated onsite using diesel generators.

1.2 OBJECTIVES

The purpose of the assessment is to determine the level of effect on the local environment (including people) for constituents of potential concern for the proposed Kiggavik Project.

The study included four major components as follows:

- Atmospheric dispersion modelling;
- Aquatic environment effects assessment;
- Ecological risk assessment; and,
- Human health risk assessment.

The atmospheric dispersion modeling assessment was undertaken to evaluate the potential effects of mining, milling and associated activities on standard pollutants (SO₂ and NO₂), radon-222 levels, total suspended particulate (TSP) and associated levels of metals and radioactive constituents in the atmospheric environment. The results of this work are presented in a separate report. Predicted atmospheric levels were exported from the air dispersion model for input to the human health and ecological risk assessment.

The aquatic environment effects assessment was undertaken to predict downstream water and sediment quality for the effluent release scenarios selected for the assessment.

Figure 1.2-1 identifies which of the Tier 2 reports the information is either obtained (air concentrations are obtained from Volume 2) or where information from this report is reported (water and sediment concentrations in Volume 5; soil, vegetation and wildlife are in Volume 6; human health in Volume 8).

The ecological risk assessment was conducted to assess potential effects of the project on the atmospheric and aquatic environments and key ecological species (e.g. aquatic plants, fish, caribou). It was not intended for the assessment to consider all potentially affected ecological species, but rather to focus on selected valued ecosystem components (VECs).

The human health risk assessment was carried out to assess project effects from radon-222, TSP and standard pollutant levels at specific human receptor locations including the community of Baker Lake and at the on-site camp. In addition, project effects on major dietary food resources were considered (e.g. on caribou and fish that may be obtained from the local study area).

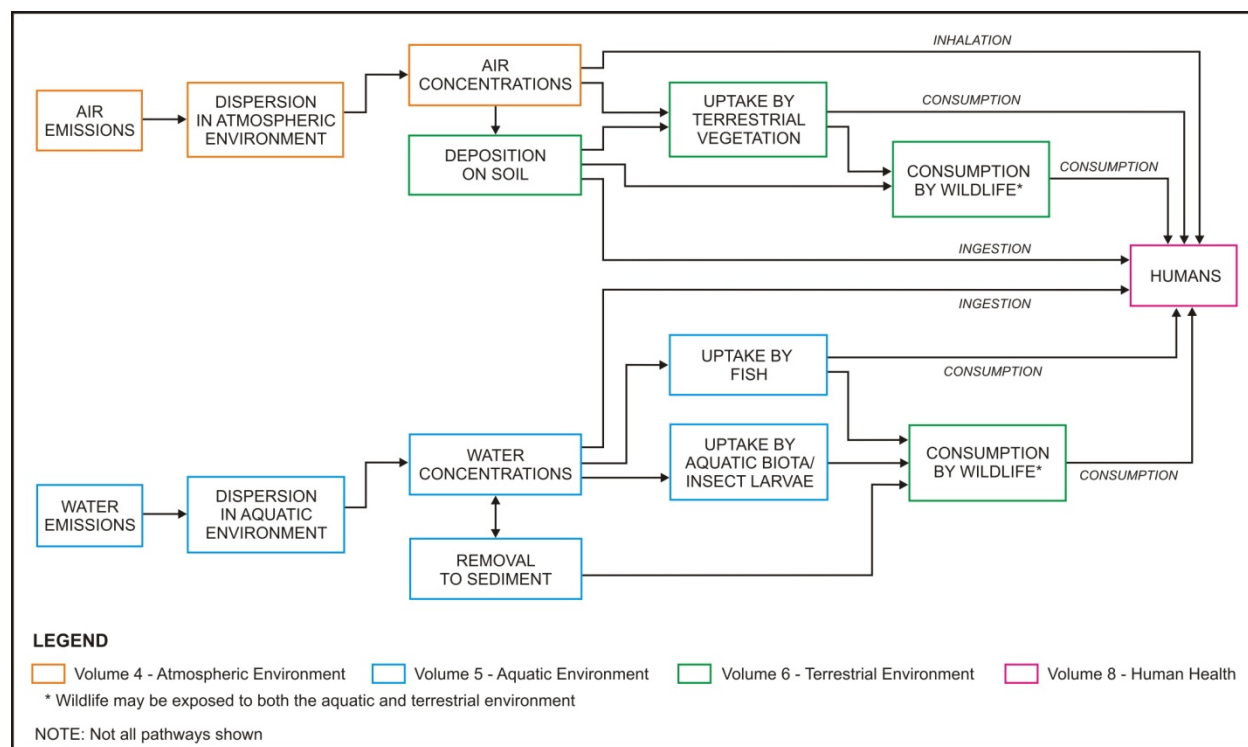


Figure 1.2-1 Linkages Between Environmental Components

1.3 OVERVIEW OF ASSESSMENT

The pathways framework considered in this assessment involves consideration of various pathways by which humans, animals and plants may be exposed to emissions from the Kiggavik Project. Thus, the pathways model or framework assesses the integrated contribution of emissions to the atmospheric and aquatic environments from all sources to determine environmental concentrations of constituents of potential concern and estimates exposure and dose levels for aquatic and terrestrial biota as well as humans.

Figure 1.3-1 presents a simplified schematic diagram of the pathways that are considered in the current study. As seen in the figure, emissions to both the atmospheric and aquatic environments have the potential to impact on humans, animals and plants.

To quantify potential exposures and effects into the future, mathematical modeling was conducted. To assess the potential effects resulting from Kiggavik Project effluent discharges on the aquatic environment, source constituent concentrations and flows, receiving environment flow monitoring results and baseline water and sediment quality data were combined to predict changes in water and sediment quality in the watershed downstream from the Kiggavik Project discharge locations. Changes in constituent concentrations in the receiving environment are a result of two very general processes: mixing of effluent with freshwater flow in the watershed; and, removal of constituents to sediments on settling solids and by diffusive exchange. Diffusive exchange is a two-way process, that is, constituents may diffuse from the water column to the sediment porewater, or from the sediment porewater to the water column depending on the concentration gradient.

To assess the fate of constituents in the surface waters and sediments the LAKEVIEW model was used. The LAKEVIEW model was developed and applied by SENES Consultants Limited on several other similar assessments. The model was modified for this application to take into account the effects of extensive ice formation in the area lakes on lake water quality and to take into account the fact there is no flow in the study area for six to eight months of the year. The model is developed within a probabilistic framework, which permits uncertainty in the magnitude of many of the model input parameters to be explicitly taken into account. The model was run probabilistically for 200 trials.

For this application, the model was run using monthly time steps to assess the effects of variations in source discharge loads and watershed flows on receiving water quality. At the Kiggavik Project, the treated effluent discharge is expected to comprise treated effluent from a conventional water treatment plant (WTP) and permeate water from a reverse osmosis (RO) system. Only treated effluent in excess of process needs will be discharged. The monthly time steps were deemed to be appropriate for simulation of receiving water quality since day-to-day variations in flow and effluent quality are evened-out in the water treatment plant.

Air concentrations were determined using the CALPUFF/CALMET model system. Estimates of the air concentrations from emissions to air from the Kiggavik Project were modelled separately, and output results from the air dispersion modeling were then entered into the pathways model. The CALPUFF/CALMET model system is recognized by regulatory agencies and is well suited to this type of application.

The pathways modeling was undertaken using the INTAKE model. The INTAKE model was developed by SENES Consultants Limited based on work performed by the firm in development of the Uranium Tailings Assessment Program (UTAP) pathways model in the 1980's (SENES 1984; 1985; 1986; 1987). The applicability of this model for simulating the exposures and impacts of operational discharges from uranium mines has been demonstrated on several projects in northern Saskatchewan. This model was then used to estimate exposure to both human and ecological receptors that could potentially be affected by the Kiggavik Project. The predicted exposures were then combined with toxicological benchmarks to evaluate the

potential adverse effects on humans and ecological receptors. The pathways model was also completed within a probabilistic framework.

As seen from the above discussion there are essentially two types of information needed to evaluate the potential adverse effects on humans or ecological receptors. The first type of information consists of inputs that are necessary for the pathways models and the second type of information needed for the assessment is effects-based estimates, which are used to gauge potential effects, or risk to identified receptors.

Site-specific data was used as much as possible to derive model inputs. In this regard, site-specific and local data were used to derive model inputs (e.g., meteorological data from Baker Lake, local surface hydrology measurements, limnological data on the area lakes, local surface water and sediment quality data, information on wildlife use of the study area, environmental samples collected from the area). Specifically, the following data were considered:

- Meteorological data
- Air quality data
- Surface hydrology and limnological data
- Surface water and sediment quality data
- Sediment extraction data
- Aquatic vegetation data
- Fish data
- Soil quality data
- Terrestrial vegetation data
- Bird and animal data
- Ecological survey data
- Human dietary survey data

Where site-specific information was not available, information from other similar operations was used. For example, site-specific information was not available for estimating constituent transfer to environmental media (e.g. transfer from air or water to vegetation or transfer to food sources to herbivores, omnivores or carnivores). In these instances, data from other regions (e.g. from work carried out northern Saskatchewan) were used. In other cases, data reported in the scientific literature were used as is customarily done in ecological and human health risk assessments.

Measurement endpoints were chosen to represent key ecological receptor population and community characteristics of growth, reproduction and abundance. Measurement endpoints are

commonly selected at the individual level of biological organization, and are typically based on exposure responses that represent key population and community characteristics, such as reproduction and abundance. Such measurement endpoints are commonly based on literature-derived toxicity dose-response relationships, examined through laboratory experimentation (i.e., the response of a particular organism to a certain level of exposure). When derived from toxicity studies, such measurement endpoints are often referred to as toxicity benchmarks.

For humans, appropriate toxicological benchmarks were selected from Health Canada, Canadian Nuclear Safety Commission and the U.S. EPA.

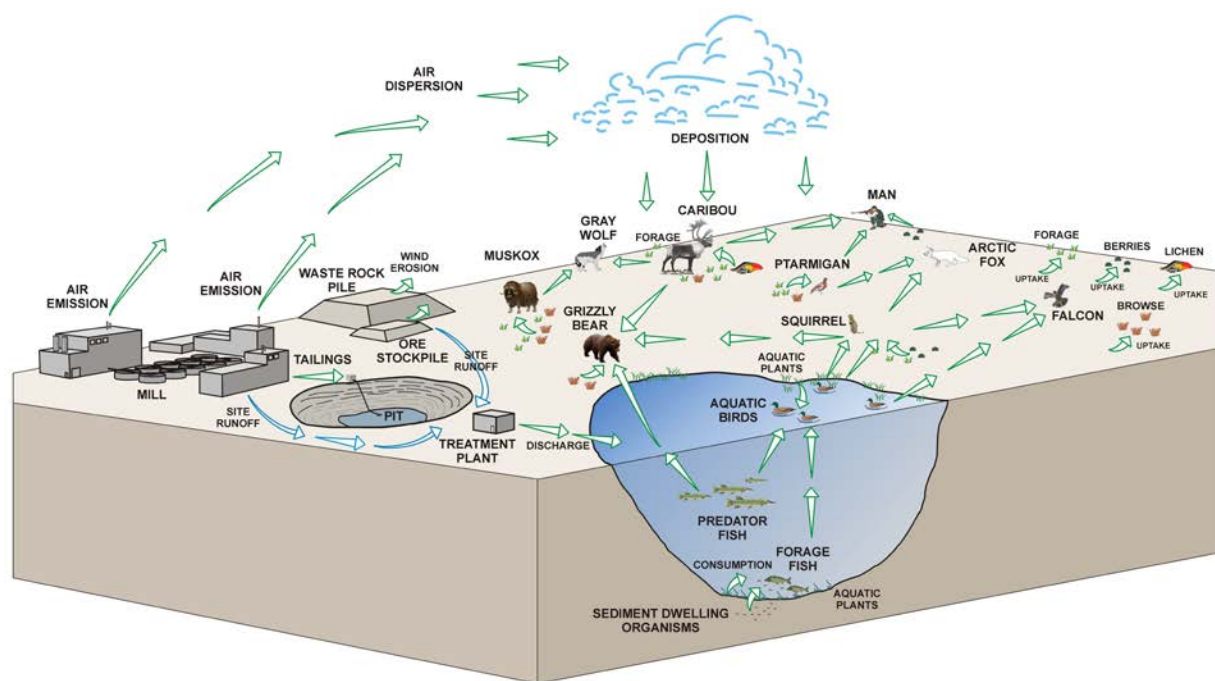


Figure 1.3-1 Simplified Diagram of Pathways Considered in the Environmental Assessment

1.4 REPORT STRUCTURE

Section 2 – Conceptual Model describes the main features of the assessment, including the selection of valued ecosystem components (VECs), selection of constituents of potential concern (COPC), and a description of the various models used in the assessment.

Section 3 – Site Characterization provides the baseline site data used for the assessment and describes the atmospheric and liquid emissions.

Section 4 - Receptor Characterization identifies the aquatic and terrestrial species selected for inclusion in the risk assessment, as well as the human receptors (i.e., adults and children) in the study area.

Section 5 – Exposure Assessment describes the pathways model used to predict the fate of constituents (metals and radionuclides) in the environment, including their uptake by aquatic and terrestrial species, removal to lake sediments. The bases for the transfer factors used in the pathways model are discussed.

Section 6 - Toxicity Assessment details the toxicity benchmarks used in the assessment to characterize the risks of potential effects on the health of ecological species and humans.

Section 7 – Receiving Environment Quality discusses the results of the water and sediment quality modelling that was conducted. Air, water, sediment, soil and vegetation quality predictions are presented and compared to available guidelines where applicable.

Section 8 - Ecological Risk Assessment presents the results of the pathways modelling and risk assessment for ecological receptors.

Section 9 - Human Health Risk Assessment presents the results of the pathways modelling and risk assessment for human receptors.

Section 10 - Summary and Conclusion - Implications of the Assessment are discussed in the context of observations of the current state of the ecosystem in the area of the Kiggavik Project. The significance of adverse effects on human health or the environment is discussed.

2 CONCEPTUAL MODEL

This assessment was undertaken within a pathways framework which involves consideration of humans, animals and plants which may be exposed to emissions from the Kiggavik Project. Thus, the assessment integrates the contribution of emissions to the atmospheric and aquatic environments from all sources to determine the potential for an adverse environmental effect.

2.1 SITE DESCRIPTION

The Kiggavik and Sissons deposits are located within the Anigaq River watershed which comprises a portion of the Hudson Bay drainage basin. The Anigaq River drains into the western edge of Baker Lake, which in turn drains into Chesterfield Inlet and finally into Hudson Bay. Adjacent watersheds include Thelon River and Qinguq Creek, both of which drain into Baker Lake.

There are three hydrometric data stations within the region: Qinguq Creek near Baker Lake, Anigaq River below Audra Lake and Thelon River at the outlet of Schultz Lake. Table 2.1-1 presents the stations and watersheds details and long-term average data (Appendix 5A).

At the Anigaq River and Qinguq stations, there is no flow throughout the winter months. Peak flows are attributed to spring melts, with smaller peaks occurring in late summer after rainfall events. At the Qinguq station, seventy percent of outflow volume occurs in June and July. Flow in the Thelon River occurs year round in contrast to the much smaller Anigaq and Qinguq watersheds.

The Anigaq River watershed has been further sub-divided into sub-watersheds that correspond to locations of lake outflow. These sub-watersheds include the Boulder Lake, Lower Lake, Caribou Lake and Willow Lake systems draining into the Judge Sissons Lake and the Skinny Lake and Kavisilik Lake systems draining into Audra Lake. Gerhard Lake and Squiggy Lake, located outside of the Anigaq River system, drain into Aberdeen and Schultz Lakes. These lakes are drained by the Thelon River, which discharges into Baker Lake.

The sub-watershed falling within the study area in the current assessment is the system relevant to the water management system proposed for the Kiggavik Project, which is Judge Sissons Lake (see Figure 2.1-1).

The monthly distribution of flows was estimated based on available monthly discharge records/estimates for Qinguq Creek (see Table 2.1-2). The annual mean stream discharge estimates for Judge Sissons Lake shown in Table 2.1-3.

Table 2.1-1 Summary Data from Hydrometric Stations Located within the Study Area

Station ID	Station Name	Zone	Location X/Y	Drainage Area (km ²)	Period of Record	Mean Annual Flow (m ³ /s)	Mean Annual Runoff (m ³ /s/km ²)	Mean Flow During Open Water Period (m ³ /s)	Mean Runoff During Open Water Period (m ³ /s/km ²)
06MA002	Quinguq Creek near Bake Lake	14 W	629926/7128166	432	1969-1994	2.73	0.0063	6.00	0.0139
06MA007	Anigaq River below Audra Lake	14 W	617197/7123147	2740	1984-1994	17.0	0.0062	36.36	0.0133
06MA006	Thelon River below outlet of Schultz Lake	14 W	594017/7186013	152000	1983-2005	926	0.0061	926	0.0061
Reference: Appendix 5A									

The total and under-ice lake volumes are also shown in Table 2.1-3. These volumes have been estimated based on existing bathymetric data or mean depth and surface area data. The under-ice volume of lakes have been calculated for lakes deeper than two meters (the mean maximum thickness of winter ice depth for lakes in the vicinity of the Kiggavik Project is estimated to be 225 cm).

Table 2.1-2 Mean Monthly Flow Distribution in Qinguq Creek (1969-1994)

Month	Mean Monthly Discharge (m ³ /s)	Total Volume (m ³)	Percentage of Annual Volume
Jan	0	0	0.0%
Feb	0	0	0.0%
Mar	0	0	0.0%
Apr	0	0	0.0%
May	0.7	1,842,739	2.4%
Jun	16.9	43,804,800	56.1%
Jul	5.6	15,025,824	19.2%
Aug	2.5	6,669,216	8.5%
Sep	3.6	9,227,520	11.8%
Oct	6	1,529,366	2.0%
Nov	0	28,512	0.0%
Dec	0	0	0.0%
Total	-	78,127,977	100.0%
Annual	2.6	82,939,680	-
Reference: Appendix 5A			

Table 2.1-3 Characteristics of Lakes Relevant for this Study

Lake	Drainage Area to Lake Outlet (km ²)	Mean Annual Discharge (m ³ /s)	Surface Area (ha)	Mean Depth (m)	Maximum Depth (m)	Total Volume (m ³)	Volume of Water Below 2m Contour (m ³)	Retention Time (yr)
Judge Sissons Lake	704.6	4.289	9550	4.6	17	439,000,000	264,000,000	3.25
Notes: - no data								
Reference: Appendix 5A								

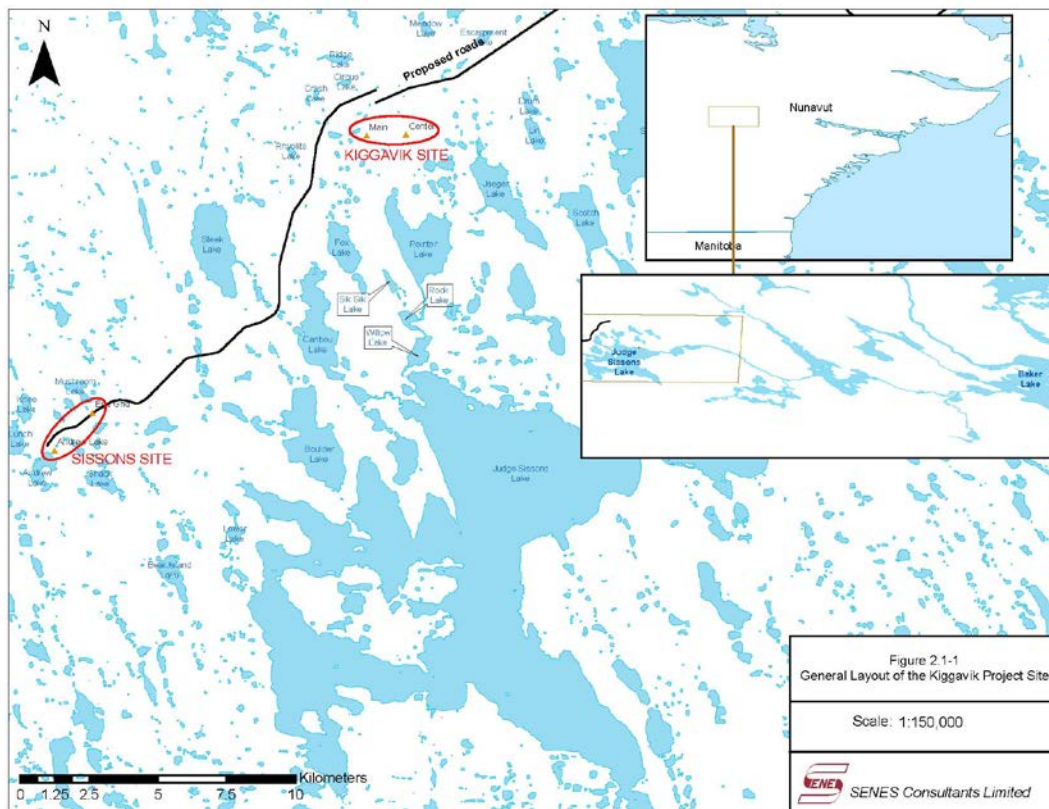


Figure 2.1-1 General Layout of the Kiggavik Project Site

2.2 SELECTION OF VALUED ECOSYSTEM COMPONENTS

Valued Ecosystem Components (VECs) are those aspects of the environment considered to be of vital importance to a particular region or community, including:

- a) resources that are either legally, politically, publically, or professionally recognized as important, such as parks, land selections, and historical sites;
- b) resources that have ecological importance; and
- c) resources that have social importance (NIRB, 2007).

Valued Socio-Economic Components (VSECs) are those aspects of the socio-economic environment considered to be of vital importance to a particular region or community, including components relating to the local economy, health, demographics, traditional way of life, cultural

well-being, social life, archaeological resources, existing services and infrastructure, and community and local government organizations (NIRB, 2007).

All environmental components were assessed with respect to specific features of the natural environment (e.g. water quality or air quality) and their roles in providing pathways and mechanisms for effects on the VECs based on the inter-relationships of the environmental components.

Generally, VEC selection considers the following:

- Abundance in the Site, Local and Regional Study Areas;
- Ecological importance - position in the food web and relative contribution to productivity;
- Baseline data availability - sufficient information should be available to allow a reasonable evaluation of effects;
- Native species, without setting aside the possibility to consider exotic species;
- Exposure - the VEC should have some degree of exposure to the “stressors” produced by the Project Works and Activities;
- Sensitivity - the VEC should be sensitive to the “stressors” produced by the Project Works and Activities;
- Ecological health – potential to affect the growth or sustainability of biota;
- Human health – potential to affect human health as represented by air quality guidelines, water quality criteria and guidelines and radiation dose to the public;
- Socio-economic importance – e.g. value as commercial, recreational or subsistence; inherent aesthetic value, including being of educational or scientific interest;
- Conservation status of Species at Risk - specifically protected by law, designated as rare, threatened, endangered, or of special concern;
- Traditional and current importance to people; and,
- Cultural and heritage importance to society.

The relevant VECs and VSECs selected for this component of the assessment are:

- Terrestrial environment, including soils;
- Surface water quality;
- Sediment quality;

- Freshwater aquatic environment - aquatic biota (including fish, aquatic macrophytes, benthic invertebrates, and other aquatic organisms);
- Vegetation;
- Terrestrial wildlife, including representative terrestrial mammals (i.e., caribou, muskoxen, wolverine, grizzly bears, wolves and less conspicuous species that may be maximally exposed to contaminants);;
- Birds including raptors, migratory birds and seabirds, and their habitat;
- Health of public

An important consideration in an ecological risk assessment is the determination of the presence or absence of species at risk. The presence of species at risk can influence the choice of indicator species and its associated toxicity benchmark. Species at risk present at or near the Kiggavik Project area were identified (Appendix 6C) considering species listed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), Species at Risk Act (SARA), and the Canadian Endangered Species Conservation Council (CESCC). Table 2.2-1 presents the species observed in the Kiggavik area that are at risk or of concern according to the relevant territorial and federal listings. A number of bird and mammal species were identified as regionally 'Sensitive' in Nunavut by the CESCC (2006). Although providing no legal protection, CESCC's status ranks are useful in identifying species of higher priority of study for the territory. For the proponent, this means more careful and particular consideration of the potential effects of the project on the species identified. Two mammals (grizzly bear and wolverine) and two birds (peregrine falcon and short-eared owl) have been identified by the COSEWIC as a special concern and are included on Schedule 3 under the federal SARA. However, none of these species are listed under Schedule 1 of the SARA. If a Schedule 1 species was identified, special measures to protect and recover such a listed species would be required.

Table 2.2-2 provides a summary of the selection of VECs/ indicator species used in the wildlife component of the ecological risk assessment and the rationale for the selection.

Table 2.2-1 Sensitive Species or Species at Risk Observed in the Kiggavik Project Area

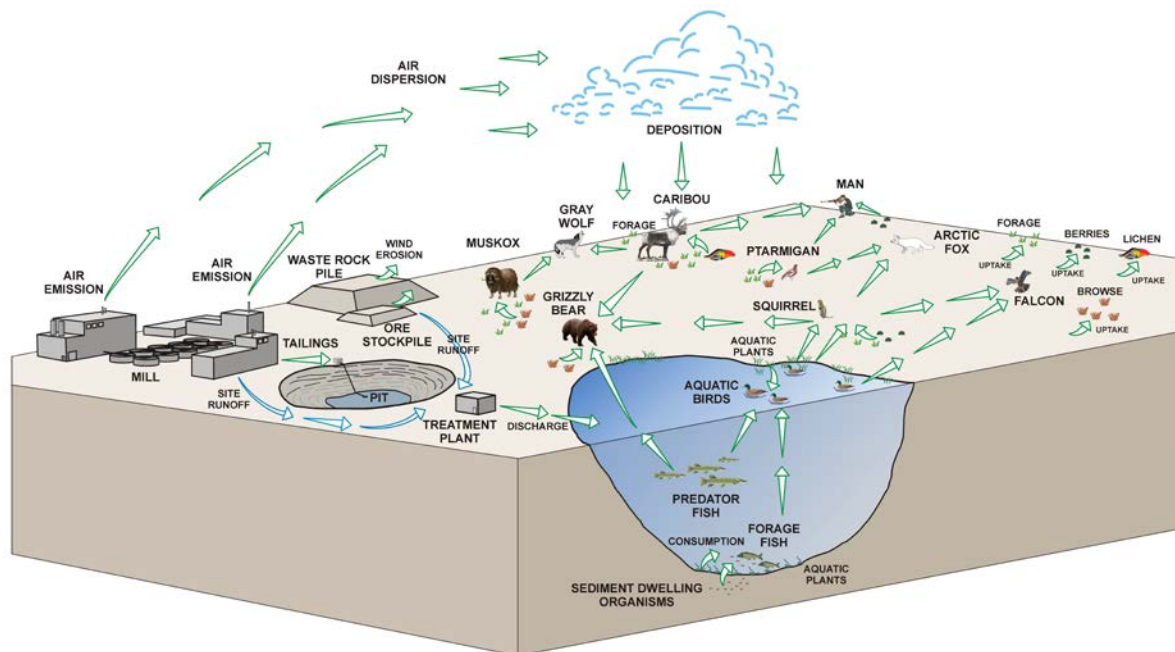
Wildlife Species	Scientific Name	Nunavut Status Rank ^(a)	COSEWIC Schedule 2 & 3 Status ^(b)	SARA Schedule 1 Status ^(c)
Mammals				
Grizzly Bear	<i>Ursus arctos</i>	Sensitive	Special Concern	No status
Wolverine	<i>Gulo gulo</i>	Secure	Special Concern	No status
Birds				
American golden plover	<i>Pluvialis dominica</i>	Sensitive	No status	No status
American tree sparrow	<i>Spizella arborea</i>	Sensitive	No status	No status
Golden eagle	<i>Aquila chrysaetos</i>	Sensitive	No status	No status
King eider	<i>Somateria spectabilis</i>	Sensitive	No status	No status
Peregrine falcon	<i>Falco peregrines</i> ssp. <i>tundrius</i>	Secure	Special Concern	No status
Ruddy turnstone	<i>Arenaria interpres</i>	Sensitive	No status	No status
Semi-palmated sandpiper	<i>Calidris pusilla</i>	Sensitive	No status	No status
Short-eared owl	<i>Asio flammeus</i>	Sensitive	Special Concern	No status
Snow bunting	<i>Plectrophenax nivalis</i>	Sensitive	No status	No status
White-crowned sparrow	<i>Zonotrichia leucophrys</i>	Sensitive	No status	No status
Wilson's snipe	<i>Gallinago delicata</i>	Sensitive	No status	No status
Notes:				
a Canada wild species status ranks (CESCC 2006)				
b COSEWIC 2009 Internet site				
c SARA 2009 Internet site				
Reference: Appendix 6C				

Table 2.2-2 Terrestrial Ecological Receptors Included in the Assessment

Receptor	Rationale	Similar Species
Herbivore Mammals		
Barren-ground Caribou	Important species for human diet and northern ecosystem; project area is within post-calving grounds	Other large herbivore mammals with a lichen diet
Brown Lemming	Common species; food source for fox, wolf, falcon, etc. Lemmings eat forage	Other small herbivore mammals, such as voles
Muskox	Important species for area, human diet	Other large herbivore mammals
Arctic ground Squirrel	Common species; could be human food source	Other small herbivore mammals, such as arctic hare
Omnivore Mammals		
Grizzly Bear	Important species for area: special concern and sensitive species	Other omnivore mammals
Insectivore Mammals		
Masked Shrew	Common species in riparian/wetland areas; insectivore	Other small insectivores
Carnivore Mammals		
Arctic Fox	Important species for trappers	Other scavenger mammals
Gray Wolf	Common species; dens in the project area	Other carnivore mammals
Wolverine	Important species, weasel family, but size of a small bear; has the largest home range of a carnivore of its size; carnivorous scavenger	Other small scavenger mammals
Aquatic Birds		
Long-tailed Duck	Diet includes benthic invertebrates (mollusks, crustaceans) and small fish	Other aquatic birds with primarily a benthic invertebrate diet
Red-breasted Merganser	Typical aquatic bird, ingestion of fish	Other aquatic birds with primarily a fish diet
Northern Pintail	Typical aquatic bird, ingestion of aquatic vegetation	Other aquatic birds with primarily aquatic vegetation diet
Raptor		
Peregrine Falcon	Species of special concern; carnivorous terrestrial bird	Other carnivorous terrestrial birds, such as short-eared owl
Terrestrial Birds		
Lapland Longspur	Common songbird of the Arctic Tundra; diet consists of insects and seeds.	Several other species of songbirds.
Rock Ptarmigan	No migration - resident year round ; could be human food source; herbivore terrestrial bird	Other terrestrial birds, such as grouse
Semipalmated Sandpiper	Represent shore-birds; breeding area within the Sissons Lease area; ingestion of benthic invertebrates	Other shore birds

2.3 CONCEPTUAL SITE MODEL

The conceptual site model (Figure 2.3-1) for the Kiggavik Project graphically displays an overview of the relationship between the receptors, and of the physical-chemical processes that affect the fate and transport of COPC. It also illustrates some of the food web processes that occur.



Note: Conceptual only. Not all exposure pathways are indicated in the figure. See discussion in Section 4 for a complete list of exposure pathways.

Figure 2.3-1 Conceptual Site Model for the Kiggavik Project

2.4 SELECTION OF CONSTITUENTS OF POTENTIAL CONCERN

SENES has extensive experience with uranium mining projects in northern Canada and the selection of constituents of potential concern (COPC) was guided by the expected quality of treated effluent based on this experience. Also, the results of treatability studies and the mineralogy of the ores were considered in the selection. The standard suite of COPC for these types of projects was selected: uranium and the uranium-238 decay series (thorium-230, lead-210, radium-226, and polonium-210), arsenic, cobalt, copper, lead, molybdenum, nickel, selenium, and zinc, as well as the standard water quality parameters ammonia, chloride, sulphate, and total dissolved solids (TDS). Cadmium was added to the standard list of COPC, as was hardness (as calcium carbonate). The general water quality parameters (ie., ammonia, chloride, sulphate, TDS, and hardness) were evaluated for water quality, because it is assumed that these parameters do not undergo any removal from the water column to the sediments due

to sorption. The other COPC (ie., uranium, uranium-238 decay series, arsenic, cadmium, cobalt, copper, lead, molybdenum, nickel, selenium, and zinc) were evaluated for water quality, sediment quality, and through pathways analysis to examine the potential exposure of ecological and human receptors.

2.5 MODELLING APPROACH

The assessment of ecological and human receptor exposures for COPC involved estimation of constituent levels in environmental compartments (i.e., air, water, sediment and soil) and environmental media (e.g., aquatic and terrestrial vegetation and animals).

An overview of the approach taken to model constituent dispersion and movement through the aquatic, atmospheric and terrestrial environments, and for the estimation of intake or dose to the ecological and human receptors is provided in this section. Assumptions and equations for the various models are summarized in Section 2.6 (air dispersion model), Section 2.7 (aquatic dispersion model), Section 2.8 (aquatic biota model), Section 2.9 (terrestrial biota model), and Section 2.10 (human model). Details are provided in Appendix 4b (Air Quality), Attachment A (LAKEVIEW Model), and Attachment D (Ecological Receptor Characteristics).

Over the past three decades, SENES Consultants Limited (SENES) has developed extensive expertise in the areas of contaminant transport modelling and ecological and human health risk assessment. During the 1980s, SENES developed the Uranium Tailings Assessment Program (UTAP) on behalf of the Canadian government and the mining industry to simulate the geochemical behaviour of metals and radionuclides in uranium tailings and in the receiving environment (SENES 1985, 1986, 1987). The UTAP model was designed to simulate the movement of contaminants through the aquatic, atmospheric and terrestrial environments including uptake by plants and animals. The model was constructed within a probabilistic framework to permit uncertainty in many of the model parameters to be taken explicitly into account, and also included a feature to estimate exposure doses to people living within the airshed or watershed.

During the early 1990s, the original model was enhanced to include routines for the estimation of ecological risk and human health risk. At the same time, SENES participated in an international model validation study known as BIOMOVs, in which several models designed to quantify the transfer and bioaccumulation of metals and radionuclides were tested. The SENES model (INTAKE) was shown to compare well with the other models and has been applied on several mining projects to assess the environmental effects of both proposed new developments and decommissioning of existing facilities. In addition, SENES has applied pathways analysis and risk assessment tools on numerous industrial sites.

The INTAKE model was developed to permit calculations to be carried out in either a deterministic framework, using nominal values of the input parameters, or a probabilistic framework to explicitly take into account uncertainty in the input parameter values. For the

Kiggavik Project, the calculations were conducted in a probabilistic framework. Table 2.5-1 lists parameter descriptions defining distributions used in the uncertainty analysis.

Table 2.5-1 Descriptors of Parameter Distributions Used in Uncertainty Analysis

Distribution	Distribution Descriptors
Constant (C)	Constant
Normal (N)	Mean Standard Deviation Minimum Maximum
Lognormal (LN)	Geometric Mean Geometric Standard Deviation Minimum Maximum
Uniform (U)	Minimum Maximum
Triangular (T)	Minimum Mode Maximum
Beta (B)	Minimum Maximum Alpha shape parameter Beta shape parameter

2.6 AIR DISPERSION MODEL

To evaluate the effects of the Kiggavik Project on the local and regional atmospheric environment, air dispersion modelling was performed using the CALMET/CALPUFF modelling package, a current, state-of-the-art dispersion model. The CALPUFF model was selected for this study because of the model's ability to handle both complex meteorology and an array of multiple emissions sources from facilities and activities located over a large area. The meteorological conditions in the LSA and RSA are unique. As such, the CALMET/CALPUFF model set is better able to simulate the meteorology and dispersion in this area.

The air dispersion model has been described in detail in other documents (Appendix A Air Quality); however, a brief description of the air dispersion model as it relates to the pathways assessment is provided here. CALPUFF is a multi-layer, multi-species, non-steady-state puff dispersion model that can simulate the effects of varying meteorological conditions in time and space on COPC transport (Scire et al. 1999). CALMET is an advanced non-steady-state diagnostic meteorological model that produces hourly three-dimensional gridded wind fields from available meteorological, terrain and land use data (Scire et al. 2000). CALPUFF runs in conjunction with CALMET to estimate the concentration or deposition value for each source-

receptor combination for each hour of input meteorology. It can calculate short-term averages such as 1 and 24-hour or annual averages for COPCs of interest. CALPUFF is also one of the air dispersion models currently accepted by the US EPA for regulatory compliance modelling. In this assessment, Version 6.326 of the CALMET model and Version 6.262 of the CALPUFF model were used (which are the most recent versions at the time the modelling was undertaken).

The CALMET meteorological model was used to simulate meteorological conditions in the study area (LSA and RSA). The CALMET model was run for a large modelling domain measuring 117 km in an east-west direction and 65 km in a north-south direction, with a grid spacing of 1 km.

One of the meteorological stations is located within the Local Study Area near the proposed Pointer Lake Airstrip, about 3 km south of the Accommodation Complex. It was installed in August 2009 and since then it has been recording surface temperature, relative humidity, wind speed and direction and atmospheric pressure data. Hourly surface wind speed and direction data from this station was used to develop the one year meteorological data set for air dispersion modelling. The meteorological dataset used in this assessment is for the period August 15, 2009 to August 14, 2010.

2.7 AQUATIC DISPERSION MODEL

The LAKEVIEW module of the INTAKE model was used to calculate water and sediment concentrations in Judge Sissons Lake (JSL). The LAKEVIEW dispersion model has been applied to several other uranium mining projects in northern Saskatchewan to simulate constituent transport and concentrations in the aquatic environment for input to a pathways model for evaluation of exposures to ecological species and humans. For this application, the LAKEVIEW model was modified to simulate the effects of extensive ice cover on Judge Sissons Lake (on the order of 2m thick) as well as the effects of prolonged periods (up to 8 months in any year) with no flow. A probabilistic framework was used for the 200 trials to simulate constituent transport and dispersion through the segments of the lake. A description of the LAKEVIEW module is provided in Attachment A.

Important processes incorporated into the LAKEVIEW model include horizontal (lateral) and vertical transport of dissolved species, chemical and biochemical reactions in the sediment and in the water column, settling of particulate matter, and sediment exchange processes. LAKEVIEW incorporates a detailed computational protocol for estimating the flux of dissolved chemical species in and out of the sediment together with chemical reactions (reduction or oxidation) and solid phase and solid solution partitioning along with conventional sorption equilibrium. Robust and efficient methodologies for parameter estimation and parameter sensitivity analysis have also been incorporated into the program.

Where possible, site-specific data or data reported for similar environments (e.g. northern Saskatchewan) were used to characterize inputs to the LAKEVIEW model. These inputs

include baseline water and sediment quality in the Kiggavik Project area and water-to-sediment distribution coefficients for estimation of constituent concentrations in sediment resulting from changes in concentrations in the water column of affected waterbodies.

Simulation results from the aquatic dispersion model were used in the pathways model to predict exposure to aquatic species and in the estimation of exposure to VECs and humans.

2.7.1 Characterization of Judge Sissons Lake

Judge Sissons Lake was divided into eight segments (Figure 2.7-1), which were defined as summarized in Table 2.7-1. The model takes into account the effects of ice formation on the concentrations of the COPC in both the water column and in sediments. Ice thickness of 2 m is typical of the study area and ice cover typically lasts 8 to 9 months per year. The effects of this natural occurrence are evident in the simulation results presented in this report, and, due to the difference in average depth of the Judge Sissons Lake segments, the COPC concentrations in each segment are affected differently by the ice cover. For example, JSL-1 is shallow compared to JSL-4 (average depth of 1.4 m in JSL-1 compared with 8.0 m in JSL-4) and therefore, there is very little free-flowing water in the winter months below the ice cover and the COPC concentrations in water increase more in JSL-1 relative to adjacent segments that are greater in depth.

Table 2.7-2 summarizes the parameter definition for the horizontal (lateral) transport of dissolved species between the water columns of the various Judge Sissons Lake segments. From Table 2.7-2, it can be seen that the connection between JSL-6 and JSL-7 and the connection between JSL-7 and JSL-8 are frozen solid during the winter months.

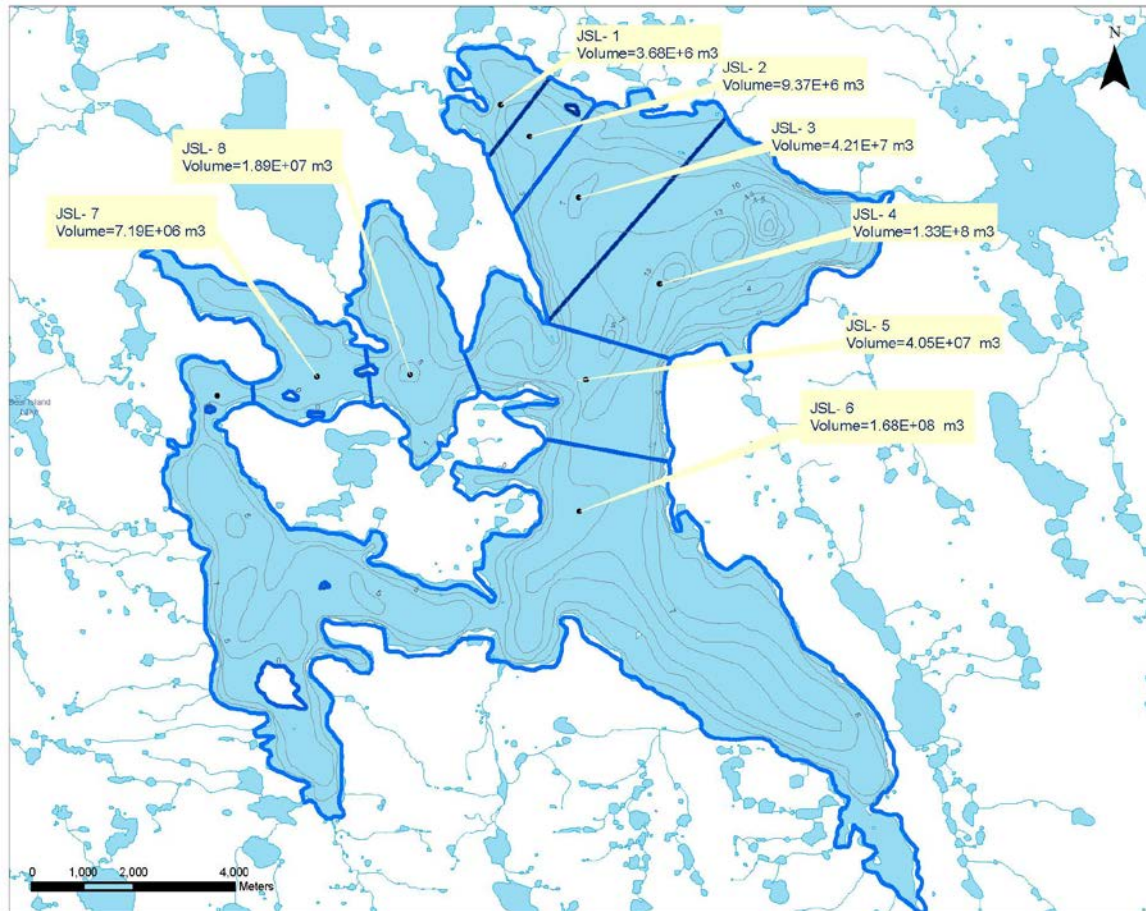


Figure 2.7-1 Judge Sissons Lake

Table 2.7-1 Summary of Judge Sissons Lake Segments

Description of Judge Sissons Lake Segments									
Parameter	Units	JSL-1	JSL-2	JSL-3	JSL-4	JSL-5	JSL-6	JSL-7	JSL-8
Volume	m ³	3.7x10 ⁶	9.4x10 ⁶	4.2x10 ⁷	1.3x10 ⁸	4.1x10 ⁷	1.7x10 ⁸	7.2x10 ⁶	1.9x10 ⁷
Area	m ²	2.6x10 ⁶	2.5x10 ⁶	8.4x10 ⁶	1.7x10 ⁷	8.5x10 ⁶	4.8x10 ⁷	5.6x10 ⁶	7.2x10 ⁶
Drainage Area (DA)	m ²	1.9x10 ⁸	5.8x10 ⁶	1.5x10 ⁷	3.1x10 ⁷	2.3x10 ⁷	2.7x10 ⁸	8.4x10 ⁷	8.4x10 ⁷
Cumulative DA	m ²	1.9x10 ⁸	1.9x10 ⁸	2.1x10 ⁸	7.0x10 ⁸	4.6x10 ⁸	2.7x10 ⁸	8.4x10 ⁷	1.7x10 ⁸
Average Depth*	m	1.4	3.7	5.0	8.0	4.8	3.5	1.3	2.6
Notes: estimated from bathymetry of JSL DA = drainage area * - calculated as the volume/area									

Table 2.7-2 Summary of Horizontal Dispersion

Judge Sissons Lake Segments – Horizontal Dispersion				
Segment	Segment	Cross-Section Area Summer (m ²)	Cross-Section Area Winter (m ²)	Distance between Midpoints (m)
JSL-1	JSL-2	6,900	3,300	850
JSL-2	JSL-3	11,000	5,700	1,600
JSL-3	JSL-4	35,000	25,000	2,300
JSL-4	JSL-5	17,000	13,000	2,700
JSL-5	JSL-6	14,000	9,600	2,700
JSL-6	JSL-7	260	0	2,100
JSL-7	JSL-8	850	0	1,900
JSL-5	JSL-8	1,600	186	3,500
Note: estimated from bathymetry of JSL				

2.7.2 Water and Sediment Distribution

It is assumed that the general parameters: chloride, sulphate and TDS do not undergo any removal from the water column to the sediments due to sorption, although there may be some exchange via diffusion. Likewise, while ammonia removal from the water column is modelled, either through conversion to nitrate or in the formation of new biomass, exchange with lake sediments is not explicitly modelled.

The LAKEVIEW model uses porewater-to-sediment distribution factor inputs to calculate water-to-sediment distribution factors, according to the equation (2.7-1):

$$Kd = Kd_{sed} \times FACT \quad (2.7-1)$$

where:

Kd = water-to-sediment distribution coefficient (m³/g dw)

Kd_{sed} = porewater-to-sediment distribution coefficient (m³/g dw)

$FACT$ = relationship factor between Kd and Kd_{sed} (normal distribution with an average of 3, standard deviation of 1, minimum of 1, and maximum of 5).

The Kd is used to govern the distribution of COPC between the water and sediments.

2.8 AQUATIC BIOTA MODEL

Modelling the uptake of radionuclides and metals by aquatic biota can be quite involved and requires consideration of several interactions. For example, direct uptake from water by aquatic vegetation, uptake from sediments by rooted vegetation, sedimentation and deposition of aquatic vegetation to lake sediment, decomposition and release of contaminants from lake

sediments to the water phase, harvesting of aquatic vegetation by invertebrates, and predation of large fish on small fish may be considered in the modelling. The bioaccumulation factors used in the aquatic biota model are an aggregate representation of numerous pathways and mechanisms of radionuclide and metal transfer through the aquatic environment.

2.8.1 Fish

In the INTAKE model, the concentration in fish flesh is calculated as a function of the transfer factor and the concentration in the water phase from the relationship shown in equation (2.8-1):

$$C_{fish} = C_{water} \times TF_{fish} \quad (2.8-1)$$

where:

C_{fish} = concentration of constituent in fish reported as Becquerels per gram (wet weight) or grams per gram (wet weight) [Bq/g (wet weight) or g/g (wet weight)]

C_{water} = water concentration reported as Becquerels per cubic meter or grams per cubic meter [Bq/m³ or g/m³]

TF_{fish} = the water-to-fish transfer factor of radionuclide or metal (Bq/g (wet weight) per Bq/m³) or (g/g (wet weight) per g/m³)

The implicit assumption is that there is a linear relationship between the water and fish concentrations, which is not necessarily true. A review of water concentrations versus fish tissue concentrations for many metals indicate that metal concentrations in fish tissue tend to be independent of water concentrations at background levels and increase only after a certain concentration has been reached. This is consistent with observations by others (Brix et al. 2005). It has been postulated that for essential metals such as selenium, molybdenum and others, bioregulation or homeostasis is responsible for these observations (Toll Environmental 2005).

Therefore, a “hockey stick” model has been developed for the transfer of constituents in water to fish flesh, as shown in equation (2.8-2):

$$C_{fish} = C_{water} \times TF_{fish} \quad (2.8-2)$$

$$\text{If } C_{fish} < C_{fish-min}, \text{ then } C_{fish} = C_{fish-min}$$

where:

C_{fish} = concentration of constituent in fish reported as Becquerels per gram (wet weight) or grams per gram (wet weight) [Bq/g (wet weight) or g/g (wet weight)]

$C_{fish-min}$ = minimum constituent concentration in fish as Becquerels per gram (wet weight) or grams per gram (wet weight) [Bq/g (wet weight) or g/g (wet weight)]

2.8.2 Aquatic Vegetation

In the INTAKE model, the concentration in aquatic plants is calculated as a function of the transfer factor and the concentration in the water phase from the relationship shown in equation (2.8-3):

$$C_{aqveg} = C_{water} \times TF_{aqveg} \quad (2.8-3)$$

where:

C_{aqveg} = concentration of constituent in aquatic vegetation reported as Becquerels per gram (wet weight) or grams per gram (wet weight) [Bq/g (wet weight) or g/g (wet weight)]

C_{water} = water concentration reported as Becquerels per cubic meter or grams per cubic meter [Bq/m³ or g/m³]

TF_{aqveg} = the water-to-aquatic vegetation transfer factor of radionuclide or metal (Bq/g (wet weight) per Bq/m³) or (g/g (wet weight) per g/m³)

2.8.3 Benthic Invertebrates

In the INTAKE model, the concentration in benthic invertebrates is calculated as a function of the transfer factor and the concentration in the water phase from the relationship shown in equation (2.8-4):

$$C_{benthic} = C_{water} \times TF_{benthic} \quad (2.8-4)$$

where:

$C_{benthic}$ = concentration of constituent in benthic invertebrates reported as Becquerels per gram (wet weight) or grams per gram (wet weight) [Bq/g (wet weight) or g/g (wet weight)]

C_{water} = water concentration reported as Becquerels per cubic meter or grams per cubic meter [Bq/m³ or g/m³]

$TF_{benthic}$ = the water-to-benthic invertebrates transfer factor of radionuclide or metal (Bq/g (wet weight) per Bq/m³) or (g/g (wet weight) per g/m³)

One of the environmental components in the pathways model is insects. Flying insects generally have an aquatic larval stage and a terrestrial adult stage. Among the more important groups with benthic larvae are the *Chironomidae* (midges), *Simuliidae* (black flies), *Ephemeroptera* (mayflies), *Plecoptera* (stoneflies), *Odonata* (dragonflies and damselflies) and *Trichoptera* (caddisflies). The pathways model considers flying insects, which are modelled as an insect with an aquatic benthic larval phase and assumes that the insect emerges and becomes a flying adult invertebrate with the same body concentration as in the aquatic larval phase.

2.9 TERRESTRIAL BIOTA MODEL

Modelling the uptake of radionuclides and metals by terrestrial biota can be quite involved and requires consideration of several interactions. For example, direct deposition from air to soil and terrestrial vegetation, direct uptake from soil to terrestrial vegetation, and ingestion of diet components by terrestrial animals and birds are considered in the modelling. The bioaccumulation factors used in the terrestrial biota model are an aggregate representation of numerous pathways and mechanisms of radionuclide and metal transfer through the environment.

2.9.1 Soil

The soil model simulates the movement in soil of radionuclides and metals that are deposited as particulate matter from the air. The soil model includes atmospheric deposition, surface runoff, downward transport of metals and radionuclides into the soil profile, and radioactive decay.

Activity in the soil is calculated and is subsequently used to compute groundshine dose. The radioactivity and metal concentrations may also be used to predict the dose due to consumption of vegetation grown in the soil via root uptake and due to the inadvertent ingestion of soil by animals or people.

To simplify the modelling exercise, the following depletion mechanisms are not included in the model: dust resuspension; plume depletion due to vegetation uptake; and soil erosion. In terms of the total amounts of constituents in the soil, the above mechanisms are relatively insignificant. However, the exclusion of these removal mechanisms leads to a conservative overestimate of the level of constituents in the soil.

The major assumption used in the soil model is that incoming radioactivity and metals are instantaneously partitioned between the liquid and solid phases according to parameter specific distribution coefficients (k_d values). The activity or mass balance in the surface soil layer (referred to in the soil model as layer 1) receiving radioactivity or metals deposited from the air can be mathematically formulated (approximately) as equation (2.9-1):

$$dZ_1 = C_a V_d A dt - C_w P A dt - \lambda Z_1 dt \quad (2.9-1)$$

where:

Z_1 = constituent content in soil layer 1 (Bq or g)

A = soil area (m^2) [taken as $1 m^2$ in model calculations]

C_a = airborne particle concentration reported as Becquerels per cubic meter or grams per cubic meter [Bq/m^3 or g/m^3]

V_d = particle deposition velocity (m/y)

t = time (yr)

C_w = concentration in soil water reported as Becquerels per cubic meter or grams per cubic meter [Bq/m^3 or g/m^3]

P = total precipitation less evapotranspiration (i.e., net precipitation) [m/y]

λ = radioactive decay constant ($1/y$)

The first term on the right hand side of the equation (2.9-1) accounts for deposition on soil from air. The second term accounts for removal via leaching in both surface and subsurface flow. The third term accounts for radioactive decay. The radionuclide and metal concentrations in the subsurface layer, which is modelled as the root zone from which constituents are taken up by vegetation, are estimated using a similar formulation as described above.

Soil model default input parameters are summarized in Table 2.9-1.

Table 2.9-1 Soil Model Input Parameters

Parameter Description	Units	Default Parameter Distribution	Reference
deposition velocity	m/s	U(0.0005, 0.005)	Based on results of air dispersion modelling
depth of soil layer k			
- Layer 1	m	C(0.08)	SENES 1987
- Layer 2	m	C(0.20)	SENES 1987
fraction of net precipitation in runoff	-	U (0.02, 0.51)	Assumed
soil bulk density of kth soil layer			
- Layer 1	kg/m^3	LN(129, 1.3, 59, 280)	SENES 1987
- Layer 2	kg/m^3	U(800, 1000)	Beak 1987
Water content of kth soil layer			
- Layer 1	kg (water) per kg (dry soil)	U(0.1, 0.4)	Beak 1987
- Layer 2		U(0.1, 0.4)	Beak 1987

2.9.2 Groundshine

The groundshine model calculates the receptor dose due to surface gamma flux (groundshine) attributed to the accumulation over time of selected radionuclides in the soil profile. The radionuclides considered in the implementation of the groundshine model include the major gamma emitting radionuclides in the uranium-238 decay series. The model uses the radionuclide concentrations in the soil layers that are calculated in the soil model. The groundshine model accounts for self-shielding by overlying soil layers and the loss of gamma ray flux via radon emanation and subsequent exhalation to the atmosphere.

In the development of the groundshine model, a number of assumptions have been introduced to simplify the computations. While the assumptions are discussed in the Component Model Documentation for UTAP Version 3 (SENES 1987), two assumptions are worth noting here.

First, any attenuation which may take place in the medium (air) between the source (i.e., the soil layer) and the receptor is neglected as is any attenuation or scatter which might be expected to occur in the thin overlying organic soil layer. Second, a simplifying approximation has been to use the linear absorption coefficient rather than the linear attenuation coefficient in estimating the gamma ray flux from the soil. This assumption more than compensates for the effect of scattered radiation originating from within the self-absorbing source material (i.e., the soil) and results in conservative overestimates of gamma ray exposure.

2.9.3 Terrestrial Vegetation

In the terrestrial vegetation model, air and soil concentrations are used to model the concentration of a radionuclide or metal in six classes of terrestrial vegetation: above ground, leafy vegetables; below ground vegetables; summer forage; browse; lichen; and berries.

One basic model is used for all types of terrestrial vegetation, with modifications for lichen. Airborne materials can be transferred to the edible portions of fruits and vegetables consumed by people or to forage consumed by animals either by direct foliar retention or root uptake. The following equation was adapted from work presented by the US NRC (1982) to calculate the average annual concentration of each radionuclide or metal in each vegetation type (equation 2.9-2):

$$C_v = C_a V_d F_{in} F_{rv} E_v \left[\frac{1 - \exp(\lambda_{wv} t_v)}{Y_v \lambda_{wv}} \right] + \frac{B_v C_g}{\rho_g} \quad (2.9-2)$$

where:

C_v = constituent concentration in each vegetation type (Bq/g (wet weight) or g/g (wet weight))

C_a = airborne particle concentration reported as Becquerels per cubic meter or grams per cubic meter [Bq/m³ or g/m³]

V_d = particle deposition velocity (m/yr)

F_{in} = fraction of deposition that is intercepted by each specific vegetation type (0 to 1)

F_{rv} = fraction of deposition that is retained on the plant surface of each specific vegetation type (0 to 1)

E_v = fraction of foliar deposition that is retained on the edible portions of each specific vegetation type (0 to 1)

λ_{wv} = a decay constant accounting for weathering losses from each specific vegetation type (1/sec) and if significant, radioactive decay

t_v = duration of plant exposure to atmospheric deposition (sec)

Y_v = yield density for each specific vegetation type (g (wet weight)/m²)

- B_v = soil-to-plant transfer coefficient for each radionuclide or constituent and each specific vegetation type (Bq/g (wet weight) plant per Bq/g (dry weight) soil or g/g(wet weight) plant per g/g (dry weight) soil)
- C_g = the average concentration of each radionuclide or constituent in the root zone of the soil (Bq/m³ or g/m³) {calculated in the soil model}
- ρ_g = density of soil (g (dry weight)/m³)

The first term on the right hand side of the equation represents direct foliar retention; the second term represents root uptake. Root uptake is considered to be insignificant for lichen (due to the limited root structure) and berries (negligible translocation to berries from root uptake). Irrigation is not included in this application. Note also that time dependence is due only to the time dependence of the air and soil concentrations and vegetation is calculated based only on the conditions at each time step.

The model assumes that the system is in equilibrium. For the foliar deposition model, this means that the weathering half-life is sufficiently less than the period of deposition and radioactive half-life of the radionuclides. Therefore the concentration of each radionuclide (or metal) reaches a steady state level. For vegetation that has a lifespan of one growing season this is a valid assumption.

The model is modified for the estimation of concentrations in lichen to incorporate a COPC-specific component to represent uptake, retention, and subsequent release (equation 2.9-3).

$$\Delta C_v = \Delta C_a V_d F_{in} F_{rv} E_v \left[\frac{1 - \exp(-\lambda_{ww} t_v)}{RT Y_v \lambda_l} \right] \quad (2.9-3)$$

where:

ΔC_v = incremental constituent concentration in lichen (Bq/g (wet weight) or g/g (wet weight))

ΔC_a = incremental airborne particle concentration reported as Becquerels per cubic meter or grams per cubic meter [Bq/m³ or g/m³]

V_d = particle deposition velocity (m/yr)

F_{in} = fraction of deposition that is intercepted by each specific vegetation type (0 to 1)

F_{rv} = fraction of deposition that is retained on the plant surface of each specific vegetation type (0 to 1)

E_v = fraction of foliar deposition that is retained on the edible portions of each specific vegetation type (0 to 1)

λ_{ww} = a decay constant accounting for weathering losses from each specific vegetation type (1/sec) and if significant, radioactive decay

t_v = duration of plant exposure to atmospheric deposition (sec)

Y_v = yield density for each specific vegetation type (g (wet weight)/m²)

RT = residence time (assumed to be 5)

λ_1 = a constituent-specific decay constant to represent uptake, retention, and release as well as weathering loss and if significant, radioactive decay (sec)

There is no transfer from soil to lichen considered in the model. According to Walther et al. (1990), the biological mean residence time is 2-5 years for most elements in lichens. As a simplification, lichens were taken to be in equilibrium with the air within one year. The model does not allow lichen concentrations to fall below a minimum concentration associated with background air concentrations.

Vegetation model default input parameters are summarized in Table 2.9-2. Transfer factors are defined in Section 5.1.

Table 2.9-2 Terrestrial Vegetation Model Input Parameters

Parameter Description	Units	Parameter Distribution	Reference
fraction of total deposition retained on plant surface (F_{IV})			
- summer forage	-	U(0.1, 0.3)	SENES 1987
- browse	-	U(0.1, 0.3)	SENES 1987
- lichen	-	U(0.8, 1.0)	SENES 1987
- berries	-	U(0.1, 0.3)	Beak 1987
fraction of plant deposition retained on edible portions (E_v)			
- summer forage	-	U(0.8, 1.0)	SENES 1987
- browse	-	U(0.8, 1.0)	SENES 1987
- lichen	-	U(0.8, 1.0)	SENES 1987
- berries	-	U(0.8, 1.0)	Beak 1987
duration of exposure to deposition (t_v)			
- summer forage	s	U(1.3×10^6 , 3.9×10^6)	SENES 1987
- browse	s	U(6.8×10^6 , 8.8×10^6)	Beak 1985
- lichen	s	C(1×10^{10})	SENES 1987
- berries	s	U(6.8×10^6 , 8.8×10^6)	Beak 1987
yield density (Y_v)			
- summer forage	g(wet)/ m ²	U(5.0×10^2 , 1.0×10^3)	SENES 1987
- browse	g(wet)/ m ²	U(5.0×10^2 , 1.0×10^3)	SENES 1987
- lichen	g(wet)/ m ²	U(4.0×10^2 , 6.0×10^2)	SENES 1987
- berries	g(wet)/ m ²	U(75, 125)	Beak 1987
decay constant accounting for weathering loss (λ_{ww})			
- summer forage	1/s	U(2.9×10^{-7} , 8.6×10^{-7})	SENES 1987
- browse	1/s	U(2.9×10^{-7} , 8.6×10^{-7})	SENES 1987

Parameter Description	Units	Parameter Distribution	Reference
- lichen*	1/s	U(6.6×10 ⁻⁸ , 1.9×10 ⁻⁷)	Adjusted
- berries	1/s	U(2.9×10 ⁻⁷ , 8.6×10 ⁻⁷)	Beak 1987
Note: * λ_{ww} used as a calibration variable for lichen to ensure predicted operational values reflect measured values.			

2.9.4 Animals

The terrestrial biota model draws on information from several other models to calculate the concentration of radionuclides and metals in animal flesh. The specific receptors considered for the assessment are characterized in Section 4, but the general model equations are provided below by animal diet-type.

2.9.4.1 Herbivores

For herbivores, the calculation of the concentration of each radionuclide and metal may include many possible subsets of browse, forage, berries, lichen, soil, water, benthic invertebrates, sediment or aquatic vegetation-to-herbivore flesh pathways. Radionuclides and metals in terrestrial and aquatic vegetation and water may be eaten by herbivores, which may in turn be eaten by omnivores, carnivores or people. This transfer for each constituent is modelled as follows in equation (2.9-4):

$$C_h = \left(\sum (C_v F_{h,v}) Q_h + C_w Q_{h,w} \right) T_h \quad (2.9-4)$$

where:

C_h = annual average concentration of constituent in herbivore (type “h”) flesh (Bq/g (wet weight) or g/g (wet weight))

C_v = average concentration of each constituent in vegetation type “v” (Bq/g (wet weight) or g/g (wet weight))

$F_{h,v}$ = fraction of feed for herbivore type “h” that is vegetation type “v”

Q_h = average daily feed intake of herbivore type “h” (g (wet weight)/d)

C_w = average concentration of each constituent in water (Bq/m³ or g/m³)

$Q_{h,w}$ = average daily water intake of herbivore type “h” (m³/d)

T_h = feed-to-herbivore (type “h”) flesh transfer coefficient (Bq/g (wet weight) per Bq/d or g/g (wet weight) per g/d)

2.9.4.2 Omnivores

In addition to vegetation and drinking water, omnivores may consume aquatic and/or terrestrial herbivores, omnivores or carnivores. The transfer for each constituent to omnivores is modelled as follows in equation (2.9-5):

$$C_o = \left(\sum (C_v F_{o,v}) Q_o + \sum (C_m F_{o,m}) Q_o + C_w Q_{o,w} \right) I_o \quad (2.9-5)$$

where:

C_o = annual average concentration of constituent in omnivore (type “o”) flesh (Bq/g (wet weight) or g/g (wet weight))

C_v = average concentration of each constituent in vegetation type “v” (Bq/g (wet weight) or g/g (wet weight))

$F_{o,v}$ = fraction of feed for omnivore type “o” that is vegetation type “v”

Q_o = average daily feed intake of omnivore type “o” (g (wet weight)/d)

C_m = average concentration of each constituent in meat type “m” (Bq/g (wet weight) or g/g (wet weight))

$F_{o,m}$ = fraction of feed for omnivore type “o” that is meat type “m”

C_w = average concentration of each constituent in water (Bq/m³ or g/m³)

$Q_{o,w}$ = average daily water intake of omnivore type “o” (m³/d)

I_o = feed-to-omnivore (type “h”) flesh transfer coefficient (Bq/g (wet weight) per Bq/d or g/g (wet weight) per g/d)

2.9.4.3 Carnivores

Carnivores consume drinking water and aquatic and/or terrestrial herbivores, omnivores or carnivores. The transfer for each constituent to carnivores is modelled as follows in equation (2.9-6):

$$C_c = \left(\sum (C_m F_{c,m}) Q_c + C_w Q_{c,w} \right) I_c \quad (2.9-6)$$

where:

C_c = annual average concentration of constituent in carnivore (type “c”) flesh (Bq/g (wet weight) or g/g (wet weight))

C_m = average concentration of each constituent in meat type “m” (Bq/g (wet weight) or g/g (wet weight))

$F_{c,m}$ = fraction of feed for carnivore type “c” that is meat type “m”

Q_c = average daily feed intake of carnivore type “c” (g (wet weight)/d)

C_w = average concentration of each constituent in water (Bq/m³ or g/m³)

$Q_{c,w}$ = average daily water intake of carnivore type “c” (m³/d)

2.10 HUMAN MODELS

The human model is comprised of the inhalation and ingestion models. Airborne dust and radon account for the inhalation dose while consumption of water, fish, vegetables, fruits, and wildlife account for the ingestion dose. In addition, an external dose is measured due to gamma radiation from the radionuclide content of dust deposited on the ground.

2.10.1 Ingestion Model

The annual average intake of radionuclides and metals by an individual due to the ingestion of above ground and below ground vegetables and fruit (berries) was calculated as follows in equation (2.10-1):

$$I_v = \sum_v U_v C_v R_v L_v \quad (2.10-1)$$

where:

I_v = annual intake of each constituent due to ingestion of vegetation (Bq/year or g/year)

U_v = average annual intake of each vegetation type (g (wet weight)/year)

C_v = calculated average annual concentration of each constituent in each vegetation type "v" (Bq/g (wet weight) or g/g (wet weight))

R_v = fraction of each constituent in each vegetation type remaining after food preparation (0 to 1)

L_v = fraction of each vegetation type that is grown locally (0 to 1)

The average annual intake of radionuclides and metals by an individual due to drinking water was modelled (NUREG 1982) as shown in equation (2.10-2):

$$I_w = U_w \sum_w C_w L_w \quad (2.10-2)$$

where:

I_w = annual intake of each constituent due to ingestion of drinking water (Bq/year or g/year)

U_w = average annual intake of drinking water (m³/year)

C_w = calculated average annual concentration of each constituent in drinking water from each source "w" (Bq/m³ or g/m³)

L_w = fraction of the annual water from each drinking water source "w" (0 to 1)

The annual average intake of radionuclides and metals by an individual due to the ingestion of fish and meat was calculated as follows in equation (2.10-3):

$$I_f = \sum_f U_f C_f L_f \quad (2.10-3)$$

where:

I_f = annual intake of each constituent due to ingestion of fish and meat (food type "f") (Bq/year or g/year)

U_f = average annual intake of each food type "f" (g (wet weight)/year)

C_f = calculated average annual concentration of each constituent in each food type “f”
(Bq/g (wet weight) or g/g (wet weight))
 L_f = fraction of each food type that is taken locally (0 to 1)

The annual average intake of radionuclides and metals by an individual due to the ingestion of soil was calculated as follows in equation (2.10-4):

$$I_s = \sum_s U_s C_s L_s \quad (2.10-4)$$

where:

I_s = annual intake of each constituent due to ingestion of soil (Bq/year or g/year)
 U_s = average annual intake of soil (g/year)
 C_s = calculated average annual concentration of each constituent in soil at location “s”
(Bq/g (wet weight) or g/g (wet weight))
 L_s = fraction of time spent at each soil location “s” (0 to 1)

2.10.2 Inhalation Model

The average annual intake by an individual due to inhalation (excluding radon) is calculated as follows in equation (2.10-5):

$$I_i = U_i C_a \quad (2.10-5)$$

where:

I_i = annual intake of each constituent due to inhalation (Bq/year or g/year)
 U_i = average annual inhalation rate (m^3 /year)
 C_a = calculated average annual concentration of each constituent in air (Bq/ m^3 or g/ m^3)

The average annual dose of radon by inhalation is calculated as follows in equation (2.10-6):

$$D_{Rn} = C_{Rn} \times OF \times INOCC \times F \times 69.6 \quad (2.10-6)$$

where:

D_{Rn} = annual dose of radon and progeny by inhalation (μ Sv/year)
 C_a = average annual concentration of radon in air (Bq/ m^3)
OF = fraction of year at location (-)
INOCC = fraction of time spent indoors (-)
F = equilibrium factor between radon and its progeny
69.6 = conversion factor from Bq/ m^3 to μ Sv/year

Since it is the radon progeny rather than the radon that produces the dose to the receptor, the radon-in-air concentration must be converted to an appropriate radon progeny concentration. This conversion requires an estimation of the equilibrium factor, F, between radon and its progeny. Theoretically, F can range from 0.0 (no radon progeny) to 1.0 (complete radon progeny ingrowth). The value of F outdoors at the receptor depends only on the transit time between the radon source and the receptor if it is assumed that there are no radon progeny removal mechanisms other than radioactive decay. Since in reality the progeny are removed by several other mechanisms that are difficult to quantify (e.g., attachment to dust that falls to the ground) and since the major exposure occurs indoors where F is dependent on several additional factors (such as the building ventilation rate), it has been customary to select an F factor that is representative of annual average indoor conditions. The radon concentration at the receptor is converted to a radon progeny concentration using this F factor. For this study, the assumed F value is selected from an input distribution, triangular in shape, with a range of 0.2 to 0.6 and a mode of 0.4. The equilibrium factor is based on a report by U.S. NRC (1991) which states that the equilibrium factor in houses without smokers is in the range of 0.3 to 0.4.

ICRP Publication No. 65 (1993) suggests, based on equality of detriment, that 1 WLM (Working Level Month) corresponds to (about) 5 mSv for workers and 4 mSv for members of the public (para 56). The formula for estimating effective dose given in the Radiation Protection Regulations of the Canadian Nuclear Safety Commission infer a conversion factor of 1 WLM to 5 mSv for a member of the public. This latter factor is used for this study.

2.10.3 Groundshine Model

The average annual dose from groundshine (external dose) is calculated as follows in equation (2.10-7):

$$D_{ext} = D \times OF \times ((1 - INOCC) + INOCC \times SHLD) \quad (2.10-7)$$

where:

D_{ext} = annual dose due to groundshine of radionuclide (μ Sv/year)

D = average groundshine dose rate due to each radionuclide (μ Sv/yr)

OF = fraction of year at location (-)

INOCC = fraction of time spent indoors (-)

SHLD = effective reduction factor for structural shielding for indoor exposure periods

2.10.4 Total Intake

The annual average total intake of radionuclides and metals by an individual was calculated as follows in equation (2.10-8):

$$I_{total} = \sum_v I_v + \sum_w I_w + \sum_f I_f + \sum_s I_s + I_i \quad (2.10-8)$$

where:

I_{total} = total annual intake of each constituent by an individual (Bq/year or g/year)

I_v = annual intake of each constituent due to ingestion of vegetation (Bq/year or g/year)

I_w = annual intake of each constituent due to ingestion of drinking water (Bq/year or g/year)

I_f = annual intake of each constituent due to ingestion of fish and meat (food type "f") (Bq/year or g/year)

I_s = annual intake of each constituent due to ingestion of soil (Bq/year or g/year)

I_i = annual intake of each constituent due to inhalation (Bq/year or g/year)

The total intake of radionuclides is converted to a dose and then considered with the calculated doses from radon and groundshine.

3 SITE CHARACTERIZATION

This section summarizes information on the baseline conditions for the area of the Kiggavik Project used in the assessment. Site-specific data were augmented as necessary with data from other locations to provide a complete set of baseline (reference) data for incorporation into the pathways analysis of total levels to predict total exposure to the various VECs (broadly, the ERA and HHRA). The assessment presented in this report considers both baseline conditions and the incremental effects of the Kiggavik Project on the atmospheric, aquatic, and terrestrial environments.

3.1 STUDY AREA

Seven areas were defined for the assessment of impacts of the project's atmospheric emissions and liquid effluent releases on the environment. The areas are indicated on Figure 3.1-1 and include:

- Area 1: Rock Lake watershed, not affected by liquid effluent, but closer proximity to atmospheric emissions than other assessment areas outside of the Project site;
- Area 2: Judge Sissons Lake – vicinity of Kiggavik discharge (JSL-2), receiving liquid effluent from the Kiggavik site;
- Area 3: Kiggavik Camp, location of atmospheric emissions
- Area 4: Judge Sissons Lake – vicinity of Sissons discharge (JSL-8), receiving liquid effluent from the Sissons site;
- Area 5: Local Study Area, capturing effects from the atmospheric and liquid effluent releases on the local area;
- Area 6: Regional Study Area, capturing effects from the atmospheric and liquid effluent releases on the regional area; and,
- Area 7: Baker Lake Area, capturing effects from the atmospheric releases on Baker Lake.

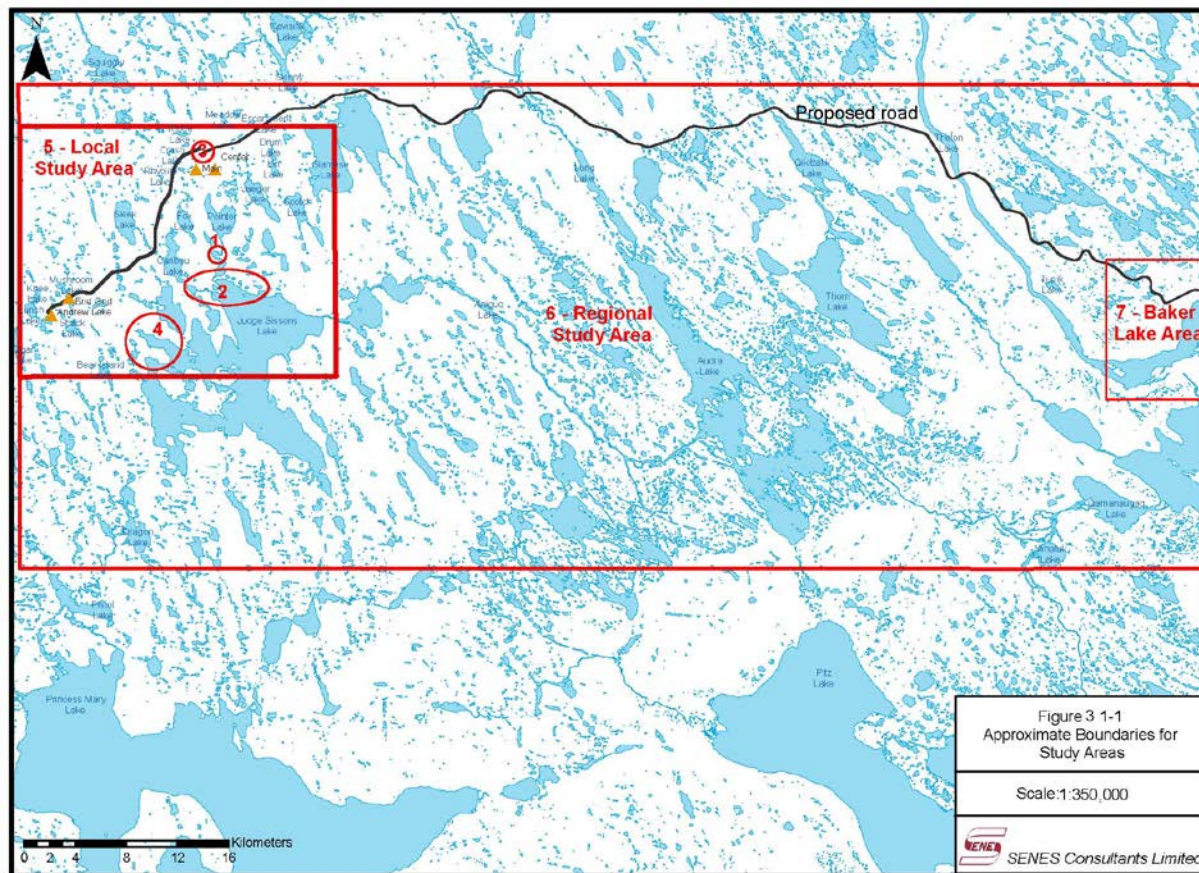


Figure 3.1-1 Assessment Locations within Study Area

3.2 BASELINE CONSTITUENT CONCENTRATIONS

Data from monitoring and baseline sampling completed at the site has been summarized for use in the ecological and human health risk assessment. Baseline concentrations of constituents of potential concern (COPC) for the Kiggavik Project area were developed from current data from reference/representative monitoring locations in the study area for air, soil, water, and sediment quality.

For other environmental media, such as terrestrial vegetation, aquatic vegetation, benthic invertebrates, fish, birds, and mammals, concentrations are calculated in the pre-operation phase using transfer factors to represent the transfer of constituents between environmental media. Where available, site-specific data were used to calculate site-specific transfer factors. In the following sections, the calculated concentrations for the pre-operation phase are compared with measured site data, if available, to illustrate the appropriateness of the model estimation.

3.2.1 Baseline Air Quality

The baseline air quality sampling in the local area is described in Appendix 4B. The data collected was used to characterize the baseline air quality for the INTAKE model and is summarized in Table 3.2-1.

Table 3.2-1 Summary of Measured Baseline Air Quality

Air Concentrations											
Constituent	Units	N	N<MDL	Min	Median	95th	Max	Avg	St. Dev.	GM	GSD
Uranium	µg/g dw	2	2	6.86x10 ⁻⁶	9.85x10 ⁻⁶	1.25x10 ⁻⁵	1.28x10 ⁻⁵	9.85x10 ⁻⁶	0.00	9.39x10 ⁻⁶	1.0
Thorium-230	Bq/g dw	2	2	2.74x10 ⁻⁶	3.94x10 ⁻⁶	5.02x10 ⁻⁶	5.14x10 ⁻⁶	3.94x10 ⁻⁶	0.00	3.75x10 ⁻⁶	1.0
Lead-210	Bq/g dw	2	0	1.37x10 ⁻⁴	1.52x10 ⁻⁴	1.66x10 ⁻⁴	1.67x10 ⁻⁴	1.52x10 ⁻⁴	0.00	1.51x10 ⁻⁴	1.0
Radium-226	Bq/g dw	2	0	2.57x10 ⁻⁶	2.66x10 ⁻⁶	2.73x10 ⁻⁶	2.74x10 ⁻⁶	2.66x10 ⁻⁶	0.00	2.66x10 ⁻⁶	1.0
Polonium-210	Bq/g dw	2	0	2.74x10 ⁻⁵	3.17x10 ⁻⁵	3.55x10 ⁻⁵	3.60x10 ⁻⁵	3.17x10 ⁻⁵	0.00	3.14x10 ⁻⁵	1.0
Arsenic	µg/g dw	2	0	3.43x10 ⁻⁵	3.77x10 ⁻⁵	4.08x10 ⁻⁵	4.11x10 ⁻⁵	3.77x10 ⁻⁵	0.00	3.75x10 ⁻⁵	1.0
Cadmium	µg/g dw	2	0	1.78x10 ⁻⁵	2.56x10 ⁻⁵	3.26x10 ⁻⁵	3.34x10 ⁻⁵	2.56x10 ⁻⁵	0.00	2.44x10 ⁻⁵	1.0
Cobalt	µg/g dw	2	2	6.86x10 ⁻⁶	9.85x10 ⁻⁶	1.25x10 ⁻⁵	1.28x10 ⁻⁵	9.85x10 ⁻⁶	0.00	9.39x10 ⁻⁶	1.0
Copper	µg/g dw	2	0	1.15x10 ⁻²	1.32x10 ⁻²	1.47x10 ⁻²	1.49x10 ⁻²	1.32x10 ⁻²	0.00	1.31x10 ⁻²	1.0
Lead	µg/g dw	2	0	7.96x10 ⁻⁴	1.63x10 ⁻³	2.38x10 ⁻³	2.47x10 ⁻³	1.63x10 ⁻³	0.00	1.40x10 ⁻³	1.0
Molybdenum	µg/g dw	2	0	2.57x10 ⁻⁵	3.76x10 ⁻⁴	6.92x10 ⁻⁴	7.27x10 ⁻⁴	3.76x10 ⁻⁴	0.00	1.37x10 ⁻⁴	1.0
Nickel	µg/g dw	2	0	8.50x10 ⁻⁵	1.31x10 ⁻⁴	1.73x10 ⁻⁴	1.77x10 ⁻⁴	1.31x10 ⁻⁴	0.00	1.23x10 ⁻⁴	1.0
Selenium	µg/g dw	2	0	2.61x10 ⁻⁵	3.49x10 ⁻⁵	4.28x10 ⁻⁵	4.37x10 ⁻⁵	3.49x10 ⁻⁵	0.00	3.37x10 ⁻⁵	1.0
Zinc	µg/g dw	2	0	5.65x10 ⁻³	6.19x10 ⁻³	6.67x10 ⁻³	6.72x10 ⁻³	6.19x10 ⁻³	0.00	6.16x10 ⁻³	1.0
Note: Data from sampling described in Appendix 4B Air Quality.											

3.2.2 Baseline Soil Quality

Sampling for soil baseline quality was described in Appendix 6B for sampling completed in 2007, 2008, and 2009. Table 3.2-2 provides a summary of the data collected from the site for the COPC. Appendix 6B provides a summary of all of the measured data for soil.

Table 3.2-2 Summary of Measured Baseline Soil Quality

Soil Concentrations - All Locations											
Constituent	Units	N	N< MDL	Min	Median	95th	Max	Avg	St. Dev.	GM	GSD
Uranium	µg/g dw	16	0	0.7	1.0	2.3	2.4	1.2	0.5	1.1	1.4
Thorium-230	Bq/g dw	46	10	0.010	0.03	0.06	0.13	0.03	0.02	0.03	1.9
Lead-210	Bq/g dw	46	39	0.010	0.01	0.04	0.07	0.02	0.01	0.01	1.7
Radium-226	Bq/g dw	46	4	0.005	0.03	0.07	0.14	0.03	0.02	0.03	2.0
Polonium-210	Bq/g dw	46	2	0.005	0.02	0.04	0.10	0.02	0.01	0.02	1.6
Arsenic	µg/g dw	57	34	2.1	2.5	6.7	13.6	3.8	2.0	3.4	1.5
Cadmium	µg/g dw	66	66	0.05	0.3	0.3	0.3	0.2	0.1	0.2	2.0
Cobalt	µg/g dw	66	0	1.6	4.2	7.1	13.0	4.4	1.9	4.1	1.5
Copper	µg/g dw	66	0	2.0	7.6	18.9	23.0	8.9	5.3	7.5	1.8
Lead	µg/g dw	66	50	4.1	15.0	15.0	23.0	13.7	3.6	13.0	1.5
Molybdenum	µg/g dw	66	48	0.1	2.0	2.0	6.9	1.8	1.2	1.2	2.8
Nickel	µg/g dw	66	1	2.5	11.8	18.7	61.0	12.4	7.7	11.1	1.6
Selenium	µg/g dw	66	65	0.05	1.0	1.5	2.0	0.8	0.5	0.5	3.6
Zinc	µg/g dw	66	0	7.8	16.2	33.7	56.0	18.2	8.2	16.8	1.5
Note: N = number of samples. N<MDL = number of samples reported as less than the method detection limit. Min = minimum; 95th = 95th percentile; Max = maximum; Avg = average. St.Dev = standard deviation; GM = geometric mean; GSD = geometric standard deviation. µg/g = micrograms per gram; Bq/g = Bequerels per gram; dw = dry weight basis.											
Source: Appendix 6B, data from 2007, 2008, 2009; data reported as less than the method detection limit were treated as equal to ½ the method detection limit											

The average values presented in Table 3.2-2 were used to represent the background concentrations for the site.

3.2.3 Baseline Water Quality

Sampling for water baseline quality was described in Appendix 5C for sampling completed in 2007, 2008, and 2009. Table 3.2-3 provides a summary of the data collected from the site for the COPC. Appendix 5C provides a summary of all of the measured data for water.

Data for water quality in lakes and rivers were compared and it was determined that water quality was generally comparable between both types of waterbodies and, therefore, data from lakes and rivers were grouped for the summary statistics provided in Table 3.2-3.

Table 3.2-3 Summary of Measured Baseline Water Quality

Water Concentrations - All Locations											
Constituent	Units	N	N<MDL	Min	Median	95th	Max	Avg	St. Dev.	GM	GSD
Uranium	µg/L	130	114	0.05	0.05	0.2	0.3	0.064	0.043	0.057	1.48
Thorium-230	Bq/L	130	118	0.005	0.005	0.010	0.03	0.006	0.003	0.005	1.33
Lead-210	Bq/L	130	126	0.01	0.01	0.010	0.03	0.011	0.003	0.010	1.19
Radium-226	Bq/L	130	98	0.0025	0.0025	0.009	0.01	0.004	0.002	0.003	1.55
Polonium-210	Bq/L	130	85	0.0025	0.0025	0.010	0.03	0.005	0.005	0.004	1.92
Arsenic	µg/L	130	14	0.05	0.15	0.3	0.5	0.16	0.086	0.14	1.70
Cadmium	mg/L	130	124	0.00001	0.00005	0.0001	0.0001	0.00005	0.00001	0.00005	1.16
Cobalt	mg/L	130	98	0.0001	0.00005	0.0001	0.0004	0.00006	0.00004	0.00006	1.41
Copper	mg/L	125	0	0.0002	0.0007	0.002	0.004	0.0008	0.0005	0.0007	1.65
Lead	mg/L	125	58	0.0001	0.0001	0.0005	0.003	0.00014	0.0003	0.00009	2.11
Molybdenum	mg/L	130	79	0.0001	0.00005	0.0002	0.0006	0.00009	0.0001	0.00007	1.71
Nickel	mg/L	125	0	0.0002	0.0005	0.001	0.002	0.0006	0.0003	0.0005	1.58
Selenium	mg/L	130	100	0.0001	0.00005	0.0001	0.0002	0.00006	0.00003	0.00006	1.40
Zinc	mg/L	125	7	0.0003	0.0029	0.009	0.011	0.004	0.003	0.003	2.47
Ammonia	mg/L	130	37	0.005	0.03	0.11	0.35	0.04	0.05	0.02	3.15
Chloride	mg/L	130	3	0.05	0.4	1.76	3.4	0.64	0.58	0.49	2.03
Sulphate	mg/L	130	1	0.10	0.6	1.56	6.9	0.78	0.70	0.66	1.67
TDS	mg/L	111	0	10.0	21	45.5	60.0	24.6	11.0	22.5	1.51
Calcium	mg/L	130	0	1.1	2.4	5.7	7.8	2.8	1.4	2.5	1.53
Note: N = number of samples. N<MDL = number of samples reported as less than the method detection limit. Min = minimum; 95th = 95th percentile; Max = maximum; Avg = average. St.Dev = standard deviation; GM = geometric mean; GSD = geometric standard deviation. µg/L = micrograms per litre; Bq/L = Bequerels per litre; mg/L – milligrams per litre Source: Appendix 5C, data from 2007, 2008, 2009; data reported as less than the method detection limit were treated as equal to ½ the method detection limit											

The average values presented in Table 3.2-3 were used to represent the background concentrations for the site.

3.2.4 Baseline Sediment Quality

Sampling for sediment baseline quality was described in Appendix 5C for sampling completed in 2007, 2008, and 2009. Table 3.2-4 provides a summary of the data collected from the site for the COPC. Appendix 5C provides a summary of all of the measured data for sediment.

Table 3.2-4 Summary of Measured Baseline Sediment Quality

Sediment Concentrations - All Locations											
Constituent	Units	N	N<MDL	Min	Median	95th	Max	Avg	St. Dev.	GM	GSD
Uranium	µg/g dw	110	0	0.40	2.5	5.6	15.0	2.7	1.9	2.2	1.9
Thorium-230	Bq/g dw	110	15	0.01	0.04	0.09	0.16	0.04	0.02	0.04	1.9
Lead-210	Bq/g dw	110	34	0.01	0.06	0.19	0.38	0.07	0.07	0.05	2.6
Radium-226	Bq/g dw	110	5	0.005	0.04	0.08	0.10	0.04	0.02	0.03	1.8
Polonium-210	Bq/g dw	110	1	0.005	0.08	0.22	0.45	0.09	0.07	0.07	2.2
Arsenic	µg/g dw	110	0	1.2	7.4	15.0	45.0	8.0	6.4	6.2	2.1
Cadmium	µg/g dw	110	48	0.05	0.10	0.40	0.60	0.17	0.14	0.12	2.3
Cobalt	µg/g dw	110	0	1.2	5.4	10.6	30.0	5.6	3.7	4.7	1.9
Copper	µg/g dw	110	0	1.7	15.5	48.7	130.0	21.1	20.2	14.0	2.6
Lead	µg/g dw	110	0	2.4	11.0	17.0	20.0	10.2	4.9	8.7	1.8
Molybdenum	µg/g dw	110	3	0.05	0.60	3.1	17.0	1.3	2.2	0.7	2.8
Nickel	µg/g dw	110	0	4.7	22.0	40.6	71.0	22.2	12.1	18.6	1.9
Selenium	µg/g dw	110	22	0.05	0.30	0.90	1.3	0.36	0.29	0.24	2.7
Zinc	µg/g dw	110	0	13.0	63.5	130.0	440.0	69.9	59.7	54.9	2.0
Notes: N = number of samples. N<MDL = number of samples reported as less than the method detection limit. Min = minimum; 95th = 95th percentile; Max = maximum; Avg = average. St.Dev = standard deviation; GM = geometric mean; GSD = geometric standard deviation. µg/g = micrograms per gram; Bq/g = Bequerels per gram; dw = dry weight basis											
Source: Appendix 5C, data from 2007, 2008, 2009; data reported as less than the method detection limit were treated as equal to ½ the method detection limit											

The average values presented in Table 3.2-4 were used to represent the background concentrations for the site.

3.2.5 Baseline Terrestrial Vegetation Quality

Baseline sampling was completed for terrestrial vegetation, as reported in Appendix 6B. Vegetation types sampled included: lichen, browse (willow, bog birch, and blueberry vegetation), forage (*Carex* sp. and sedge), and berry (blueberry and other berries). Tables 3.2-5 to 3.2-8 summarize the measured data for the baseline terrestrial vegetation at the site. Appendix 6B provides a summary of all of the measured data for terrestrial vegetation.

Table 3.2-5 Summary of Measured Baseline Terrestrial Vegetation Quality - Lichen

Lichen Concentrations - All Locations											
Constituent	Units	N	N<MDL	Min	Median	95th	Max	Avg	St. Dev.	GM	GSD
Uranium	µg/g ww	65	7	0.003	0.02	0.28	0.35	0.05	0.1	0.02	3.5
Thorium-230	Bq/g dw	43	35	0.00025	0.0025	0.006	0.006	0.002	0.00	0.002	3.0
Lead-210	Bq/g dw	43	0	0.26	0.47	0.62	0.71	0.47	0.10	0.46	1.3
Radium-226	Bq/g dw	43	2	0.0005	0.003	0.014	0.018	0.005	0.004	0.003	3.2
Polonium-210	Bq/g dw	43	0	0.15	0.40	0.64	0.65	0.42	0.10	0.41	1.3
Arsenic	µg/g ww	65	9	0.01	0.07	0.19	0.31	0.08	0.05	0.07	2.1
Cadmium	µg/g ww	65	0	0.02	0.10	0.22	0.30	0.11	0.06	0.10	1.9
Cobalt	µg/g ww	65	14	0.03	0.10	0.52	1.4	0.18	0.23	0.11	2.5
Copper	µg/g ww	65	0	0.56	1.7	4.5	6.2	1.9	1.1	1.7	1.6
Lead	µg/g ww	65	0	0.10	0.47	1.6	3.0	0.61	0.50	0.49	1.9
Molybdenum	µg/g ww	65	17	0.02	0.08	0.64	3.4	0.23	0.47	0.11	3.1
Nickel	µg/g ww	65	3	0.15	0.82	2.7	9.1	1.1	1.2	0.76	2.1
Selenium	µg/g ww	65	65	0.03	0.30	0.40	0.40	0.27	0.15	0.18	3.2
Zinc	µg/g ww	65	0	10.9	24.0	40.0	60.0	26.2	9.2	24.7	1.7
Notes: N = number of samples. N<MDL = number of samples reported as less than the method detection limit. Min = minimum; 95th = 95th percentile; Max = maximum; Avg = average. St.Dev = standard deviation; GM = geometric mean; GSD = geometric standard deviation. µg/g = micrograms per gram; Bq/g = Bequerels per gram; ww = wet weight basis Source: Appendix 6B, data from 2007, 2008, and 2009; data reported as less than the method detection limit was treated as equal to ½ the method detection limit. Sample Kig4-3 collected in 2008 was removed as an outlier from the database and was not included in the summary statistics.											

Table 3.2-6 Summary of Measured Baseline Terrestrial Vegetation Quality - Browse

Browse Concentrations - All Locations											
Constituent	Units	N	N<MDL	Min	Median	95th	Max	Avg	St. Dev.	GM	GSD
Uranium	µg/g ww	18	17	0.005	0.005	0.006	0.010	0.005	0.001	0.005	1.2
Thorium-230	Bq/g dw	18	6	0.0002	0.0006	0.0012	0.002	0.0006	0.0004	0.0005	1.9
Lead-210	Bq/g dw	18	0	0.057	0.11	0.16	0.16	0.11	0.03	0.10	1.3
Radium-226	Bq/g dw	18	0	0.0012	0.004	0.008	0.014	0.004	0.003	0.004	1.8
Polonium-210	Bq/g dw	18	0	0.045	0.088	0.13	0.13	0.09	0.03	0.09	1.4
Arsenic	g/g ww	18	17	0.025	0.025	0.04	0.13	0.03	0.02	0.03	1.5
Cadmium	µg/g ww	18	0	0.08	0.58	4.2	5.0	1.2	1.5	0.62	3.5
Cobalt	µg/g ww	18	0	0.05	0.38	0.97	1.0	0.42	0.30	0.30	2.7
Copper	µg/g ww	18	0	4.3	6.5	10.0	12.0	6.8	2.1	6.5	1.4
Lead	µg/g ww	18	0	0.04	0.09	0.20	0.21	0.11	0.06	0.09	1.7
Molybdenum	µg/g ww	18	14	0.05	0.05	0.52	0.60	0.12	0.16	0.08	2.3
Nickel	µg/g ww	18	0	0.57	1.7	3.5	4.1	1.8	0.96	1.6	1.7
Selenium	µg/g ww	18	18	0.025	0.025	0.025	0.025	0.025	0	0.025	1.0
Zinc	µg/g ww	18	0	32	120	312	380	132	98	104	2.0
Notes: N = number of samples. N<MDL = number of samples reported as less than the method detection limit. Min = minimum; 95th = 95th percentile; Max = maximum; Avg = average. St.Dev = standard deviation; GM = geometric mean; GSD = geometric standard deviation. µg/g = micrograms per gram; Bq/g = Bequerels per gram; ww = wet weight basis; dw = dry weight basis Source: Appendix 6B, data from 2007, 2008, and 2009 for willow, bog birch, and blueberry vegetation; data reported as less than the method detection limit was treated as equal to ½ the method detection limit.											

Table 3.2-7 Summary of Measured Baseline Terrestrial Vegetation Quality - Forage

Forage Concentrations - All Locations											
Constituent	Units	N	N<MDL	Min	Median	95th	Max	Avg	St. Dev.	GM	GSD
Uranium	µg/g ww	66	19	0.002	0.01	0.30	13.9	0.4	2.0	0.02	5.9
Thorium-230	Bq/g dw	43	31	0.00025	0.0025	0.010	0.12	0.006	0.02	0.002	3.2
Lead-210	Bq/g dw	43	0	0.007	0.20	0.42	0.46	0.22	0.12	0.16	2.5
Radium-226	Bq/g dw	43	1	0.0005	0.004	0.015	0.26	0.01	0.04	0.004	2.7
Polonium-210	Bq/g dw	43	0	0.012	0.15	0.31	0.38	0.17	0.10	0.13	2.3
Arsenic	µg/g ww	66	28	0.01	0.03	0.14	0.51	0.05	0.08	0.03	2.4
Cadmium	µg/g ww	66	2	0.005	0.04	0.12	0.18	0.05	0.04	0.04	2.1
Cobalt	µg/g ww	66	10	0.005	0.09	0.52	0.87	0.16	0.18	0.09	2.9
Copper	µg/g ww	66	0	0.37	2.0	3.9	4.4	2.2	0.94	2.0	1.6
Lead	µg/g ww	66	3	0.02	0.15	0.59	0.95	0.23	0.21	0.14	2.8
Molybdenum	µg/g ww	66	2	0.01	0.30	1.8	4.8	0.57	0.82	0.29	3.3
Nickel	µg/g ww	66	0	0.06	0.68	2.4	12.5	1.1	1.6	0.74	2.1
Selenium	µg/g ww	66	66	0.025	0.20	0.30	0.40	0.18	0.10	0.13	2.6
Zinc	µg/g ww	66	0	3.6	16.7	60	100	22.2	17.6	18.0	1.9
Notes: N = number of samples. N<MDL = number of samples reported as less than the method detection limit. Min = minimum; 95th = 95th percentile; Max = maximum; Avg = average. St.Dev = standard deviation; GM = geometric mean; GSD = geometric standard deviation. µg/g = micrograms per gram; Bq/g = Bequerels per gram; ww = wet weight basis; dw = dry weight basis Source: Appendix 6B, data from 2007, 2008, and 2009 for Carex sp. and sedge; data reported as less than the method detection limit was treated as equal to ½ the method detection limit.											

Table 3.2-8 Summary of Measured Baseline Terrestrial Vegetation Quality - Berry

Berry Concentrations - All Locations											
Constituent	Units	N	N<MDL	Min	Median	95th	Max	Avg	St. Dev.	GM	GSD
Uranium	µg/g ww	51	48	0.001	0.001	0.005	0.006	0.002	0.002	0.001	1.9
Thorium-230	Bq/g dw	18	17	0.0002	0.002	0.0025	0.0025	0.002	0.001	0.001	2.5
Lead-210	Bq/g dw	18	2	0.001	0.01	0.04	0.09	0.01	0.02	0.01	3.0
Radium-226	Bq/g dw	18	5	0.00025	0.001	0.002	0.004	0.0012	0.0009	0.0009	2.0
Polonium-210	Bq/g dw	18	0	0.002	0.007	0.013	0.014	0.007	0.004	0.006	1.8
Arsenic	µg/g ww	51	50	0.005	0.005	0.025	0.026	0.009	0.008	0.007	1.9
Cadmium	µg/g ww	51	21	0.0025	0.01	0.19	0.36	0.04	0.08	0.01	4.3
Cobalt	µg/g ww	51	40	0.005	0.01	0.06	0.07	0.02	0.02	0.01	1.8
Copper	µg/g ww	51	0	0.54	0.70	4.7	7.0	1.3	1.5	0.92	2.0
Lead	µg/g ww	51	44	0.005	0.010	0.03	0.05	0.012	0.008	0.011	1.5
Molybdenum	µg/g ww	51	7	0.005	0.04	0.26	1.5	0.09	0.21	0.04	3.1
Nickel	µg/g ww	51	5	0.05	0.20	1.8	3.0	0.49	0.61	0.27	2.9
Selenium	µg/g ww	51	51	0.025	0.10	0.10	0.10	0.09	0.03	0.08	1.7
Zinc	µg/g ww	51	0	1.3	19.0	34	40.4	17.0	11.7	11.0	3.1
Notes: N = number of samples. N<MDL = number of samples reported as less than the method detection limit. Min = minimum; 95th = 95th percentile; Max = maximum; Avg = average. St.Dev = standard deviation; GM = geometric mean; GSD = geometric standard deviation. µg/g = micrograms per gram; Bq/g = Bequerels per gram; ww = wet weight basis; dw = dry weight basis											
Source: Appendix 6B, data from 2007, 2008, and 2009 for blueberry and other berries; data reported as less than the method detection limit was treated as equal to ½ the method detection limit.											

3.2.6 Baseline Aquatic Vegetation Quality

Sampling for macrophyte (aquatic vegetation) baseline quality was described in Appendix 5C for sampling completed in 2009. Table 3.2-9 provides a summary of the data collected from the site for the COPC. Appendix 5C provides a summary of all of the measured data for aquatic vegetation.

Table 3.2-9 Summary of Measured Baseline Aquatic Vegetation Quality

Aquatic Vegetation Concentrations - All Locations											
Constituent	Units	N	N<MDL	Min	Median	95th	Max	Avg	St. Dev.	GM	GSD
Uranium	µg/g dw	30	11	0.005	0.045	0.50	0.86	0.13	0.20	0.04	6.2
Thorium-230	Bq/g dw	13	13	0.0005	0.0005	0.0015	0.003	0.0007	0.0007	0.0005	2.6
Lead-210	Bq/g dw	30	0	0.013	0.042	0.18	0.30	0.07	0.06	0.05	2.2
Radium-226	Bq/g dw	30	0	0.001	0.004	0.015	0.05	0.007	0.009	0.004	2.3
Polonium-210	Bq/g dw	30	0	0.012	0.032	0.13	0.16	0.05	0.04	0.04	2.2
Arsenic	µg/g ww	30	2	0.025	0.44	17.0	31.0	4.7	7.5	0.68	10.7
Cadmium	µg/g ww	30	2	0.005	0.055	0.46	0.71	0.13	0.17	0.06	4.0
Cobalt	µg/g ww	30	1	0.005	0.31	3.0	5.0	0.87	1.2	0.29	5.7
Copper	µg/g ww	30	0	2.2	4.5	16.0	27.0	6.1	5.3	4.9	1.8
Lead	µg/g ww	30	0	0.01	0.35	3.6	7.2	1.0	1.6	0.28	6.4
Molybdenum	µg/g ww	30	0	0.1	0.6	1.7	2.3	0.75	0.54	0.57	2.2
Nickel	µg/g ww	30	0	0.2	1.2	5.1	5.7	1.7	1.5	1.1	2.6
Selenium	µg/g ww	30	22	0.025	0.025	0.16	0.19	0.05	0.05	0.04	1.9
Zinc	µg/g ww	30	0	11.0	26.0	41.8	50.0	26.4	9.1	24.9	1.4
Notes: N = number of samples. N<MDL = number of samples reported as less than the method detection limit. Min = minimum; 95th = 95th percentile; Max = maximum; Avg = average. St.Dev = standard deviation; GM = geometric mean; GSD = geometric standard deviation. µg/g = micrograms per gram; Bq/g = Bequerels per gram; dw = dry weight basis											
Source: Appendix 5C, data from 2007, 2008, and 2009; data reported as less than the method detection limit was treated as equal to ½ the method detection limit. For shoots and roots combined.											

3.2.7 Baseline Insect Quality

Insects were collected from around the RSA and Mine LSA for analysis, as reported in Appendix 6C. In 2008, three samples were collected using Malaise traps, and in 2009, one sample was collected using a Skeeter-Vac. Flying insects, such as mosquitoes, midges, and blackflies, were captured, although the insect species were not specified. Table 3.2-10 summarizes the measured data for the baseline insect quality at the site. Appendix 6C provides a summary of all of the measured data for insects.

Table 3.2-10 Summary of Measured Baseline Insect Quality

Insect Concentrations - All Locations											
Constituent	Units	N	N<MDL	Min	Median	95th	Max	Avg	St. Dev.	GM	GSD
Uranium	µg/g ww	4	0	0.01	0.02	0.055	0.060	0.03	0.02	0.02	2.2
Thorium-230	Bq/g ww*	1	1	0.045	0.045	0.045	0.045	0.045	-	0.045	-
Lead-210	Bq/g ww*	1	1	0.011	0.011	0.011	0.011	0.011	-	0.011	-
Radium-226	Bq/g ww*	1	1	0.009	0.009	0.009	0.009	0.009	-	0.009	-
Polonium-210	Bq/g ww*	1	1	0.015	0.015	0.015	0.015	0.015	-	0.015	-
Arsenic	µg/g ww	4	1	0.025	0.033	0.069	0.075	0.042	0.023	0.038	1.6
Cadmium	µg/g ww	4	0	0.57	1.1	1.7	1.8	1.1	0.51	1.1	1.6
Cobalt	µg/g ww	4	1	0.03	0.08	0.12	0.13	0.08	0.04	0.07	1.8
Copper	µg/g ww	4	0	24.0	28.6	30.1	30.2	27.9	2.8	27.7	1.1
Lead	µg/g ww	4	0	0.15	0.37	0.78	0.83	0.43	0.30	0.35	2.1
Molybdenum	µg/g ww	4	0	0.59	0.73	0.97	1.00	0.76	0.19	0.74	1.3
Nickel	µg/g ww	4	0	0.32	0.53	2.2	2.5	0.97	1.0	0.69	2.4
Selenium	µg/g ww	4	0	0.52	0.75	0.79	0.80	0.70	0.12	0.69	1.2
Zinc	µg/g ww	4	0	109	151	618	700	278	282	204	2.3
Notes: N = number of samples. N<MDL = number of samples reported as less than the method detection limit. Min = minimum; 95th = 95th percentile; Max = maximum; Avg = average. St.Dev = standard deviation; GM = geometric mean; GSD = geometric standard deviation. µg/g = micrograms per gram; Bq/g = Bequerels per gram; ww = wet weight basis * = converted to a wet weight basis using an assumed moisture content of 70% (Gray and Bradley, 2005)											
Source: Appendix 6C, data from 2008, and 2009; data reported as less than the method detection limit was treated as equal to ½ the method detection limit.											

3.2.8 Baseline Fish Quality

Sampling for fish baseline quality was described in Appendix 5C for sampling completed in 2008 and 2009. A number of fish species were sampled, including Arctic grayling, cisco, lake trout, and white roundfish. Flesh and bone samples were analyzed separately, and only flesh data was considered for the assessment. However, all fish species were grouped together for the summary statistics presented in Table 3.2-11. Appendix 5C provides a summary of all of the measured data for fish.

Table 3.2-11 Summary of Measured Baseline Fish Quality

Fish Concentrations - All Locations											
Constituent	Units	N	N<MDL	Min	Median	95th	Max	Avg	St. Dev.	GM	GSD
Uranium	µg/g ww	56	32	0.0005	0.0005	0.03	0.16	0.007	0.02	0.001	4.6
Thorium-230	Bq/g ww	56	54	0.00004	0.0005	0.001	0.001	0.0004	0.0003	0.0002	3.3
Lead-210	Bq/g ww	56	50	0.0005	0.001	0.01	0.045	0.0027	0.008	0.0010	2.7
Radium-226	Bq/g ww	56	46	0.000025	0.00025	0.0005	0.002	0.0002	0.0003	0.0001	3.2
Polonium-210	Bq/g ww	56	28	0.0001	0.0003	0.001	0.002	0.0004	0.0004	0.0003	2.3
Arsenic	µg/g ww	56	6	0.005	0.02	0.05	0.05	0.03	0.01	0.02	1.9
Cadmium	µg/g ww	56	52	0.001	0.001	0.002	0.005	0.0012	0.0007	0.0011	1.4
Cobalt	µg/g ww	56	0	0.002	0.005	0.013	0.019	0.006	0.004	0.005	1.7
Copper	µg/g ww	56	0	0.12	0.26	0.58	0.80	0.32	0.14	0.29	1.5
Lead	µg/g ww	56	36	0.001	0.001	0.012	0.024	0.003	0.005	0.002	2.5
Molybdenum	µg/g ww	56	55	0.010	0.010	0.010	0.030	0.010	0.003	0.010	1.2
Nickel	µg/g ww	56	13	0.005	0.02	0.08	0.12	0.020	0.022	0.014	2.2
Selenium	µg/g ww	56	0	0.15	0.26	0.46	0.59	0.28	0.09	0.27	1.4
Zinc	µg/g ww	56	0	3.5	5.6	11.3	16.0	6.4	2.7	6.0	1.4
Notes: N = number of samples. N<MDL = number of samples reported as less than the method detection limit. Min = minimum; 95th = 95th percentile; Max = maximum; Avg = average. St.Dev = standard deviation; GM = geometric mean; GSD = geometric standard deviation. µg/g = micrograms per gram; Bq/g = Bequerels per gram; ww = wet weight basis											
Source: Appendix 5C, data from 2008, and 2009; data reported as less than the method detection limit was treated as equal to ½ the method detection limit; data for flesh only; all fish species grouped.											

3.2.9 Baseline Bird Concentrations

Small mammals were captured for chemical tissue analysis in 2009, as reported in Appendix 6C. As part of that survey, several birds were inadvertently captured, and chemical analysis of the tissues were completed. The three Savannah sparrow specimens were collected from around the LSA (locations SIS-3 and SIS-5) and a reference location. Table 3.2-12 summarizes the measured data for sparrow at the site. Appendix 6C provides a summary of all of the measured data for sparrow.

Table 3.2-12 Summary of Measured Baseline Sparrow Quality

Sparrow Concentrations - All Locations											
Constituent	Units	N	N<MDL	Min	Median	95th	Max	Avg	St. Dev.	GM	GSD
Uranium	µg/g ww	3	3	0.001	0.001	0.001	0.001	0.001	0	0.001	1.0
Thorium-230	Bq/g ww	3	3	0.001	0.001	0.001	0.001	0.001	0	0.001	1.0
Lead-210	Bq/g ww	3	0	0.020	0.029	0.079	0.084	0.044	0.035	0.037	2.1
Radium-226	Bq/g ww	3	0	0.001	0.002	0.002	0.002	0.002	0.001	0.002	1.5
Polonium-210	Bq/g ww	3	0	0.006	0.014	0.024	0.025	0.015	0.010	0.013	2.0
Arsenic	µg/g ww	3	3	0.010	0.010	0.010	0.010	0.010	0	0.010	1.0
Cadmium	µg/g ww	3	0	0.005	0.015	0.018	0.018	0.013	0.007	0.011	2.0
Cobalt	µg/g ww	3	0	0.012	0.019	0.034	0.036	0.022	0.012	0.020	1.7
Copper	µg/g ww	3	0	2.2	2.5	2.9	2.9	2.5	0.35	2.5	1.1
Lead	µg/g ww	3	0	0.018	0.021	0.030	0.031	0.023	0.007	0.023	1.3
Molybdenum	µg/g ww	3	0	0.08	0.08	0.13	0.13	0.10	0.03	0.09	1.3
Nickel	µg/g ww	3	0	0.07	0.09	0.17	0.18	0.11	0.06	0.10	1.6
Selenium	µg/g ww	3	0	0.08	0.29	0.34	0.35	0.24	0.14	0.20	2.2
Zinc	µg/g ww	3	0	17.0	21.0	27.3	28.0	22.0	5.6	21.5	1.3
Notes: N = number of samples. N<MDL = number of samples reported as less than the method detection limit. Min = minimum; 95th = 95th percentile; Max = maximum; Avg = average. St.Dev = standard deviation; GM = geometric mean; GSD = geometric standard deviation. µg/g = micrograms per gram; Bq/g = Bequerels per gram; ww = wet weight basis Source: Appendix 6C, data from 2007, 2008, and 2009; data reported as less than the method detection limit was treated as equal to ½ the method detection limit.											

3.2.10 Baseline Animal Concentrations

Small mammals were captured for chemical tissue analysis in 2009, as reported in Appendix 6C. There were 16 lemming specimens collected from around the LSA (Kiggavik and Sissons sites). Table 3.2-13 summarizes the measured data for lemming at the site. Appendix 6C provides a summary of all of the measured data for these small mammals.

Table 3.2-13 Summary of Measured Baseline Lemming Quality

Lemming Concentrations - All Locations											
Constituent	Units	N	N<MDL	Min	Median	95th	Max	Avg	St. Dev.	GM	GSD
Uranium	µg/g ww	16	9	0.001	0.001	0.19	0.73	0.05	0.2	0.003	5.8
Thorium-230	Bq/g ww	16	15	0.001	0.001	0.003	0.006	0.001	0.001	0.001	1.6
Lead-210	Bq/g ww	16	0	0.005	0.066	0.14	0.15	0.07	0.05	0.05	2.9
Radium-226	Bq/g ww	16	8	0.0005	0.00075	0.15	0.58	0.037	0.14	0.001	5.8
Polonium-210	Bq/g ww	16	0	0.002	0.0045	0.030	0.036	0.010	0.010	0.006	2.4
Arsenic	µg/g ww	16	10	0.010	0.010	0.06	0.11	0.02	0.03	0.02	2.0
Cadmium	µg/g ww	16	0	0.005	0.048	0.13	0.17	0.06	0.04	0.04	2.4
Cobalt	µg/g ww	16	0	0.028	0.084	0.17	0.18	0.10	0.05	0.08	1.7
Copper	µg/g ww	16	0	1.6	2.3	2.6	2.7	2.3	0.30	2.3	1.1
Lead	µg/g ww	16	0	0.015	0.065	0.18	0.22	0.07	0.06	0.05	2.4
Molybdenum	µg/g ww	16	3	0.025	0.095	0.90	1.4	0.27	0.39	0.12	3.5
Nickel	µg/g ww	16	0	0.07	0.19	0.33	0.37	0.20	0.08	0.18	1.6
Selenium	µg/g ww	16	0	0.03	0.04	0.12	0.27	0.06	0.06	0.05	1.7
Zinc	µg/g ww	16	0	16.0	26.5	34.8	37.0	27.7	5.5	27.1	1.2
Notes: N = number of samples. N<MDL = number of samples reported as less than the method detection limit. Min = minimum; 95th = 95th percentile; Max = maximum; Avg = average. St.Dev = standard deviation; GM = geometric mean; GSD = geometric standard deviation. µg/g = micrograms per gram; Bq/g = Bequerels per gram; ww = wet weight basis Source: Appendix 6C, data from 2007, 2008, and 2009; data reported as less than the method detection limit was treated as equal to ½ the method detection limit.											

There were 11 vole specimens collected from the site, as described in Appendix 6C. Table 3.2-14 summarizes the measured data for vole at the site. Appendix 6C provides a summary of the vole data as well.

Table 3.2-14 Summary of Measured Baseline Vole Quality

Vole Concentrations - All Locations											
Constituent	Units	N	N<MDL	Min	Median	95th	Max	Avg	St. Dev.	GM	GSD
Uranium	µg/g ww	11	6	0.001	0.001	0.23	0.43	0.04	0.13	0.003	6.7
Thorium-230	Bq/g ww	11	9	0.001	0.001	0.004	0.004	0.001	0.001	0.001	1.7
Lead-210	Bq/g ww	11	1	0.002	0.057	0.22	0.29	0.09	0.08	0.06	3.6
Radium-226	Bq/g ww	11	2	0.0005	0.001	0.006	0.008	0.002	0.002	0.001	2.3
Polonium-210	Bq/g ww	11	0	0.001	0.013	0.032	0.037	0.015	0.011	0.010	3.0
Arsenic	µg/g ww	11	9	0.01	0.01	0.02	0.02	0.012	0.004	0.011	1.3
Cadmium	µg/g ww	11	1	0.0025	0.01	0.015	0.017	0.010	0.004	0.009	1.6
Cobalt	µg/g ww	11	0	0.036	0.063	0.087	0.094	0.060	0.019	0.058	1.4
Copper	µg/g ww	11	0	2.0	2.4	3.8	5.0	2.6	0.83	2.5	1.3
Lead	µg/g ww	11	0	0.02	0.03	0.10	0.10	0.05	0.03	0.04	2.0
Molybdenum	µg/g ww	11	0	0.12	0.13	0.21	0.22	0.15	0.03	0.14	1.2
Nickel	µg/g ww	11	0	0.07	0.13	0.20	0.22	0.14	0.04	0.13	1.4
Selenium	µg/g ww	11	0	0.05	0.14	0.23	0.24	0.13	0.07	0.12	1.7
Zinc	µg/g ww	11	0	24.0	28.0	34.5	35.0	28.9	3.6	28.7	1.1
Notes: N = number of samples. N<MDL = number of samples reported as less than the method detection limit. Min = minimum; 95th = 95th percentile; Max = maximum; Avg = average. St.Dev = standard deviation; GM = geometric mean; GSD = geometric standard deviation. µg/g = micrograms per gram; Bq/g = Bequerels per gram; ww = wet weight basis											
Source: Appendix 6C, data reported as less than the method detection limit was treated as equal to ½ the method detection limit.											

Appendix 6C describes the collection of 76 caribou tissue samples (bone, kidney, liver, and muscle) from 27 separate caribou provided by Baker Lake hunters in February and May 2009. Samples were collected from animals that had either been stored or recently killed for personal use. Table 3.2-15 summarizes the measured data for caribou collected from the Baker Lake area. Attachment B of this report provides a summary of the caribou data, as well as a comparison with caribou collected from other areas in Northern Canada.

Table 3.2-15 Summary of Measured Baseline Caribou Quality

Caribou Muscle Concentrations - All Locations											
Constituent	Units	N	N<MDL	Min	Median	95th	Max	Avg	St. Dev.	GM	GSD
Uranium	µg/g ww	23	8	0.0005	0.002	0.031	0.17	0.013	0.04	0.003	5.2
Thorium-230	Bq/g ww	23	22	0.00004	0.00005	0.0001	0.0005	0.0001	0.0001	0.0001	1.7
Lead-210	Bq/g ww	23	14	0.0005	0.0005	0.004	0.007	0.001	0.002	0.001	2.3
Radium-226	Bq/g ww	23	6	0.000025	0.0001	0.00020	0.00035	0.00011	0.00008	0.00009	2.1
Polonium-210	Bq/g ww	23	0	0.004	0.026	0.039	0.046	0.027	0.008	0.025	1.6
Arsenic	µg/g ww	23	1	0.005	0.040	0.050	0.060	0.035	0.014	0.031	1.8
Cadmium	µg/g ww	23	2	0.001	0.006	0.02	0.07	0.010	0.014	0.007	2.5
Cobalt	µg/g ww	23	0	0.002	0.006	0.02	0.02	0.008	0.005	0.006	1.9
Copper	µg/g ww	23	0	0.74	2.1	4.0	4.2	2.4	0.81	2.2	1.4
Lead	µg/g ww	23	0	0.002	0.014	0.038	0.049	0.016	0.012	0.012	2.5
Molybdenum	µg/g ww	23	13	0.01	0.01	0.07	0.46	0.05	0.09	0.02	2.8
Nickel	µg/g ww	23	7	0.005	0.020	0.088	0.160	0.032	0.036	0.019	2.9
Selenium	µg/g ww	23	0	0.10	0.18	0.21	0.22	0.17	0.02	0.17	1.2
Zinc	µg/g ww	23	0	18.0	41.0	61.8	62.0	40.4	14.2	37.7	1.5
Notes: N = number of samples. N<MDL = number of samples reported as less than the method detection limit. Min = minimum; 95th = 95th percentile; Max = maximum; Avg = average. St.Dev = standard deviation; GM = geometric mean; GSD = geometric standard deviation. µg/g = micrograms per gram; Bq/g = Bequerels per gram; dw = dry weight basis; ww = wet weight basis Source: Appendix 6C, data from 2009; data reported as less than the method detection limit was treated as equal to ½ the method detection limit.											

3.3 BIOAVAILABILITY FACTORS

Sediment samples in the Kiggavik study area were collected at various lake locations in the Pointer Lake, Shack Lake, Judge Sissons Lake, and Squiggly Lake watersheds. Tessier sequential extraction tests (Tessier et al., 1979; Davidson et al., 1994) were performed on 21 composite samples. The sediment samples were analyzed following the six-step Tessier extraction procedure to measure metal and radionuclide binding in the sediments. The test procedure differentiates between: 1) water soluble: fraction dissolved in distilled water; 2) ion exchangeable: fraction that is weakly adsorbed and released by ion-exchange processes; 3) fraction bound to carbonates and released by organic acid treatment; 4) fraction bound to Fe and Mn oxides: (also called the “reducible fraction”); 5) sulphide and/or organic matter bound fraction (also called the “oxidizable fraction”); and 6) residual fraction: not extractable by the above methods.

Normally, the first four fractions are considered available for sediment/water column exchange. The specific constituents that are contained in these fractions are expected to be reversibly bound and are in equilibrium with concentrations in the porewater phase. The extractable

fraction of the COPC metals ranges from near 0% (antimony, silver, thorium) to near 100% (cadmium), but most constituents are less than 50% extractable. As expected, the extractable fraction of the oxy-anions (arsenate, molybdate, selenate) is primarily absorbed onto iron and manganese oxides. On the average, 78% of the extractable arsenic, 61% of extractable molybdenum, and 58% of the extractable selenium was partitioned in the Fe/Mn oxide fraction. Cations (cobalt, copper, nickel, zinc) are also mainly associated with the Fe/Mn oxide fraction, but the distribution includes significant speciation as ion exchangeable species and carbonates. Similar results were obtained by Sutherland (2002). Of the COPC metals, uranium is an exception inasmuch as most (69%) of the exchangeable uranium is associated with carbonates, while the rest (31%) is adsorbed onto iron/manganese oxides. Amongst the radionuclides, Pb-210 and Po-210 are mainly associated with iron oxides while Ra-226 speciation includes a significant ion exchangeable fraction.

To analyze for relationships between variables, the extraction data were subjected to K-mean cluster analysis. The technique involves grouping data of similar characteristics (Romesburg, 2004). K-mean cluster analysis is widely recognized as a powerful hierarchical algorithm that can identify similarities in large data sets. This chemometric technique involves grouping data of similar chemical or physico-chemical characteristics. It has replaced simple statistical functions such as the arithmetic mean in data mining applications. In the present investigation, the total metal concentrations (µg/g) in the sediment and the extractable fractions of 21 observations were employed. The environmentally mobile fraction was defined as the sum of the first four extraction measurements (water soluble, ion exchangeable, carbonate bound and adsorbed to Fe/Mn oxides) in each sequential Tessier analysis. The logarithmic values of observations were used to avoid bias between the variable types (concentration vs % extraction). The Euclidean distance between the extraction data sets was chosen as the cluster measure. This is one of the most common means of measuring similarities between data. It is computed as follows in equation (3.3-1):

$$D(X_i, X_j) = \left[\sum_{l=1}^N (X_{i,l} - X_{j,l})^2 \right]^{1/2} \quad (3.3-1)$$

where:

$D(X_i, X_j)$ = distance between the i-th and j-th set of observations

$X_{i,l}$ = the l-th observation in the i-th set

$l = 1, 2, 3, \dots, N$

The value of N was 2 (total metal content and % extractable content) in the present case.

A K-mean cluster analysis was completed for the Judge Sissons Lake samples. The main reason for selecting the K-mean cluster approach was the small sediment sample size in Judge Sissons Lake and the relatively high frequency of apparent outliers either in the sediment concentration or the % extraction data. The mean distance between uncorrelated locations

varied depending on the constituent. Using a one-sided significance test, the critical distance at the 95% confidence level was estimated. On this basis, the dataset naturally formed distinct clusters. Cluster size depended on the particular constituent in question. The clustering results indicate that the sediment composition and extractability in the Kiggavik area are similar and the data from several locations may be combined with sediments from Judge Sissons Lake to derive characteristic composition and extractability information.

The extractable fractions together with the total metal concentrations were used, in turn, to establish solid phase “background” concentrations and linear sorption coefficients (K_d values) for further analysis of water and sediment quality impact of discharges on Judge Sissons Lake. The sorption coefficient (K_d), also known as the partition or distribution coefficient, is an estimate of the partitioning of the constituents between the solid (i.e. sediment) and liquid (porewater) phases. The results of the k-mean cluster analysis to estimate extractable fractions are summarized in Table 3.3-1.

Table 3.3-1 Summary of Calculated Site-Specific Extractable Fraction

COPC	Extractable Fraction
Uranium	0.460
Thorium-230	1.0 ^a
Lead-210	0.626
Radium-226	0.334
Polonium-210	0.050
Arsenic	0.174
Cadmium	1.0 ^a
Cobalt	0.309
Copper	0.166
Lead	0.235
Molybdenum	0.150
Nickel	0.157
Selenium	0.243
Zinc	0.459
Note: a assumed	

The site-specific extractable fractions were used in the sediment model and for the bioavailability of ingested soil and sediment.

3.4 EMISSIONS

3.4.1 Atmospheric Emissions

Emissions for the atmospheric dispersion model are discussed in detail (Appendix 4B Air Quality); however, a brief overview is provided here. During the construction, operational years and into the post-closure phase of the Project, sources of atmospheric emissions may include:

- drilling and blasting;
- ore and waste rock handling;
- maintenance activities (i.e., grading and bulldozing);
- wind erosion of stockpiled ore and mine waste rock;
- non-road mining equipment;
- vehicular transportation;
- milling operations; and,
- supporting activities such as power generation.

Activities like material handling along with heavy equipment operation are also primary emission sources during construction and quarrying. Additional activities such as aggregate crushing and screening are also emission sources during these phases.

Various phases of development were assessed over the lifetime of the Project including construction, mining stages, decommissioning and post-decommissioning. Long-term air quality effects were assessed for four (4) production scenarios associated with the scheduled activities of the Project over its lifetime. These various scenarios assess the development of the three open pit mines (East Zone, Centre Zone and Main Zone) at the Kiggavik site and both the Andrew Lake open pit mine and End Grid underground mine at the Sissons site. Production schedules for mining and milling were both considered in deriving the modelling scenarios to consider a range of operating conditions. A description of each of the modelled scenarios is provided in Appendix 4B Air Quality.

3.4.2 Liquid Effluent

The liquid effluent associated with the Kiggavik Project is characterized by quality and flow profiles. The three aspects defining the liquid effluent assumptions throughout the assessment period are the discharge scenario, the operation scenario, and the closure scenario. The following sections provide a screening process to ascertain a conservative assessment scenario that covers the potential options outlined for discharge scenarios, operation scenarios, and

closure scenarios. The scenario selected will be considered for the ERA and HHRA and the results will encompass the range of results from the various other potential options for discharge, operation, and closure.

3.4.2.1 Discharge Scenarios

Three discharge scenarios were considered for the water treatment plants (WTPs) associated with the Kiggavik Project, as described below. Refer to Figure 2.7-1 for the segments of Judge Sissons Lake.

- Option 1: Kiggavik WTP discharges to segment JSL-2 and Sissons WTP discharges to segment JSL-8
- Option 2: Kiggavik WTP and Sissons WTP discharge to segment JSL-2
- Option 3: the Kiggavik WTP is expanded to also treat effluent from Sissons, and the expanded Kiggavik WTP discharges to segment JSL-2

Table 3.4-1 summarizes the maximum predicted COPC water concentrations in each segment of Judge Sissons Lake for the three options. For comparison purposes, the maximum concentration of each COPC in each segment from the three scenarios has been identified. Since there is a direct discharge from the Sissons WTP to JSL-8 in Option 1, the maximum concentrations of the three scenarios generally occurs in this area of the lake. There is less constituent load into JSL-2 for this option, compared with Options 2 and 3. Options 2 and 3 clearly have a greater influence on the water concentrations in the vicinity of the JSL-2, since these two options exclusively discharge effluent to this location. This influence extends to the outlet of Judge Sissons Lake (JSL-4), where Options 2 and 3 also have the highest predicted maximum monthly mean water concentrations for the constituents.

Table 3.4-1 Maximum of Monthly Mean Water Concentrations in JSL Segments – Option 1 (O1) vs Option 2 (O2) vs Option 3 (O3)

COPC	Units	JSL-1			JSL-2			JSL-3		
		O1	O2	O3	O1	O2	O3	O1	O2	O3
Uranium	µg/L	1.1	1.6	<u>2.1</u>	0.8	1.1	<u>1.4</u>	0.8	0.9	<u>1.2</u>
Thorium-230	Bq/L	0.032	0.032	0.032	0.013	<u>0.014</u>	<u>0.014</u>	0.010	0.010	0.010
Lead-210	Bq/L	0.058	<u>0.061</u>	0.060	0.024	<u>0.027</u>	<u>0.027</u>	0.017	<u>0.018</u>	<u>0.018</u>
Radium-226	Bq/L	0.021	0.021	0.021	0.008	<u>0.009</u>	0.008	<u>0.006</u>	<u>0.006</u>	0.005
Polonium-210	Bq/L	0.027	<u>0.028</u>	<u>0.028</u>	0.012	<u>0.013</u>	<u>0.013</u>	0.009	<u>0.010</u>	0.009
Arsenic	µg/L	1.6	<u>1.9</u>	1.8	0.9	<u>1.1</u>	1.0	0.7	<u>0.8</u>	0.7
Cadmium	µg/L	0.5	0.5	0.5	0.3	0.3	<u>0.4</u>	0.3	0.3	0.3
Cobalt	µg/L	0.5	0.5	0.5	0.2	0.2	<u>0.3</u>	0.1	0.1	<u>0.2</u>
Copper	µg/L	4.1	4.1	<u>4.2</u>	1.5	1.5	<u>1.7</u>	1.1	1.1	<u>1.2</u>
Lead	µg/L	0.6	0.6	<u>0.8</u>	0.3	0.3	<u>0.4</u>	0.2	0.2	<u>0.3</u>
Molybdenum	µg/L	14.4	<u>15.5</u>	14.1	14.0	<u>14.6</u>	13.4	13.6	<u>13.8</u>	12.8
Nickel	µg/L	3.4	3.4	3.4	1.6	1.6	1.6	1.1	1.1	1.1
Selenium	µg/L	0.7	<u>0.8</u>	0.7	0.4	0.4	0.4	<u>0.3</u>	<u>0.3</u>	0.2
Zinc	µg/L	20.5	20.5	20.5	<u>7.6</u>	7.5	<u>7.6</u>	<u>5.3</u>	<u>5.3</u>	5.2
Ammonia (Unionized)	mg/L	0.004	0.004	0.004	0.007	0.007	0.007	0.009	0.009	<u>0.010</u>
Chloride	mg/L	47.3	58.7	<u>58.9</u>	69.7	73.9	<u>74.8</u>	87.2	<u>88.3</u>	88.1
Sulphate	mg/L	172	174	<u>191</u>	224	225	<u>251</u>	269	269	<u>297</u>
TDS	mg/L	353	387	<u>459</u>	403	416	<u>517</u>	472	479	<u>605</u>
Hardness (as CaCO ₃)	mg/L	133	<u>148</u>	146	162	<u>167</u>	165	192	<u>194</u>	193
COPC	Units	JSL-4			JSL-5			JSL-6		
		O1	O2	O3	O1	O2	O3	O1	O2	O3
Uranium	µg/L	0.7	0.8	<u>1.0</u>	0.6	0.6	<u>0.8</u>	<u>0.4</u>	0.3	<u>0.4</u>
Thorium-230	Bq/L	0.009	0.009	0.009	0.010	0.010	0.010	0.011	0.011	0.011
Lead-210	Bq/L	0.016	<u>0.017</u>	<u>0.017</u>	0.017	<u>0.018</u>	<u>0.018</u>	0.019	0.019	0.019
Radium-226	Bq/L	0.005	<u>0.006</u>	0.005	0.006	0.006	0.006	0.007	0.007	0.007
Polonium-210	Bq/L	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009
Arsenic	µg/L	0.6	<u>0.7</u>	<u>0.7</u>	0.6	0.6	0.6	0.4	0.4	0.4
Cadmium	µg/L	0.2	0.2	<u>0.3</u>	0.2	0.2	0.2	0.1	0.1	0.1
Cobalt	µg/L	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Copper	µg/L	1.0	1.0	<u>1.2</u>	1.1	1.1	<u>1.2</u>	1.4	1.4	1.4
Lead	µg/L	0.2	0.2	<u>0.3</u>	0.2	0.2	<u>0.3</u>	0.2	0.2	0.2

COPC	Units	JSL-4			JSL-5			JSL-6		
		O1	O2	O3	O1	O2	O3	O1	O2	O3
Molybdenum	µg/L	11.8	<u>11.9</u>	11.1	<u>9.4</u>	<u>9.4</u>	8.8	<u>2.6</u>	2.5	2.3
Nickel	µg/L	1.0	1.0	1.0	1.0	1.0	1.0	1.1	1.1	1.1
Selenium	µg/L	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Zinc	µg/L	<u>5.2</u>	<u>5.2</u>	5.1	5.6	5.6	5.6	6.9	6.9	6.9
Ammonia (Unionized)	mg/L	0.007	0.007	0.007	0.007	0.007	0.007	0.0012	0.0012	0.0012
Chloride	mg/L	76.1	76.4	<u>78.3</u>	<u>68.7</u>	67.7	67.5	<u>9.7</u>	8.6	8.7
Sulphate	mg/L	231	231	<u>262</u>	206	206	<u>227</u>	24.5	24.5	<u>26.6</u>
TDS	mg/L	417	422	<u>538</u>	371	376	<u>472</u>	73.7	76.9	<u>86.5</u>
Hardness (as CaCO ₃)	mg/L	169	<u>171</u>	170	150	<u>151</u>	150	26.2	<u>27.0</u>	26.6

COPC	Units	JSL-7			JSL-8		
		O1	O2	O3	O1	O2	O3
Uranium	µg/L	<u>1.4</u>	0.9	1.0	<u>0.9</u>	0.4	0.4
Thorium-230	Bq/L	<u>0.040</u>	<u>0.040</u>	0.039	<u>0.014</u>	0.013	0.013
Lead-210	Bq/L	<u>0.074</u>	0.072	0.072	<u>0.026</u>	0.024	0.024
Radium-226	Bq/L	<u>0.027</u>	0.026	0.026	0.009	0.009	0.009
Polonium-210	Bq/L	<u>0.034</u>	0.033	0.033	<u>0.012</u>	0.011	0.011
Arsenic	µg/L	<u>1.5</u>	1.4	1.4	<u>0.6</u>	0.5	0.5
Cadmium	µg/L	0.4	0.4	0.4	0.1	0.1	<u>0.2</u>
Cobalt	µg/L	0.4	0.4	0.4	0.1	0.1	0.1
Copper	µg/L	5.2	5.2	5.2	1.7	1.7	1.7
Lead	µg/L	0.7	0.7	0.7	0.2	0.2	0.2
Molybdenum	µg/L	<u>5.6</u>	4.2	3.8	<u>3.9</u>	2.7	2.4
Nickel	µg/L	4.0	4.0	4.0	1.3	1.3	1.3
Selenium	µg/L	0.7	0.7	0.7	0.2	0.2	0.2
Zinc	µg/L	26.1	26.1	26.1	8.6	8.6	8.6
Ammonia (Unionized)	mg/L	0.001	0.001	0.001	0.0014	0.0014	0.0014
Chloride	mg/L	<u>24.8</u>	12.6	12.6	<u>25.5</u>	11.2	11.2
Sulphate	mg/L	32.2	30.8	<u>33.1</u>	33.5	31.7	<u>34.7</u>
TDS	mg/L	201	200	<u>210</u>	106	100	<u>112</u>
Hardness (as CaCO ₃)	mg/L	65.9	<u>62.6</u>	62.1	<u>41.4</u>	35.0	34.7

Notes:

O1 – Option 1

O2 – Option 2

O3 – Option 3

Bold underlining indicates the maximum value for the three options.

Table 3.4-2 summarizes the maximum predicted sediment concentrations in each segment of Judge Sissons Lake for the three options. Similar to the results for water, Options 2 and 3 have a greater influence on the sediment concentrations in the vicinity of the JSL-2, since these two options exclusively discharge effluent to this location. For sediment, differences in the maximum predicted concentrations between the three options are generally minor.

Table 3.4-2 Maximum of Monthly Mean Sediment Concentrations in JSL Segments – Option 1 (O1) vs Option 2 (O2) vs Option 3 (O3)

COPC	Units	JSL-1			JSL-2			JSL-3		
		O1	O2	O3	O1	O2	O3	O1	O2	O3
Uranium	µg/g	2.8	<u>2.9</u>	<u>2.9</u>	2.8	2.9	<u>3.0</u>	2.8	2.8	<u>2.9</u>
Thorium-230	Bq/g	0.05	0.05	0.05	0.04	0.04	0.04	0.04	0.04	0.04
Lead-210	Bq/g	0.12	0.12	0.12	0.12	0.12	0.12	0.11	0.11	0.11
Radium-226	Bq/g	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Polonium-210	Bq/g	0.11	<u>0.12</u>	0.11	0.11	0.11	0.11	0.11	0.11	0.11
Arsenic	µg/g	8.5	<u>8.6</u>	8.5	8.5	<u>8.6</u>	<u>8.6</u>	8.4	<u>8.5</u>	8.4
Cadmium	µg/g	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Cobalt	µg/g	8.9	8.9	<u>9.0</u>	9.9	9.9	<u>10.1</u>	9.3	9.3	<u>9.4</u>
Copper	µg/g	21.3	21.3	21.3	<u>21.2</u>	<u>21.2</u>	21.1	21.1	21.1	21.1
Lead	µg/g	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1
Molybdenum	µg/g	2.3	<u>2.4</u>	2.3	<u>2.3</u>	<u>2.3</u>	2.2	<u>2.2</u>	<u>2.2</u>	2.1
Nickel	µg/g	22.7	22.7	<u>22.8</u>	22.6	22.6	<u>22.7</u>	22.5	22.5	22.5
Selenium	µg/g	0.7	0.7	0.7	0.7	<u>0.8</u>	0.7	0.7	0.7	0.7
Zinc	µg/g	71.8	71.8	<u>71.9</u>	71.1	71.1	71.1	70.8	70.8	70.8
COPC	Units	JSL-4			JSL-5			JSL-6		
		O1	O2	O3	O1	O2	O3	O1	O2	O3
Uranium	µg/g	2.8	2.8	<u>2.9</u>	2.8	2.8	2.8	<u>2.8</u>	2.7	<u>2.8</u>
Thorium-230	Bq/g	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Lead-210	Bq/g	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
Radium-226	Bq/g	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Polonium-210	Bq/g	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
Arsenic	µg/g	8.4	8.4	8.4	8.4	8.4	8.4	8.3	8.3	8.3
Cadmium	µg/g	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Cobalt	µg/g	9.2	9.2	9.2	9.1	9.1	9.1	8.9	8.9	8.9
Copper	µg/g	21.1	21.1	21.1	21.1	21.1	21.1	<u>21.2</u>	<u>21.2</u>	21.1
Lead	µg/g	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1
Molybdenum	µg/g	2.0	<u>2.1</u>	1.9	<u>1.9</u>	<u>1.9</u>	1.8	1.6	1.6	1.6
Nickel	µg/g	22.5	22.5	22.5	22.4	22.4	<u>22.5</u>	22.4	22.4	<u>22.5</u>
Selenium	µg/g	0.7	0.7	0.7	0.6	0.6	0.6	0.6	0.6	0.6
Zinc	µg/g	70.8	70.8	70.8	70.8	70.8	<u>70.9</u>	71.0	71.0	<u>71.1</u>

COPC	Units	JSL-7			JSL-8		
		O1	O2	O3	O1	O2	O3
Uranium	µg/g	2.8	2.8	2.8	<u>2.8</u>	2.7	<u>2.8</u>
Thorium-230	Bq/g	0.05	0.05	0.05	0.04	0.04	0.04
Lead-210	Bq/g	0.12	0.12	0.12	0.11	0.11	0.11
Radium-226	Bq/g	0.05	0.05	0.05	0.05	0.05	0.05
Polonium-210	Bq/g	0.12	0.12	0.12	0.11	0.11	0.11
Arsenic	µg/g	8.4	8.4	8.4	<u>8.4</u>	8.3	8.3
Cadmium	µg/g	0.2	0.2	0.2	0.2	0.2	0.2
Cobalt	µg/g	8.9	8.9	8.9	8.9	8.9	8.9
Copper	µg/g	21.3	21.3	21.3	21.2	21.2	21.2
Lead	µg/g	10.1	10.1	10.1	10.1	10.1	10.1
Molybdenum	µg/g	<u>1.6</u>	1.5	1.5	<u>1.8</u>	1.6	1.6
Nickel	µg/g	22.7	22.7	<u>22.8</u>	22.5	22.5	22.5
Selenium	µg/g	0.7	0.7	0.7	0.6	0.6	0.6
Zinc	µg/g	72.0	72.0	<u>72.1</u>	71.2	71.2	71.2
Notes: O1 – Option 1 O2 – Option 2 O3 – Option 3 <u>Bold underlining</u> indicates the maximum value for the three options.							

Discharge scenario Option 1 is selected for evaluation in the ecological and human health risk assessment. The predicted water and sediment quality for the three discharge scenarios is similar, and Option 1 was selected because it has two separate discharge locations and therefore the risks associated with this option are considered to be representative or conservative of any of the options that may be selected.

3.4.2.2 Operation Scenarios

Two operation scenarios were considered for the assessment:

- Project Scenario: 13 years of operation for the Kiggavik Project (operation ends June 2026)
- Extended Scenario: 25 years of operation for the Kiggavik Project (operation ends June 2038)

Table 3.4-3 summarizes the maximum predicted water concentrations in each segment of Judge Sissons Lake for the two operation scenarios. A comparison of the values in each

segment shows that in most cases, the maximum predicted water concentrations are the same for the two operation scenarios. However, when the values are different, the maximum predicted water concentrations are higher for the Extended Scenario.

Table 3.4-3 Maximum of Monthly Mean Water Concentrations in JSL Segments – Project Scenario vs Extended Scenario

COPC	Units	JSL-1		JSL-2		JSL-3		JSL-4	
		Pr	Ex	Pr	Ex	Pr	Ex	Pr	Ex
Uranium	µg/L	1.1	1.1	0.8	0.8	0.8	0.8	0.7	0.7
Thorium-230	Bq/L	0.032	0.032	0.013	0.013	0.009	<u>0.010</u>	0.009	0.009
Lead-210	Bq/L	0.058	0.058	0.024	0.024	0.017	0.017	0.016	0.016
Radium-226	Bq/L	0.021	0.021	0.008	0.008	0.006	0.006	0.005	0.005
Polonium-210	Bq/L	0.027	0.027	0.012	0.012	0.009	0.009	0.009	0.009
Arsenic	µg/L	1.6	1.6	0.9	0.9	0.7	0.7	0.6	0.6
Cadmium	µg/L	0.5	0.5	0.3	0.3	0.3	0.3	0.2	0.2
Cobalt	µg/L	0.5	0.5	0.2	0.2	0.1	0.1	0.1	0.1
Copper	µg/L	4.1	4.1	1.5	1.5	1.1	1.1	1.0	1.0
Lead	µg/L	0.6	0.6	0.3	0.3	0.2	0.2	0.2	0.2
Molybdenum	µg/L	13.9	<u>14.4</u>	13.4	<u>14.0</u>	12.8	<u>13.6</u>	11.3	<u>11.8</u>
Nickel	µg/L	3.4	3.4	1.6	1.6	1.1	1.1	1.0	1.0
Selenium	µg/L	0.7	0.7	0.4	0.4	0.2	<u>0.3</u>	0.2	0.2
Zinc	µg/L	20.5	20.5	7.6	7.6	5.3	5.3	5.2	5.2
Ammonia (Unionized)	mg/L	0.004	0.004	0.007	0.007	0.009	0.009	0.007	0.007
Chloride	mg/L	47.3	47.3	69.7	69.7	83.7	<u>87.2</u>	76.1	76.1
Sulphate	mg/L	172	172	224	224	265	<u>269</u>	231	231
TDS	mg/L	350	<u>353</u>	403	403	472	472	417	417
Hardness (as CaCO ₃)	mg/L	132	<u>133</u>	162	162	192	192	169	169
COPC	Units	JSL-5		JSL-6		JSL-7		JSL-8	
		Pr	Ex	Pr	Ex	Pr	Ex	Pr	Ex
Uranium	µg/L	0.6	0.6	0.3	<u>0.4</u>	1.4	1.4	0.9	0.9
Thorium-230	Bq/L	0.010	0.010	0.011	0.011	0.040	0.040	0.014	0.014
Lead-210	Bq/L	0.017	0.017	0.019	0.019	0.074	0.074	0.026	0.026
Radium-226	Bq/L	0.006	0.006	0.007	0.007	0.027	0.027	0.009	0.009
Polonium-210	Bq/L	0.009	0.009	0.009	0.009	0.034	0.034	0.012	0.012
Arsenic	µg/L	0.6	0.6	0.4	0.4	1.5	1.5	0.6	0.6
Cadmium	µg/L	0.2	0.2	0.1	0.1	0.4	0.4	0.1	0.1
Cobalt	µg/L	0.1	0.1	0.1	0.1	0.4	0.4	0.1	0.1
Copper	µg/L	1.1	1.1	1.4	1.4	5.2	5.2	1.7	1.7
Lead	µg/L	0.2	0.2	0.2	0.2	0.7	0.7	0.2	0.2
Molybdenum	µg/L	9.1	<u>9.4</u>	2.5	<u>2.6</u>	5.4	<u>5.6</u>	3.8	<u>3.9</u>
Nickel	µg/L	1.0	1.0	1.1	1.1	4.0	4.0	1.3	1.3

COPC	Units	JSL-5		JSL-6		JSL-7		JSL-8	
		Pr	Ex	Pr	Ex	Pr	Ex	Pr	Ex
Selenium	µg/L	0.2	0.2	0.2	0.2	0.7	0.7	0.2	0.2
Zinc	µg/L	5.6	5.6	6.9	6.9	26.1	26.1	8.6	8.6
Ammonia (Unionized)	mg/L	0.007	0.007	0.0012	0.0012	0.001	0.001	0.0014	0.0014
Chloride	mg/L	66.1	<u>68.7</u>	9.7	9.7	24.8	24.8	25.5	25.5
Sulphate	mg/L	202	<u>206</u>	24.5	24.5	32.2	32.2	33.5	33.5
TDS	mg/L	371	371	73.4	<u>73.7</u>	200	<u>201</u>	106	106
Hardness (as CaCO ₃)	mg/L	150	150	26.1	<u>26.2</u>	65.9	65.9	41.2	<u>41.4</u>
Note: results are presented for O1Pr14 and O1Ex14. Pr – Project Scenario Ex – Extended Scenario <u>Bold underlining</u> indicates the maximum value for the two scenarios									

Table 3.4-4 summarizes the maximum predicted sediment concentrations in each segment of Judge Sissons Lake for the two operation scenarios. A comparison of the values in each segment shows that in most cases, the maximum predicted sediment concentrations are the same for the two operation scenarios. However, when the values are different, the maximum predicted sediment concentrations are higher for the Extended Scenario.

Table 3.4-4 Maximum of Monthly Mean Sediment Concentrations in JSL Segments – Project Scenario vs Extended Scenario

COPC	Units	JSL-1		JSL-2		JSL-3		JSL-4	
		Pr	Ex	Pr	Ex	Pr	Ex	Pr	Ex
Uranium	µg/g	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8
Thorium-230	Bq/g	0.05	0.05	0.04	0.04	0.04	0.04	0.04	0.04
Lead-210	Bq/g	0.12	0.12	0.12	0.12	0.11	0.11	0.11	0.11
Radium-226	Bq/g	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Polonium-210	Bq/g	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
Arsenic	µg/g	8.5	8.5	8.5	8.5	8.4	8.4	8.4	8.4
Cadmium	µg/g	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Cobalt	µg/g	8.9	8.9	9.6	<u>9.9</u>	9.1	<u>9.3</u>	9.1	<u>9.2</u>
Copper	µg/g	21.3	21.3	21.2	21.2	21.1	21.1	21.1	21.1
Lead	µg/g	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1
Molybdenum	µg/g	2.3	2.3	2.2	<u>2.3</u>	2.1	<u>2.2</u>	2.0	2.0
Nickel	µg/g	22.7	22.7	22.6	22.6	22.5	22.5	22.5	22.5
Selenium	µg/g	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Zinc	µg/g	71.8	71.8	71.1	71.1	70.8	70.8	70.8	70.8

COPC	Units	JSL-5		JSL-6		JSL-7		JSL-8	
		Pr	Ex	Pr	Ex	Pr	Ex	Pr	Ex
Uranium	µg/g	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8
Thorium-230	Bq/g	0.04	0.04	0.04	0.04	0.05	0.05	0.04	0.04
Lead-210	Bq/g	0.11	0.11	0.11	0.11	0.12	0.12	0.11	0.11
Radium-226	Bq/g	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Polonium-210	Bq/g	0.11	0.11	0.11	0.11	0.12	0.12	0.11	0.11
Arsenic	µg/g	8.4	8.4	8.3	8.3	8.4	8.4	8.4	8.4
Cadmium	µg/g	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Cobalt	µg/g	9.0	9.1	8.9	8.9	8.9	8.9	8.9	8.9
Copper	µg/g	21.1	21.1	21.2	21.2	21.3	21.3	21.2	21.2
Lead	µg/g	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1
Molybdenum	µg/g	1.9	1.9	1.6	1.6	1.6	1.6	1.8	1.8
Nickel	µg/g	22.4	22.4	22.4	22.4	22.7	22.7	22.5	22.5
Selenium	µg/g	0.6	0.6	0.6	0.6	0.7	0.7	0.6	0.6
Zinc	µg/g	70.8	70.8	71.0	71.0	72.0	72.0	71.2	71.2
Note: results are presented for O1Pr14 and O1Ex14. Pr – Project Scenario Ex – Extended Scenario <u>Bold underlining</u> indicates the maximum value for the two scenarios.									

Therefore, the Extended Scenario is selected for the operation component of the liquid effluent characterization and is evaluated in the ecological and human health risk assessment. The Extended Scenario represents the conservative operation scenario.

3.4.2.3 Closure Scenarios

Multiple closure scenarios were evaluated to address uncertainty associated with resources (and resulting tailings mass) and tailings consolidation rate. Therefore, four closure scenarios for the Kiggavik effluent were considered for the assessment:

- Base Case: for the Project Scenario only, East Zone and Centre Zone consolidation and decommissioning completed during the operational period, Main Zone TMF partially full at the end of the operational period
 - o 14-years for Main Zone Consolidation (Kiggavik closure complete in 30 years)
 - o 22-years for Main Zone Consolidation (Kiggavik closure complete in 37 years)
- Bounding Case: for the Extended Scenario only, the three TMFs are filled with tailings and no consolidation has occurred prior to the decommissioning period
 - o 14-years for Main Zone Consolidation (Kiggavik closure complete in 42 years)

- o 22-years for Main Zone Consolidation (Kiggavik closure complete in 49 years)

Because the Extended Scenario was selected as the conservative operation scenario for the evaluation, only the two bounding cases for the Extended Scenario are considered further. Table 3.4-5 summarizes the maximum predicted water concentrations in each segment of Judge Sissons Lake for the two bounding case closure scenarios. The maximum predicted water concentration occurs during the operation period and therefore, the bounding scenarios do not affect the maximum water concentrations experienced by the project.

Table 3.4-5 Maximum of Monthly Mean Water Concentrations in JSL Segments – 14-Year Bounding Case Scenario vs 22-Year Bounding Case Scenario

COPC	Units	JSL-1		JSL-2		JSL-3		JSL-4	
		14-yr	22-yr	14-yr	22-yr	14-yr	22-yr	14-yr	22-yr
Uranium	µg/L	1.1	1.1	0.8	0.8	0.8	0.8	0.7	0.7
Thorium-230	Bq/L	0.032	0.032	0.013	0.013	0.010	0.010	0.009	0.009
Lead-210	Bq/L	0.058	0.058	0.024	0.024	0.017	0.017	0.016	0.016
Radium-226	Bq/L	0.021	0.021	0.008	0.008	0.006	0.006	0.005	0.005
Polonium-210	Bq/L	0.027	0.027	0.012	0.012	0.009	0.009	0.009	0.009
Arsenic	µg/L	1.6	1.6	0.9	0.9	0.7	0.7	0.6	0.6
Cadmium	µg/L	0.5	0.5	0.3	0.3	0.3	0.3	0.2	0.2
Cobalt	µg/L	0.5	0.5	0.2	0.2	0.1	0.1	0.1	0.1
Copper	µg/L	4.1	4.1	1.5	1.5	1.1	1.1	1.0	1.0
Lead	µg/L	0.6	0.6	0.3	0.3	0.2	0.2	0.2	0.2
Molybdenum	µg/L	14.4	14.4	14.0	14.0	13.6	13.6	11.8	11.8
Nickel	µg/L	3.4	3.4	1.6	1.6	1.1	1.1	1.0	1.0
Selenium	µg/L	0.7	0.7	0.4	0.4	0.3	0.3	0.2	0.2
Zinc	µg/L	20.5	20.5	7.6	7.6	5.3	5.3	5.2	5.2
Ammonia (Unionized)	mg/L	0.004	0.004	0.007	0.007	0.009	0.009	0.007	0.007
Chloride	mg/L	47.3	47.3	69.7	69.7	87.2	87.2	76.1	76.1
Sulphate	mg/L	172	172	224	224	269	269	231	231
TDS	mg/L	353	353	403	403	472	472	417	417
Hardness (as CaCO ₃)	mg/L	133	133	162	162	192	192	169	169

COPC	Units	JSL-5		JSL-6		JSL-7		JSL-8	
		14-yr	22-yr	14-yr	22-yr	14-yr	22-yr	14-yr	22-yr
Uranium	µg/L	0.6	0.6	0.4	0.4	1.4	1.4	0.9	0.9
Thorium-230	Bq/L	0.010	0.010	0.011	0.011	0.040	0.040	0.014	0.014
Lead-210	Bq/L	0.017	0.017	0.019	0.019	0.074	0.074	0.026	0.026
Radium-226	Bq/L	0.006	0.006	0.007	0.007	0.027	0.027	0.009	0.009
Polonium-210	Bq/L	0.009	0.009	0.009	0.009	0.034	0.034	0.012	0.012
Arsenic	µg/L	0.6	0.6	0.4	0.4	1.5	1.5	0.6	0.6
Cadmium	µg/L	0.2	0.2	0.1	0.1	0.4	0.4	0.1	0.1
Cobalt	µg/L	0.1	0.1	0.1	0.1	0.4	0.4	0.1	0.1
Copper	µg/L	1.1	1.1	1.4	1.4	5.2	5.2	1.7	1.7
Lead	µg/L	0.2	0.2	0.2	0.2	0.7	0.7	0.2	0.2
Molybdenum	µg/L	9.4	9.4	2.6	2.6	5.6	5.6	3.9	3.9
Nickel	µg/L	1.0	1.0	1.1	1.1	4.0	4.0	1.3	1.3
Selenium	µg/L	0.2	0.2	0.2	0.2	0.7	0.7	0.2	0.2
Zinc	µg/L	5.6	5.6	6.9	6.9	26.1	26.1	8.6	8.6
Ammonia (Unionized)	mg/L	0.007	0.007	0.0012	0.0012	0.001	0.001	0.0014	0.0014
Chloride	mg/L	68.7	68.7	9.7	9.7	24.8	24.8	25.5	25.5
Sulphate	mg/L	206	206	24.5	24.5	32.2	32.2	33.5	33.5
TDS	mg/L	371	371	73.7	73.7	201	201	106	106
Hardness (as CaCO ₃)	mg/L	150	150	26.2	26.2	65.9	65.9	41.4	41.4
Note: results are presented for O1Ex14 and O1Ex22. 14-yr – Bounding Case 14-years 22-yr – Bounding Case 22-years <u>Bold underlining</u> indicates the maximum value for the two scenarios									

Table 3.4-6 summarizes the maximum predicted sediment concentrations in each segment of Judge Sissons Lake for the two closure scenarios. Similar to water, the maximum predicted sediment concentration occurs during the operation period and therefore, the maximum values are the same for the two closure scenarios.

Although the maximum predicted concentrations for the two Kiggavik closure scenarios are equal, the Bounding Case 22-year consolidation results in effluent loads to the receiving environment for a longer amount of time. Therefore, the 22-year consolidation for the Bounding Case is selected for the closure component of the liquid effluent characterization and is evaluated in the ecological and human health risk assessment.

Table 3.4-6 Maximum of Monthly Mean Sediment Concentrations in JSL Segments – 14-Year Bounding Case Scenario vs 22-Year Bounding Scenario

COPC	Units	JSL-1		JSL-2		JSL-3		JSL-4	
		14-yr	22-yr	14-yr	22-yr	14-yr	22-yr	14-yr	22-yr
Uranium	µg/g	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8
Thorium-230	Bq/g	0.05	0.05	0.04	0.04	0.04	0.04	0.04	0.04
Lead-210	Bq/g	0.12	0.12	0.12	0.12	0.11	0.11	0.11	0.11
Radium-226	Bq/g	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Polonium-210	Bq/g	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
Arsenic	µg/g	8.5	8.5	8.5	8.5	8.4	8.4	8.4	8.4
Cadmium	µg/g	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Cobalt	µg/g	8.9	8.9	9.9	9.9	9.3	9.3	9.2	9.2
Copper	µg/g	21.3	21.3	21.2	21.2	21.1	21.1	21.1	21.1
Lead	µg/g	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1
Molybdenum	µg/g	2.3	2.3	2.3	2.3	2.2	2.2	2.0	2.0
Nickel	µg/g	22.7	22.7	22.6	22.6	22.5	22.5	22.5	22.5
Selenium	µg/g	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Zinc	µg/g	71.8	71.8	71.1	71.1	70.8	70.8	70.8	70.8
COPC	Units	JSL-5		JSL-6		JSL-7		JSL-8	
		14-yr	22-yr	14-yr	22-yr	14-yr	22-yr	14-yr	22-yr
Uranium	µg/g	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8
Thorium-230	Bq/g	0.04	0.04	0.04	0.04	0.05	0.05	0.04	0.04
Lead-210	Bq/g	0.11	0.11	0.11	0.11	0.12	0.12	0.11	0.11
Radium-226	Bq/g	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Polonium-210	Bq/g	0.11	0.11	0.11	0.11	0.12	0.12	0.11	0.11
Arsenic	µg/g	8.4	8.4	8.3	8.3	8.4	8.4	8.4	8.4
Cadmium	µg/g	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Cobalt	µg/g	9.1	9.1	8.9	8.9	8.9	8.9	8.9	8.9
Copper	µg/g	21.1	21.1	21.2	21.2	21.3	21.3	21.2	21.2
Lead	µg/g	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1
Molybdenum	µg/g	1.9	1.9	1.6	1.6	1.6	1.6	1.8	1.8
Nickel	µg/g	22.4	22.4	22.4	22.4	22.7	22.7	22.5	22.5
Selenium	µg/g	0.6	0.6	0.6	0.6	0.7	0.7	0.6	0.6
Zinc	µg/g	70.8	70.8	71.0	71.0	72.0	72.0	71.2	71.2
Note: results are presented for O1Ex14 and O1Ex22. 14-yr – Bounding Case 14-years 22-yr – Bounding Case 22-years <u>Bold underlining</u> indicates the maximum value for the two scenarios.									

One closure scenario was assessed for the Sissons effluent, with decommissioning continuing for 7 years (Sissons closure complete June 2031).

3.4.2.4 Summary of Scenario Selected for Evaluation

Option 1 Extended Operation with 22-year consolidation (O1Ex22) was selected as the scenario for the evaluation of ecological and human health risks. This scenario was determined in the previous sections to represent the scenario with the greatest potential for effects on the receiving environment. Potential impacts from the other scenarios would be less than or equal to the potential impacts identified for the O1Ex22 scenario. Option 1 considers the discharge of Kiggavik WTP to segment JSL-2 and discharge of Sissons WTP to segment JSL-8 (Figure 2.7-1).

Tables 3.4-7 through 3.4-9 summarize the water quality distributions assumed to characterize the Kiggavik WTP, Sissons WTP, and Kiggavik Reverse Osmosis (RO) effluent, respectively. Predicted WTP and RO effluent quality values were provided by AREVA. In order to develop reasonable probability distributions for the effluent sources, operational data from similar systems at the JEB, McClean, and Key Lake sites were evaluated and the observed variance in these datasets were used to define the variance for the Kiggavik Project effluents.

Figures 3.4-1 through 3.4-3 present the assumed monthly flows for the O1Ex22 scenario. The predicted monthly flows were provided by AREVA and these values were assumed to be the mode of a triangular distribution, with the minimum and maximum represented by +/- 33%. Assumptions for the other liquid effluent discharge scenarios are provided in Attachment C.

Table 3.4-7 Effluent Concentration Distributions for Kiggavik WTP Discharge

COPC	Lognormal Distribution Descriptors (mg/L or Bq/L)			
	Geometric Mean (GM) ^a	Geometric Standard Deviation (GSD) ^b	Minimum (-3 GSD)	Maximum (+3 GSD)
Uranium	0.002	2.24	0.0002	0.02
Thorium-230	0.011	2.05	0.0013	0.10
Lead-210	0.052	1.54	0.014	0.19
Radium-226	0.008	2.53	0.0005	0.13
Polonium-210	0.007	2.10	0.0007	0.06
Arsenic	0.021	1.76	0.004	0.11
Cadmium	0.007	1.44	0.0023	0.02
Cobalt	0.007	2.12	0.0007	0.07
Copper	0.002	2.41	0.0001	0.02
Lead	0.002	2.63	0.0001	0.04
Molybdenum	0.2	1.75	0.038	1.1
Nickel	0.02	1.57	0.005	0.08
Selenium	0.01	1.28	0.0047	0.02
Zinc	0.003	2.06	0.0003	0.03
Ammonia	17.3	1.36	6.9	44
Calcium	470	1.29	219	1010
Chloride	237	1.49	71	792

COPC	Lognormal Distribution Descriptors (mg/L or Bq/L)			
	Geometric Mean (GM) ^a	Geometric Standard Deviation (GSD) ^b	Minimum (-3 GSD)	Maximum (+3 GSD)
Sulphate	2199	1.29	1027	4708
TDS ^c	3115	1.31	1373	7068
Note: a - GM from predicted Kiggavik WTP data, if not specified. Kiggavik WTP values provided by AREVA were assumed to be geometric mean values for the distributions. b – GSDs preferentially selected from Key Lake data (4/2009-9/2010) for uranium, radium-226, arsenic, copper, molybdenum, nickel, selenium, and ammonia. GSDs from McClean (2011) for the JEB WTP (future quality) were used in the absence of other data for thorium-230, lead-210, polonium-210, cadmium, cobalt, lead, zinc, chloride, sulphate, and TDS. c – TDS calculated as the sum of the anions and cations (as available).				

Table 3.4-8 Effluent Concentration Distributions for Sissons WTP Discharge

COPC	Lognormal Distribution Descriptors (mg/L or Bq/L)			
	Geometric Mean (GM) ^a	Geometric Standard Deviation (GSD) ^b	Minimum (-3 GSD)	Maximum (+3 GSD)
Uranium	0.034	2.24	0.003	0.38
Thorium-230	0.19	2.05	0.022	1.64
Lead-210	0.59	1.54	0.16	2.17
Radium-226	0.10	2.53	0.006	1.62
Polonium-210	0.17	2.10	0.018	1.58
Arsenic	0.018	1.76	0.003	0.10
Cadmium	0.0001	1.44	0.00004	0.0004
Cobalt	0.0003	2.12	0.00003	0.003
Copper	0.001	2.41	0.00007	0.014
Lead	0.0005	2.63	0.00003	0.009
Molybdenum	0.085	1.75	0.016	0.46
Nickel	0.001	1.57	0.0003	0.005
Selenium	0.004	1.28	0.002	0.008
Zinc	0.014	2.06	0.002	0.12
Ammonia	3.1	1.36	1.24	7.86
Calcium	336	1.29	157	721
Chloride	846.6	1.49	254	2825
Sulphate	167.0	1.29	78	357
TDS ^c	1528	1.31	673	3466
Note: a - GM from predicted Sissons WTP data, if not specified. Sisson WTP values provided by AREVA were assumed to be geometric mean values for the distributions. b – GSDs preferentially selected from Key Lake data (4/2009-9/2010) for uranium, radium-226, arsenic, copper, molybdenum, nickel, selenium, and ammonia. GSDs from McClean (2011) for the JEB WTP (future quality) were used in the absence of other data for thorium-230, lead-210, polonium-210, cadmium, cobalt, lead, zinc, chloride, sulphate, and TDS. c – TDS calculated as the sum of the anions and cations (as available).				

Table 3.4-9 Effluent Concentration Distributions for Kiggavik RO Discharge

COPC	Lognormal Distribution Descriptors (mg/L or Bq/L)			
	Geometric Mean (GM) ^a	Geometric Standard Deviation (GSD) ^b	Minimum (-3 GSD)	Maximum (+3 GSD)
Uranium	0.0003	2.25	0.00003	0.003
Thorium-230	0.002	2.05	0.0002	0.02
Lead-210	0.005	1.54	0.001	0.02
Radium-226	0.013	2.42	0.0009	0.19
Polonium-210	0.002	2.10	0.0002	0.02
Arsenic	0.001	1.60	0.00025	0.00
Cadmium	0.0003	1.44	0.0001	0.001
Cobalt	0.0003	2.12	0.0000	0.003
Copper	0.0004	2.04	0.00005	0.003
Lead	0.0002	2.63	0.00001	0.004
Molybdenum	0.03	1.69	0.006	0.13
Nickel	0.001	2.31	0.0001	0.01
Selenium	0.001	2.42	0.000071	0.0142
Zinc	0.0001	2.28	0.00001	0.001
Ammonia	1.11	1.63	0.254	4.84
Calcium	1.06	1.29	0.494	2.28
Chloride	1.0	1.49	0.300	3.34
Sulphate	5.2	1.29	2.4	11.2
TDS ^c	11	1.31	4.7	24.0
Note: a - Kiggavik RO values provided by AREVA were assumed to be geometric mean values for the distributions. The ammonia GM value from the Midwest RO. b – GSDs from McClean (2011) for the JEB WTP (future quality) for all but nickel . The GSD for nickel was based on the Midwest RO GSD due to high variability in the JEB WTP. c – TDS calculated as the sum of the anions and cations (as available).				

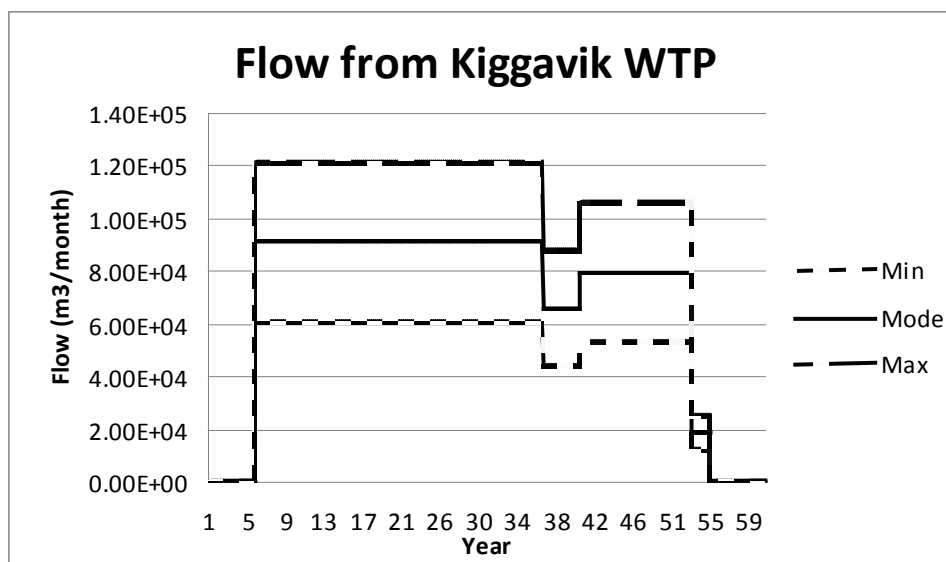


Figure 3.4-1 Assumed Flow Distributions for the Kiggavik WTP

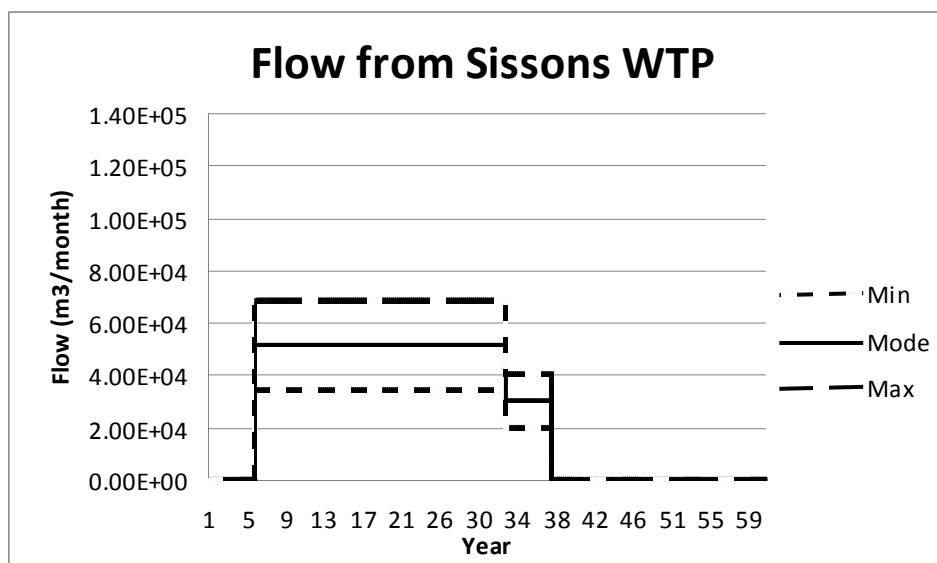


Figure 3.4-2 Assumed Flow Distributions for the Sissons WTP

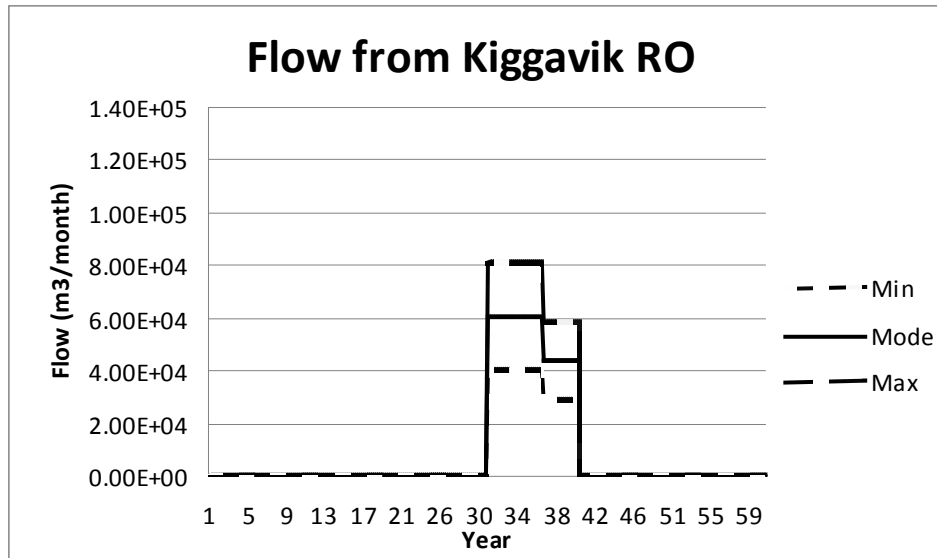


Figure 3.4-3 Assumed Flow Distributions for the Kiggavik RO

4 RECEPTOR CHARACTERIZATION

One of the key considerations defining the scope of a risk assessment is the selection and characterization of ecological and human receptors. Receptors are used in risk assessments as endpoints for the assessment of the potential effects of a project or activity. Receptors are selected to represent the VECs and VSECs identified. In selecting receptors, it is important to identify plants, animals, and people that are likely to be most exposed to the effects of the Project, as well as those that may be important for other ecological or social reasons. This section details the ecological (aquatic and terrestrial) species and people selected for the assessment, and it provides the rationale behind their selection.

4.1 ECOLOGICAL RECEPTORS

The first step in the assessment of ecological receptors is to determine the ecological receptors to be examined. In an ecological risk assessment (ERA), it is not necessary to evaluate potential effects on all species that are present in the study area; rather, ecological receptors are generally chosen to capture various levels of exposure via the different types of diets that they consume. Ecological receptors are also selected if they are considered important: i) in the functioning of the ecosystem; ii) in the production of food for subsistence; or iii) due to their cultural or medicinal significance. As the Kiggavik Project will feature emissions to both the aquatic and atmospheric environments, several aquatic and terrestrial based species were selected to capture exposures via aquatic, atmospheric, and terrestrial pathways.

4.1.1 Aquatic Receptors

Aquatic receptors selected for this assessment, summarized below, cover all food chain levels in lake systems.

- Phytoplankton
- Zooplankton
- Aquatic plants (pondweed)
- Benthic invertebrates
- Forage fish (burbot and white roundfish)
- Predatory fish (Arctic grayling, cisco, and lake trout)

Aquatic receptors were evaluated in each segment of Judge Sissons Lake. The following sections provide the rationale for the selection.

4.1.1.1 Primary Producers

Primary producers are organisms that occupy the lowest level in the food chain. These organisms are generally plants which use solar energy and inorganic substances for growth and reproduction.

4.1.1.1.1 Aquatic Plants

Aquatic plants in most lake ecosystems (for example, pond weed) can constitute an important primary producer biomass. Aquatic plants are consumed by some species of aquatic birds and are therefore a component of the foodchain. Besides being an important food resource, aquatic plants provide habitat to aquatic organisms.

4.1.1.1.2 Phytoplankton

Phytoplankton can also comprise an important component of the aquatic biomass in aquatic systems and are an important food sources to both aquatic and terrestrial species. Phytoplankton historically collected from the area lakes were rich in species typical of shallow tundra pond habitats. They included green algae, *Cyanobacteria*, *Cyanophytes*, *Chlorophytes* and *Chrysophytes* and diatoms (Urangesellschaft 1992).

Members of the division *Chlorophyta* have been studied extensively and are relatively common in most aquatic ecosystems in the north. Even though the overall contribution of *Chlorophyta* to aquatic ecosystems in the north is relatively small, *Chlorophyta* are a primary food resource for grazing zooplankton. *Chlorophyta* are one of the phytoplankton groups that are considered in this assessment; in the absence of data on *Chlorophyta*, other representative phytoplankton species are used. Therefore, the assessment considers phytoplankton as the overall ecological receptor being assessed.

4.1.1.2 Primary Consumers

Primary consumers are organisms that occupy the second level in the aquatic food chain. These organisms generally eat plant material such as phytoplankton.

4.1.1.2.1 Zooplanktons

Zooplanktons such as *Cladocerans* (a member of the zooplankton group) are found in most aquatic ecosystems in the north. Although *Cladocerans* may be seasonally abundant, their overall contribution to aquatic ecosystems in the north is relatively small. Overall, rotifers were the most abundant taxonomic group in all of the lakes sampled within the Project area in both the spring and fall.

4.1.1.2.2 Benthic Invertebrates

Due to the association of benthic invertebrates with sediments in aquatic ecosystems, they are useful to represent the potential risk to ecosystems from changes in sediment quality. Benthic invertebrates both live and feed within sediments and therefore may be exposed to constituents through ingestion of sediment bound constituents and also through exposure to interstitial waters within the sediment.

Benthic invertebrates provide a link between aquatic and terrestrial ecosystems. *Chironomidae* (midge) larvae are usually the most abundant benthic invertebrate taxa present in aquatic ecosystems in the northern climate. Many species feed on decaying organic matter and thereby form an important link between the decomposer level and primary consumers. Furthermore, midge larvae are a main food source for small/juvenile fish and larger omnivorous fish. The midge adults are capable of flight and are frequently consumed by birds and bats. This life stage provides an important link between aquatic and terrestrial ecosystems in the region.

4.1.1.3 Secondary and Tertiary Consumers

Arctic grayling and lake trout are the most widely dispersed species in the LSA and the species found in the highest abundance (Appendix 5C). Other species (e.g. ninespine stickleback, slimy sculpin and burbot) occur in lesser numbers and their distribution is much more restricted.

Ecological receptors at the secondary consumer level include forage fish, which feed primarily on benthic invertebrates and are an important food source of larger predatory fishes. Examples of fish from the forage category are burbot and white round fish.

Tertiary consumers are found at the top end of the aquatic food chain and consist of larger piscivorous (predatory) fish species such as Arctic grayling, cisco, and lake trout. These predatory fish consume other fish species. Predatory fish are also an important component of the human food chain. Both forage and predatory fish are an important component of the diet of omnivores (e.g., bear).

For the purposes of the risk assessment, specific fish species are not selected for the assessment; rather, general consumer levels are considered. The information from site surveys demonstrates the presence of both forage fish (i.e., burbot) and predatory fish (i.e., lake trout and arctic grayling) in Judge Sissons Lake (Appendix 5C).

4.1.1.4 Summary of Aquatic Receptors

Table 4.1-1 summarizes the areas where the aquatic receptors are assessed in the ecological risk assessment. The risks were considered for each of receptors in each of the segments Judge Sissons Lake. Judge Sissons Lake is the largest lake in the area, and forage and predatory fish can potentially exist year-round.

4.1.2 Terrestrial Receptors

Terrestrial receptors selected for this assessment cover all food chain levels in aquatic and terrestrial systems and are listed in Table 4.1-2. Terrestrial receptors were evaluated in various areas of the project area (Figure 3.1-1) and the following sections provide the rationale for the selection.

4.1.2.1 Background

Caribou are perhaps the most significant terrestrial species in the area. Field studies and collaring data have concluded that caribou from several identified herds occur within the Kiggavik RSA in different seasons (Appendix 6C). Although historically, the Kiggavik RSA was identified as a post-calving area for Beverly caribou, current use by this herd during the post-calving season appears to be limited. Some members of the Beverly/Ahiak herd may still be using the Kiggavik RSA during the post-calving period. The Qamanirjuaq herd has not historically been identified as using the Kiggavik RSA during any season; however, in 2009 and 2010, ground observations and collaring data found that most animals occurring within the Kiggavik RSA during late July and early August were from the Qamanirjuaq herd. Animals do not remain in the area long before they move rapidly to the south to wintering areas. Collaring data on the northeast mainland herds (Wager Bay, Lorillard and 'resident' herds) has supported the view that most caribou occurring in the Kiggavik RSA in the winter are individuals from these herds.

Another predominant mammal species in the Kivalliq region is the muskox, which was seen regularly and in herds up to 80 individuals during baseline studies (Appendix 6C). The majority of muskoxen groups were in heath tundra and tussock hummock habitats. Large predatory species, including grizzly bear, wolverine and wolf, are present throughout the Kiggavik RSA but are observed infrequently. Smaller predatory species, such as Arctic fox and ermine, are also present, along with their primary prey such as Arctic hare, sik sik or Arctic ground squirrel, voles and lemmings. (Appendix 6C)

Of terrestrial vertebrates, birds are represented by the greatest number of species. Several raptor species occur, including the peregrine falcon, which nests within the Kiggavik RSA. Other raptor species, including the federally-listed short-eared owl, and rough-legged hawk are known to nest but at low densities. Raptor species feed primarily on small mammals and upland birds, of which there are several common species in winter (i.e., ptarmigan) and summer (e.g., Lapland longspur, horned lark and savannah sparrow). Waterbirds, including ducks, geese, swans, gulls, terns and shorebirds are also well represented in the Kiggavik RSA. The most common waterbird species are Canada goose, semipalmated sandpiper and long-tailed duck. (Appendix 6C)

The Kiggavik Project area is located in a low arctic region characterized by minimal topography, predominantly shrub tundra habitat, an extreme northern climate, and relatively few terrestrial vertebrates (Appendix 6B). Plant species that are primary forage for herbivorous mammals and

birds included fruit and vegetation from blueberry plants (*Vaccinium myrtilloides*), willow (*Salix* spp.), dwarf birch (*Betula nana*), sedge (*Carex* spp.) and lichen.

4.1.2.2 Selection of Terrestrial Receptors

Based on the relevant VECs for the project and information on the presence and significance of various ecological species in the LSA and RSA, the following terrestrial receptors were selected for the ERA.

4.1.2.2.1 Herbivores

Barren-ground caribou, muskoxen, ptarmigan, Arctic ground squirrel, brown lemming, Lapland longspur, and masked shrew are herbivores and thus are mainly exposed to contaminants via atmospheric deposition on terrestrial vegetation. Herbivores convert vegetable matter to animal protein, and in turn are consumed by omnivores and carnivores. They are also trapped or hunted for fur and food. Herbivores span a wide range of species, including microorganisms, invertebrates and vertebrates.

Figure 4.1-1 provides a schematic diagram of the exposure pathways considered for the herbivores considered as terrestrial ecological receptors for the assessment. The diagram shows an overview of the diet components considered in the assessment for these receptors.

Barren-ground caribou (*Rangifer tarandus groenlandicus*) were selected because they are an important source of food for people in the area (Volume 3). The atmospheric pathway is an important pathway of exposure for caribou since their diet is composed mainly of lichen. Constituent concentrations in lichen are linked directly to constituents in air through direct deposition and nutrient uptake from air. Therefore, the inclusion of caribou is appropriate for assessment of the potential effects on this important regional species from the transfer of constituents through the air pathway. Caribou are also part of the grizzly bear, gray wolf, and wolverine food chain.

Muskoxen (*Ovibos moschatus*) were selected because they have been an integral part of the Inuit lifestyle for centuries as one animal can provide a great amount of meat, a warm versatile hide, and soft insulating fur.

Rock ptarmigans (*Lagopus muta*) were selected because they are occasionally consumed by humans. Ptarmigan are terrestrial birds that are common in northern areas. The ptarmigan will be a surrogate in the assessment for other terrestrial birds with similar diets, such as Canadian goose and grouse.

Arctic ground squirrels (*Spermophilus parryi*) were selected since they are part of the food chain. They consume browse and herbaceous vegetation. They have a significant role in the food chain, since they are part of the diet of larger predatory species. The Arctic hare is also a

common species for the area and was identified as a possible human food source; however, the hare has essentially the same diet as the Arctic ground squirrel. Therefore, exposures to the Arctic hare are captured with the inclusion of the Arctic ground squirrel in the assessment. The Arctic ground squirrel will also serve as a surrogate for Arctic hare in the human diet.

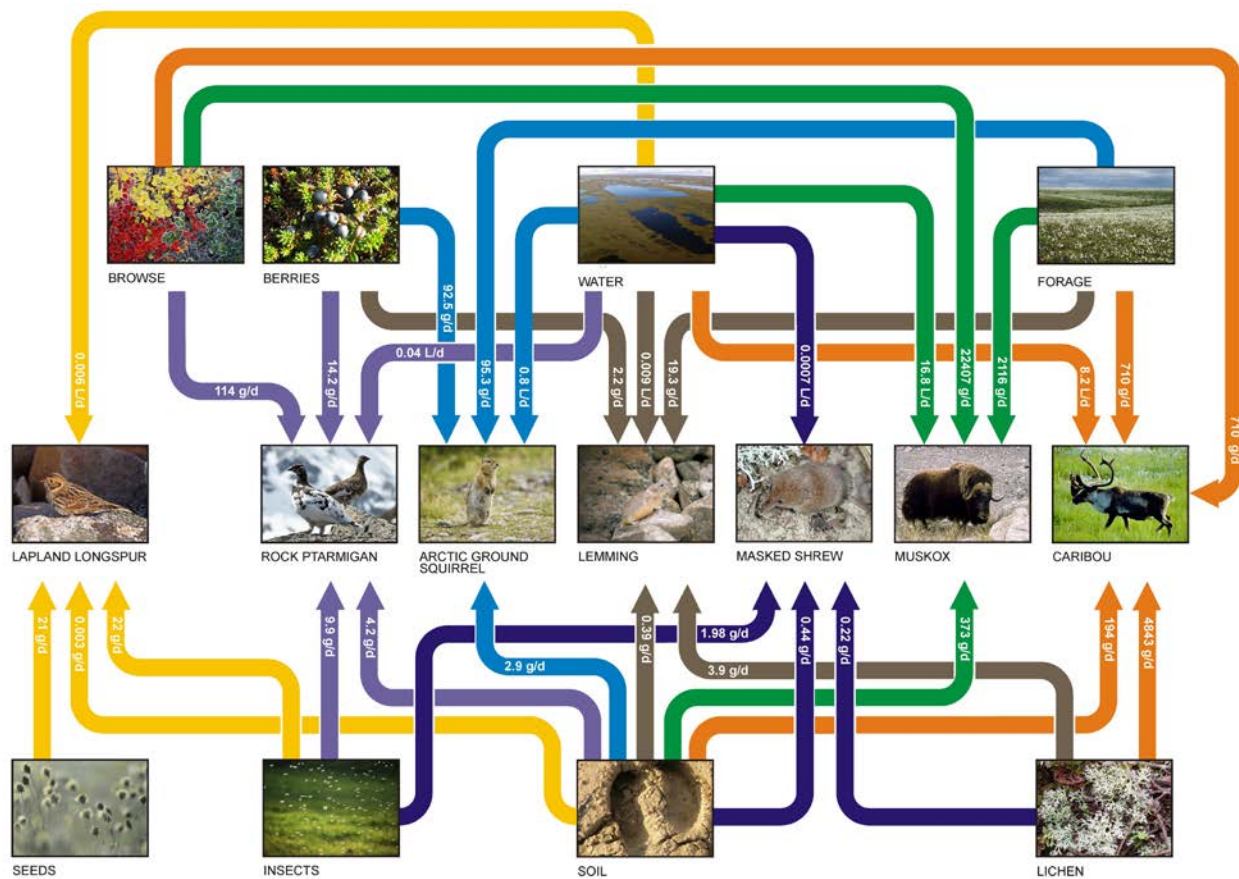


Figure 4.1-1 Schematic of Exposure Pathways for Herbivores

Brown lemmings (*Lemmus sibiricus*) are an important food source for a number of other animals. They consume herbaceous vegetation, berries, and lichen. The lemming acts as a surrogate species for other small herbivore mammals, such as the vole.

Lapland longspurs (*Calcarius lapponicus*) are a common songbird on the Arctic tundra. The longspur was selected as an ecological receptor because its diet consists of seeds and insects. It will represent other small songbirds that might be present in the area.

Masked shrew (*Sorex cinereus*) is a common small mammal that likes riparian and wetland environments. It relies heavily on insects for food, with a small portion of the diet from lichen.

4.1.2.2.2 Omnivores

Omnivores consume both plant and animal matter. Vertebrate omnivores included in the assessment include waterfowl and bear. Figure 4.1-2 provides a schematic diagram of the exposure pathways considered for the waterfowl included in the assessment. Figure 4.1-3 provides similar information for the bear. These diagrams show an overview of the diet components considered in the assessment for these receptors.

Waterfowl selected for the assessment include northern pintail (*Anus acuta*), red-breasted merganser (*Mergus serrator*), semipalmated sandpiper (*Calidris pusilla*), and long-tailed duck (*Clangula hyemalis*). These species, which feed on fish, insects, aquatic vegetation, and aquatic (benthic) invertebrates, cover different diet compositions and food chain effects.

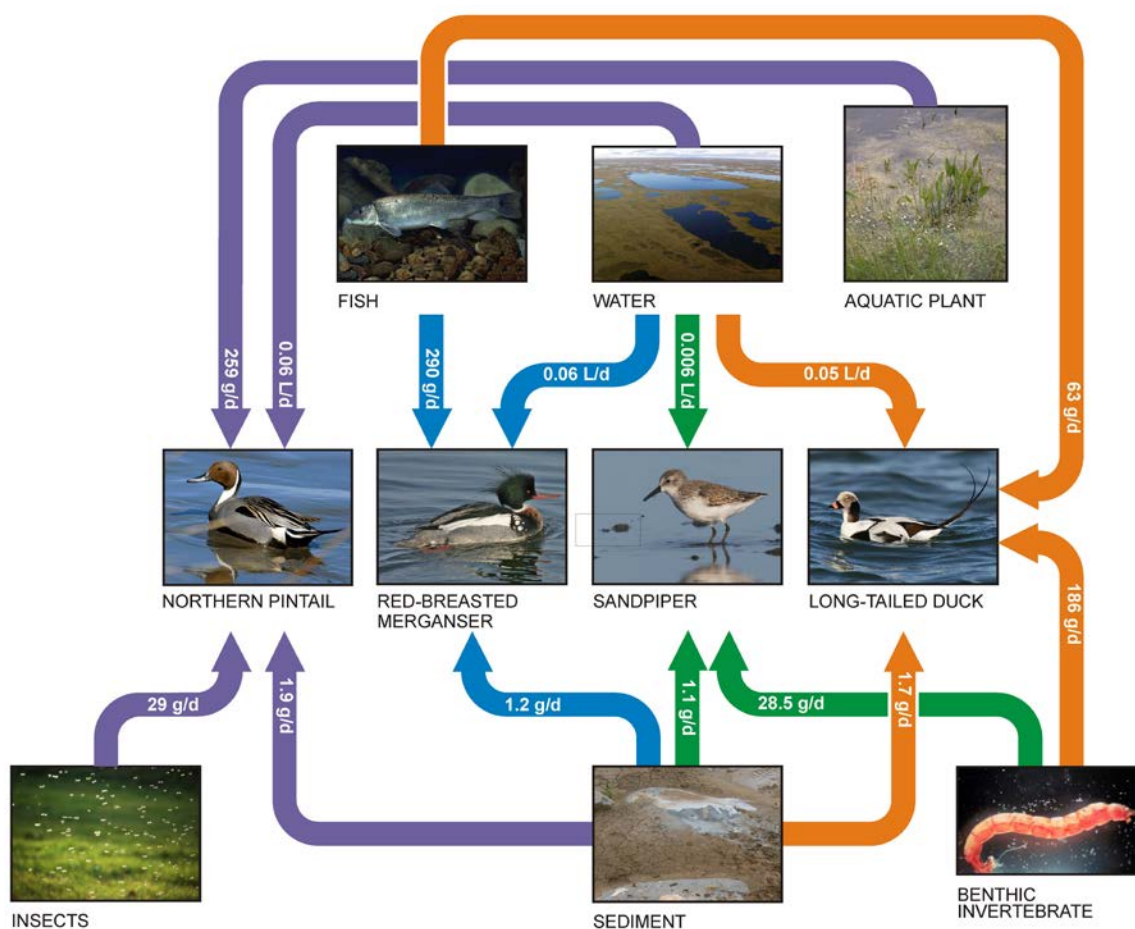


Figure 4.1-2 Schematic of Exposure Pathways for Waterfowl

The diet of the grizzly bear (*Ursus arctos*) is composed of terrestrial vegetation, berries, fish, and caribou, and therefore, the bear is an important indicator of potential effects of atmospheric deposition on the terrestrial environment (and transfer to terrestrial vegetation, berries and soil) as well as emissions to the aquatic environment (and uptake by fish).

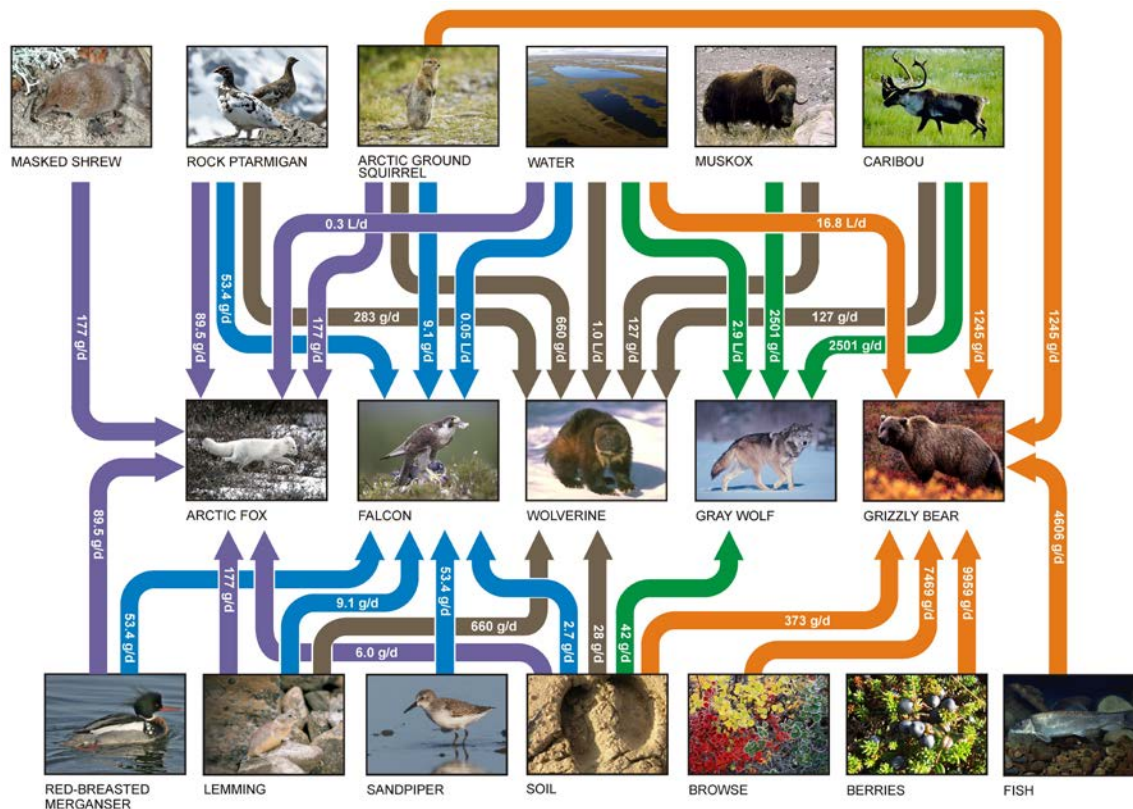


Figure 4.1-3 Schematic of Exposure Pathways for Omnivores and Carnivores

4.1.2.2.3 Carnivores

Falcon, fox, wolf and wolverine are predatory species at the top end of the food chain. Predators interact with prey species (usually herbivores) and may influence population levels and distribution of prey. Figure 4.1-3 provides a schematic diagram of the exposure pathways considered for the carnivores included as terrestrial ecological receptors for the assessment. The diagram shows an overview of the diet components considered in the assessment for these receptors.

Peregrine falcons (*Falco peregrinus*) were selected because they are exposed to smaller birds and mammals and are known to nest in the area (Appendix 6C). Exposures to the falcon represent potential exposures to other similar species, such as the short-eared owl. The short-eared owl is also a species of special concern identified within the Sissons Lease area, but it is not specifically considered in the assessment.

Arctic fox (*Alopex lagopus*) were selected since they consume small terrestrial animals and birds and are an important species for trappers in the area. Predicted exposures to the fox will represent exposure to other scavenger mammals.

Gray wolf (*Canis lupus*) was selected since the diet contains caribou and muskox. Wolf dens have been observed within the project area.

Wolverines (*Gulo gulo*) were identified as an important species for the area and are carnivorous scavengers. The wolverine is a member of the weasel family and has the largest home range of carnivores of its size. The diet of the wolverine consists of small mammals and birds and carrion (caribou and muskoxen).

4.1.2.3 Summary of Terrestrial Receptors

The terrestrial receptors chosen for the current assessment are summarized in Table 4.1-1 with the areas where the species were considered to be present. The receptors were selected to represent a wide range of exposure pathways. The rationale for the selection of different terrestrial species was provided above. Attachment D provides a description of the detailed characteristics for the terrestrial receptors considered in this assessment.

The fraction of time assumed to be spent at each location for the receptors is also provided in Table 4.1-1. These assumptions were based on information related to home range and migration behaviours. A conservative approach was taken in setting the values. For example, for the caribou, estimates of time spent in the LSA and RSA was estimated from available satellite and GPS telemetry data from the governments of Nunavut and Northwest Territories. A number of assumptions were made in the evaluation of the radio-collar data:

- Collared animals were accurately identified as members of a particular herd (i.e., they move and live with what is generally accepted as a particular herd);
- Collared animals accurately represent a cross-section of a herd (i.e., as a subset, they sufficiently reflect the home range or extent of an entire herd); and
- Percentage values represent an estimate of the time any one caribou herd spends in the study areas.

Table 4.1-1 Terrestrial Ecological Receptors and Exposure Areas

Study Area	Receptors (Fraction of Time at Location)	
1. Rock Lake Watershed	Lemming (1.0) Longspur (0.33) Ptarmigan (1.0)	Shrew (1.0) Squirrel (1.0)
2. Judge Sissons Lake – vicinity of Kiggavik discharge (JSL-2)	Duck (0.33) Lemming (1.0) Longspur (0.33) Merganser (0.33) Muskox (0.1)	Pintail (0.33) Ptarmigan (1.0) Sandpiper (0.33) Shrew (1.0) Squirrel (1.0)
3. Kiggavik Camp	Lemming (1.0) Longspur (0.33)	Ptarmigan (1.0) Shrew (1.0) Squirrel (1.0)
4. Judge Sissons Lake – vicinity of Sissons discharge (JSL-8)	Duck (0.33) Lemming (1.0) Longspur (0.33) Merganser (0.33) Muskox (0.1)	Pintail (0.33) Ptarmigan (1.0) Sandpiper (0.33) Shrew (1.0) Squirrel (1.0)
5. Local Study Area (LSA)	Bear (0.5) Caribou (0.02) ^a Falcon (0.33)	Fox (1.0) Wolf (0.5) Wolverine (0.5)
6. Regional Study Area (RSA)	Caribou (0.04) ^b Falcon (0.33)	Wolf (1.0) Wolverine (1.0)
Note: for a map of areas, please see Figure 3.1-1. The value in (-) indicates the fraction of the year each receptor is assumed to spend in the study area. a – the fraction of time for the caribou in the LSA is on a triangular distribution T(0.002, 0.02, 0.04). b – the fraction of time for the caribou in the RSA is on a triangular distribution T(0.004, 0.04, 0.08)		

Table 4.1-2 summarizes the results of the analysis of the telemetry data for the caribou herds within the LSA and RSA. The percent occurrences range from 0.0% to 0.2% within the LSA and 0.0% to 0.4% for the RSA. To provide a cautious approach to the assessment of impacts on caribou a distribution was used to characterize their time spent in the LSA and RSA. A triangular distribution was used with the minimum of the distribution set to the maximum result from the telemetry data, the mode of the distribution was set to 10 times this number and the maximum to 20 times the number. This means that, for example, although caribou are only present in the LSA for a maximum of 0.2% of their time, the assessment assumed they were typically present 2% of their time, and may be present up to 4%.

Table 4.1-2 Caribou Residency Time Based on Telemetry Data

Herd	Percent Occurrence	
	LSA	RSA
Baker Lake	0.2%	0.4%
Ahiak and Beverly	0.0%	0.0%
Wager Bay	0.0%	0.0%
Qamanirjuaq	0.0%	0.2%
Lorillard	0.1%	0.3%
Note: analysis completed by AREVA.		

4.2 HUMAN RECEPTORS

To cover a variety of potential exposure situations from the site, both members of the public and workers were included in this assessment. These include permanent residents of the Baker Lake community, hunters at Judge Sissons Lake and non-nuclear workers at the project site.

4.2.1.1 Selection of Human Receptors

Members of the public that were identified for inclusion in the risk assessment were focused on adult, child and toddler family members in Baker Lake, the closest community to the Kiggavik Project. As Baker Lake is located 75 km away from the proposed mine site and other communities are situated at even greater distances, it was decided to limit the assessment to Baker Lake. Potential effects in other communities would be expected to be less than assessed for Baker Lake residents. Chesterfield Inlet and Rankin Inlet, the next closest communities, are both located about 350 km from the Kiggavik site.

Baker Lake is located at almost the geographic centre of Canada; 940 km east of Yellowknife and 256 km northwest of Rankin Inlet. Most of the residents are descendants of the Thule Inuit who migrated to Keewatin about 1,000 years ago. It is the only inland community in Nunavut. Caribou and inland fish are important components of the local diet. Traditional activity remains highly valued and the number of hunters appears stable (Volume 9).

The hunter at Judge Sissons Lake was selected based on evidence of historical fishing and hunting activities in the area (Volume 3). This receptor is assumed to spend four months at a cabin at Judge Sissons Lake and eight months at the Baker Lake community. Since there is a strong desire to pass traditional knowledge to the younger generation (Volume 3), a child in the hunter's family was also considered to spend 1 month of the year with the hunter. The remainder of the year, the child is at home in Baker Lake, consuming the food obtained by the hunter at Judge Sissons Lake. A toddler in the family is also considered at hunter's home in Baker Lake.

The worker considered is a non-Nuclear Energy Worker (NEW) who lives at the campsite fifty percent of the time. The worker is assumed to have been hired from the Baker Lake community, where the remaining fifty percent of their time is assumed to be spent. Note, NEW are not considered in the pathways analysis and human health risk assessment as their exposure pathways are quite different from members of the public and therefore human health risks to NEW are assessed separately (see Volume 8).

4.2.1.2 Dietary Characteristics of Human Receptors

The human diet derived for the assessment was based on a survey of the present day diet of the Kivalliq community (Kuhnlein et al. 2000) as well as the Inuit Qaujimagatuqangit (IQ) for Baker Lake (Appendix 3B). Kivalliq, located on the western shores of Hudson's Bay, is home to seven communities including the Baker Lake and Chesterfield communities.

Based on the IQ, caribou and fish were consistently named the primary food sources. Trout and whitefish were cited as common fish. Squirrel was identified by one interviewee as a food source, but only in the case of the lack of other foods.

Kuhnlein et al. (2000) identified the most commonly reported foods: caribou, fish (arctic char, salmon, cod, trout, and whitefish), muskox, grouse/ptarmigan, hare, berries (cranberry and blackberry), and duck. Some marine species, such as seal, whale, polar bear, and walrus, were identified in Kuhnlein et al. (2000), but these species were not considered for the assessment as only 2% of Baker Lake households reported harvesting sea mammals (Appendix 9A). It is noted that almost 40% of people reported that they ate at least some sea mammals in 2010 but is this likely due to intra community sharing of harvests, as well as some limited commercialization.

The ingestion of squirrel was considered in the assessment because squirrels were mentioned as a potential food source in the IQ for Baker Lake (Appendix 3B) and hare (similar dietary characteristics to squirrel) was indicated as a potential food source in Kuhnlein et al. (2000). Therefore, a small part of the human diet was attributed to the ingestion of squirrel (which also serves as a surrogate for other small mammals). A small portion of the diet was also assigned to ptarmigan. This source was identified by Kuhnlein et al. (2000), although expected to comprise a small portion of the diet. The recent survey of Baker Lake was consistent with this information (Appendix 9A).

The IQ studies completed as part of the baseline program discussed the use of certain plant species as food, medicine, shelter, and other human uses (see Appendix 3B). Cowberries, blueberries, cloudberry, 'black' berries and 'red' berries were gathered in the past and are still used today. Some plants (e.g. cloudberry leaves, tundra moss) are used to make tea. Elders commented during focus groups that traditional cures were no longer used. IQ interviews did not identify particular places for collecting plants; rather it was noted that plants were everywhere. The area around Sissons Lake was noted to be particularly good for red berries. Plants are typically gathered by Elders from August to September. Based on survey results

from Baker Lake (Appendix 9A), 40% of households are engaged in plant collecting, although most households (87%) are likely not engaged regularly (one a day or two every now and then, likely during day trips and weekends). The study noted that this type of occasional involvement did not reflect a low level of commitment or harvesting. Almost seven percent of households indicated they had purchased wild berries over the course of the year.

Figure 4.2-1 illustrates the exposure pathways for human receptors considered in the assessment. Table 4.2-1 summarizes the dietary characteristics assumed for the human receptors. The assessment has been completed in a probabilistic framework and the distributions used to represent the uncertainty in the assumptions are provided in the table.

Table 4.2-1 Human Receptor Dietary Characteristics for the Kiggavik Project

	Units	Receptor		
		Adult	Child	Toddler
Water Intake	m ³ /yr	LN (0.6, 1.65, 0.22, 1.6)	LN (0.3, 1.49, 0.14, 0.67)	LN (0.22, 1.49, 0.10, 0.50)
Soil Intake	mg/d	LN (1.7, 2.9, 0, 68)	LN (12, 27, 0, 783)	LN (13, 18, 0, 283)
Total Meat Intake	g (ww)/d	LN (350, 2.5, 56, 2190)	LN (150, 2.5, 24, 938)	LN (100, 2.5, 16, 625)
Fraction Fish Intake	(-)	U (0.23, 0.36)*	U (0.23, 0.36)*	U (0.23, 0.36)*
Fraction Ptarmigan Intake	(-)	U (0.02, 0.06)	U (0.02, 0.06)	U (0.02, 0.06)
Fraction Squirrel Intake	(-)	U (0.02, 0.06)	U (0.02, 0.06)	U (0.02, 0.06)
Fraction Caribou Intake	(-)	U (0.60, 0.65)	U (0.60, 0.65)	U (0.60, 0.65)
Berry Intake	g (ww)/d	LN (1.8, 3, 0.2, 16.2)	LN (8.5, 3, 0.9, 77)	LN (6.4, 3, 0.7, 58)
Medicinal Tea Intake	L/d	T (0.023, 0.043, 0.085)	C (0)	C (0)
Inhalation Rate	m ³ /d	LN (16.6, 4.1, 9.5, 33)	LN (14.5, 3.4, 8.3, 25)	LN (8.3, 2.2, 4.6, 15.6)
Body Weight	kg	C (70.7)	C (32.9)	C (16.5)
Note: These intake amounts only consider the portion of the diet from local food sources. C = Constant distribution (value) T = Triangular distribution (Min, Mode, Max) LN = Lognormal distribution (Geomean, Geo Std Dev, Min, Max) U = Uniform distribution (Min, Max) * calculated as remainder of ptarmigan, squirrel, and caribou fractions in the LAKEVIEW/INTAKE code.				

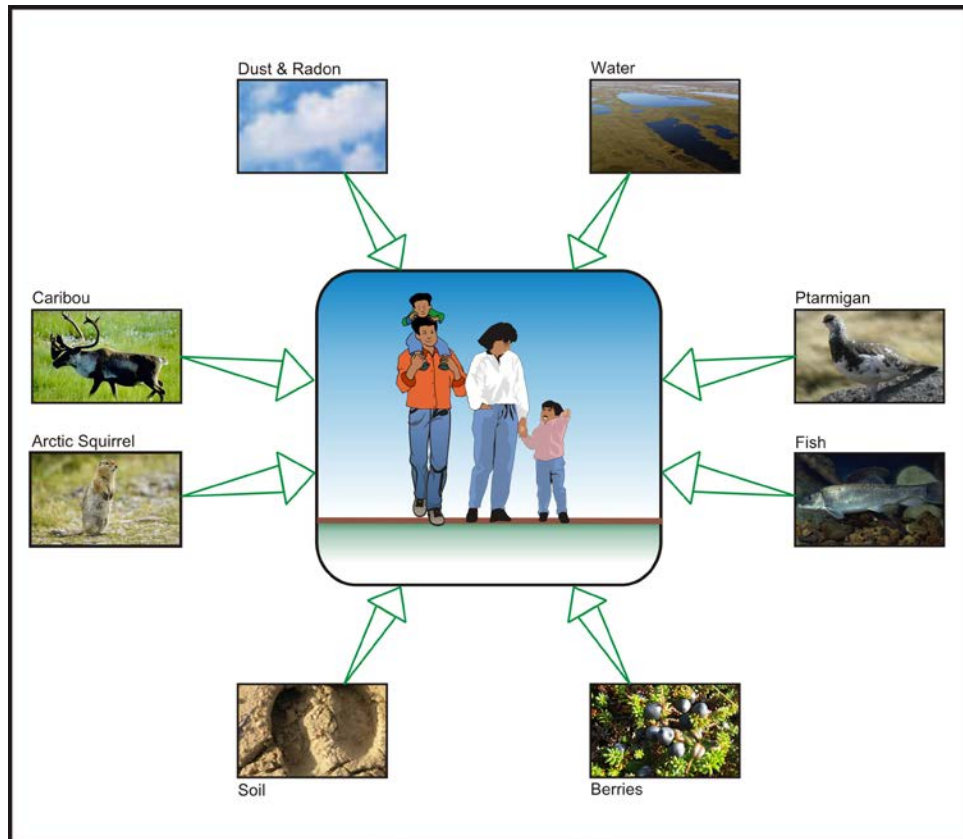


Figure 4.2-1 Schematic Representation of Exposure Pathways for Human Receptors

4.2.1.2.1 Water Intake

A lognormal distribution was assumed for drinking water intake rate, using mean and standard deviation values reported in Richardson (1997) *"Compendium of Canadian Human Exposure Factors for Risk Assessment"*. Maximum values were based on the 90th percentile from recent unpublished data analyzed by Health Canada (Richardson 2009a) and minimum values were assumed.

4.2.1.2.2 Soil Intake

The Contaminated Sites Division (CSD) of Health Canada has undertaken to re-evaluate soil ingestion rates and to define these as lognormal probability distribution functions (PDFs). Numerous studies have been conducted to quantify soil ingestion rate (reviewed by Doyle *et al.* 2010). Doyle *et al.* (2010) has indicated that the quantities of soil ingested, as deduced from those studies, are as much an artifact of limited study statistical strength and minimum analytical detection limits, than related to true quantification of actual soil ingestion.

It is broadly acknowledged among professional risk assessors that the assumed rates of soil ingestion currently used for risk assessment significantly over-estimate actual exposure from

this environmental medium. Also, the assumptions concerning soil ingestion currently employed and recommended for risk assessment by Health Canada (2004a) are not associated in any way with the amount of time spent in the outdoor environment. As a result, the same assumed rate of soil ingestion is applied whether a hypothetical receptor is assumed to be outdoors for 10 minutes or 10 hours. However, with the exception of children exhibiting pica behaviour, it is logical to expect that the amount of soil ingested, and certainly the likelihood that soil ingestion would actually occur, would be greater if that receptor were outdoors 10 hours versus 10 minutes.

Based on methods originally developed for estimation of indoor settled dust ingestion rates (WTCWG 2003), and accounting for various factors such as time spent outdoors, soil adherence to hands, rates of hand-to-mouth activity, surface area of hands, etc., the CSD (unpublished) has developed the lognormal PDFs for soil ingestion rate presented in Table 4.2-1.

4.2.1.2.3 Air Intake

A lognormal distribution was assumed for inhalation rate. Mean and standard deviation were based on Allan *et al.* (2008). The 5th and 95th percentiles were used as minimum and maximum. These values were not reported in Allan *et al.* (2008) but were provided separately by Richardson (2009b).

4.2.1.2.4 Body Weight

The body weight (bw) of a toddler, child and adult are also necessary in order to calculate a daily intake (mg/(kg (bw) d)). In this assessment, the body weights used for the toddler, child and adult receptors were 16.5 kg, 32.9 kg and 70.7 kg, respectively (Richardson 1997). Body weights were held constant in the assessment.

4.2.1.2.5 Medicinal Tea Intake

Kuhnlein *et al.* (2000) did not include medicinal tea in the regional frequency questionnaire. The IQ for Baker Lake (Appendix 3B) mentions of the ingestion of tea, generally, throughout the interviews.

In the absence of data on consumption amount, the Yukon dietary survey (Receveur *et al.* 1998) indicated that in the winter 12% of the population consumes Labrador Tea 1.2 days/week and in the summer 23% of the population consumes Labrador tea 1.4 days/week. This equates to an average Labrador tea consumption of 1.3 days per week. The survey does not provide the amount of Labrador tea or other medicinal teas that are consumed.

To estimate the amount of medicinal tea consumed by members of the community, a web search was undertaken. The web search indicated that "*Labrador Tea contains small amounts of the toxin andromedotoxin which can cause headaches, cramps, paralysis and intestinal*

problems if too much is consumed. As a general rule, this tea should be consumed in moderation. One cup is often considered the safe amount.” - <http://www.laurentiancenter.com/plantkey/plants/labradortea.html>

Therefore, it was assumed in this assessment that an adult (70 kg body weight) would consume 250 mL (1 cup) of medicinal teas for 1.3 days a week. This equates to a consumption rate of 0.17 cups/day. There was no information available on the amount of tea used in the brewing process. In this assessment, it was assumed that approximately 3 g were used. This is equivalent to a bag of regular tea. A triangular distribution was established around this value with an assumed range of +/- a factor of 2 to capture a range of possible consumptions.

4.2.1.2.6 Food Intake

The food ingestion rates for local food developed from Kuhnlein et al. (2000) in were used for the current assessment. Lognormal distributions were assigned with a geometric standard deviation of 2.5 around a geometric mean value to obtain an arithmetic mean value consistent with the nominal value for the total meat ingestion rate (including caribou, ptarmigan, squirrel, and fish). Similar distributions were developed for ingestion rates of berries, with nominal values based on the Hatchet Lake Band survey (CanNorth 2000) and a geometric standard deviation of 3.0. The LAKEVIEW/INTAKE code considers the fraction of meat ingestion for each component (i.e., caribou) and therefore, the information is presented this way in Table 4.2-1. Uniform distributions were derived with some accommodation for the squirrel portion of the diet coming from the allotment for caribou. The fraction of the diet that is fish is calculated as the remainder of the diet in the LAKEVIEW/INTAKE code; however, the values presented in Table 4.2-1 represent the likely distribution for the fish portion of the diet based on the other distributions. The distributions are intended to account for the variation in diet among individuals but is not meant to represent any one specific person.

A study for the Beverly and Qamanirjuaq Caribou Management Board (BQCMB) (InterGroup 2008) was also considered. This report indicates that 25 caribou are harvested per domestic hunter and that each caribou has an edible weight of 45 kg. This would correspond to 1125 kg of caribou meat in a year for a hunter. Based on the intake rates provided in Tabel 4.2-1, one hunter can support at least 10 individuals.

4.2.1.3 Summary of Human Receptors

Table 4.2-2 summarizes the assumptions for the exposure pathways and locations for the human receptors considered in the assessment. The table shows that a variety of potential exposures are accounted for in the assessment.

Table 4.2-2 Exposure Pathways and Locations Considered for Human Receptors

Pathway	Non-NEW at Campsite	Hunter at Judge Sissons			Baker Lake Residents
		Adult	Child	Toddler	
Inhalation	0.5 Campsite (3) 0.5 Baker Lake (7)	0.33 JSL (2) 0.67 Baker Lake (7)	0.08 JSL (2) 0.92 Baker Lake (7)	1.0 Baker Lake (7)	1.0 Baker Lake (7)
Radon	0.5 Campsite (3) 0.5 Baker Lake (7)	0.33 JSL (2) 0.67 Baker Lake (7)	0.08 JSL (2) 0.92 Baker Lake (7)	1.0 Baker Lake (7)	1.0 Baker Lake (7)
Drinking Water	1.0 Background	0.33 Average of JSL-1 and JSL-2 0.67 Background	0.08 Average of JSL-1 and JSL-2 0.92 Background	1.0 Background	1.0 Background
Small Game	0.0	1.0 JSL (2)	1.0 JSL (2)	1.0 JSL (2)	1.0 Baker Lake (7)
Large Game (Caribou)	0.0	1.0 Local Study Area (5)	1.0 Local Study Area (5)	1.0 Local Study Area (5)	1.0 Regional Study Area (6)
Fish	0.0	1.0 Average of JSL-1 and JSL-2	1.0 Average of JSL-1 and JSL-2	1.0 Average of JSL-1 and JSL-2	1.0 Background
Berries	0.5 Campsite (3) 0.5 Baker Lake (7)	1.0 JSL (2)	1.0 JSL (2)	1.0 JSL (2)	1.0 Baker Lake (7)
Soil	0.5 Campsite (3) 0.5 Baker Lake (7)	0.33 JSL (2) 0.67 Baker Lake (7)	0.08 JSL (2) 0.92 Baker Lake (7)	1.0 Baker Lake (7)	1.0 Baker Lake (7)
Note: 0.5 Campsite (3) represents fraction of time (0.5) at location Campsite (area 3). Refer to Figure 3.1-1 for locations. The non-NEW worker at the Project Site will not be allowed to hunt or fish while working; therefore, these ingestion pathways are not considered for the worker. The adult hunter is assumed to spend 4 months of the year hunting in the vicinity of Judge Sissons Lake. A child is assumed to join the hunter for 1 month of the year, while a toddler is assumed to spend all of the year at home in Baker Lake. The adult, child, and toddler all eat the food obtained by the hunter from Judge Sissons Lake area.					

4.3 OVERVIEW OF RECEPTORS AND VECs/VSECS

The entire list of receptors considered in this assessment is provided in Table 4.3-1, along with the VEC/VSEC that they represent.

Table 4.3-1 Summary of Receptors and VEC / VSEC

VEC / VSEC	Receptor
Terrestrial environment, including soils	• Soil quality
Surface water quality	• Surface water quality
Sediment quality	• Sediment quality
Freshwater aquatic environment - aquatic biota (including fish, aquatic macrophytes, benthic invertebrates, and other aquatic organisms)	• Phytoplankton • Zooplankton • Aquatic plants • Benthic invertebrates • Forage fish • Predatory fish
Vegetation	• Lichen • Browse (e.g. willow, birch) • Forage (e.g. sedges) • Berries
Terrestrial wildlife, including representative terrestrial mammals (i.e., caribou, muskoxen, wolverine, grizzly bears, wolves and less conspicuous species that may be maximally exposed to contaminants)	• Barren-ground caribou • Muskox • Grizzly bear • Arctic fox • Gray wolf • Wolverine • Brown lemming • Masked shrew • Arctic ground squirrel
Birds including raptors, migratory birds and seabirds	• Peregrine falcon • Long-tailed duck • Lapland longspur • Red-breasted merganser • Northern pintail • Rock ptarmigan • Semipalmated sandpiper
Health of public	• Non-NEW at Kiggavik camp • Resident of Baker Lake • Hunter at cabin on Judge Sissons Lake

5 EXPOSURE ASSESSMENT

This section discusses the estimated exposures of selected receptors to effects from the Kiggavik Project.

5.1 TRANSFER FACTORS

The INTAKE model relies on transfer factors to estimate concentrations in environmental media. Transfer factors are empirical values that provide a measure of the partitioning behaviour of a COPC between two environmental media. Transfer factors can describe partitioning between many different media, including water-to-fish, water-to-benthic invertebrates, food-to-animal flesh and other media.

5.1.1 Aquatic Model Transfer Factors

Section 2.7 provided an overview of the aquatic model. Site-specific Kd_{sed} values were developed from solid phase concentrations, porewater concentrations, and extractable fraction information available from the six-step Tessier extraction test (introduced in Section 3.3). The Kd_{sed} value for each contaminant was evaluated as follows in equation (5.1-1):

$$Kd_{sed} = \frac{f_i \sigma_i}{C_{p,i}} \quad (5.1-1)$$

Where:

i = specific constituent “i”

Kd_{sed} = sorption (distribution) coefficient (m^3 / kg)

f_i = fraction of “exchangeable” constituent “i” in the sediment

σ_i = total concentration of constituent “i” in the sediment (g/kg)

$C_{p,i}$ = porewater concentration of dissolved constituent “i” (g/m^3)

The calculated Kd_{sed} values are summarized in Table 5.1-1. It is apparent from Table 5.1-1 that the cobalt concentration in the porewater is solubility rather than sorption controlled. A Kd value above $20 m^3/kg$ ($20,000 ml/g$) is indicative of precipitation or co-precipitation rather than sorption equilibrium. The relatively large sorption coefficient for arsenic ($Kd = 6.1 \times 10^{-3} m^3/g$) is characteristic of ferric hydroxide containing sediments. The affinity of arsenate for iron hydroxide surfaces is well established (Banerjee et al., 2008) and filtration through granular ferric hydroxide columns is often used to remove dissolved arsenic from contaminated groundwater. Nickel sorption is pH dependent and is expected to be greater than $1.0 \times 10^{-3} m^3/g$ reaching a maximum value at pH= 7.6 (Butow et al., 1990). The relatively high Kd value for nickel in

Table 5.1-1, however, is within the reported maximum value of $7.4 \times 10^{-3} \text{ m}^3/\text{g}$ in sandy aquifers (Christensen et al., 1998).

Table 5.1-1 Summary of Calculated Site-Specific Sorption Coefficients

COPC	Solid-Phase Concentration		Porewater Concentration		$K_{d_{\text{sed}}} (\text{m}^3/\text{g dw})$
Uranium	0.317	$\mu\text{g/g dw}$	8.9×10^{-5}	g/m^3	1.6×10^{-3}
Thorium-230	0.043	Bq/g dw	9.22	Bq/m^3	3.9×10^{-3}
Lead-210	0.103	Bq/g dw	16.8	Bq/m^3	3.9×10^{-3}
Radium-226	0.058	Bq/g dw	5.04	Bq/m^3	3.9×10^{-3}
Polonium-210	0.176	Bq/g dw	8.41	Bq/m^3	1.1×10^{-3}
Arsenic	8.24	$\mu\text{g/g dw}$	2.4×10^{-4}	g/m^3	6.1×10^{-3}
Cadmium	Not calculated				
Cobalt	8.97	$\mu\text{g/g dw}$	2.5×10^{-5}	g/m^3	0.110
Copper	12.9	$\mu\text{g/g dw}$	1.3×10^{-3}	g/m^3	1.6×10^{-3}
Lead	15.3	$\mu\text{g/g dw}$	9.2×10^{-4}	g/m^3	3.9×10^{-3}
Molybdenum	1.31	$\mu\text{g/g dw}$	1.5×10^{-4}	g/m^3	1.3×10^{-3}
Nickel	21.0	$\mu\text{g/g dw}$	7.9×10^{-4}	g/m^3	4.2×10^{-3}
Selenium	0.509	$\mu\text{g/g dw}$	5.0×10^{-5}	g/m^3	2.5×10^{-3}
Zinc	64.7	$\mu\text{g/g dw}$	2.0×10^{-2}	g/m^3	1.5×10^{-3}

The radioisotope lead-210 forms an ideal solid solution with the parent element, lead. Consequently, the K_d values for lead and lead-210 should be identical. Lead sorption in various soils has been extensively studied world-wide. It is reportedly influenced by sediment constituents (clays, oxides, hydroxides, oxyhydroxides, and organic matter) lead concentration and the pH. At a pH range of 6.4 to 8.7 the expected K_d ranges from 1.9×10^{-3} to $23.7 \times 10^{-3} \text{ m}^3/\text{g}$ at dissolved lead concentrations of $1 \mu\text{g/l}$ or less. This compares with an estimated K_d of $3.9 \times 10^{-3} \text{ m}^3/\text{g}$ in Judge Sissons Lake sediments.

Selenium is most likely to exist as selenate (SeO_4^{2-}) or selenite (SeO_3^{2-}) in the top layers of sediments in equilibrium with the water column. Chemically, selenium resembles sulphate and consequently the sorption coefficient is expected to be relatively low, less than $1 \times 10^{-3} \text{ m}^3/\text{g}$ (U.S. EPA, 1999). By contrast the estimated value reported in Table 5.1-1 is $2.5 \times 10^{-3} \text{ m}^3/\text{g}$. The reason for the high K_d value for selenium is not clear. Selenium is not expected to be reduced to selenide and precipitate under normal environmental conditions. It may be, that porewater concentrations of selenium were under-predicted during the simulation of porewater to surface water distributions resulting in higher than expected K_d values.

Under oxidizing conditions uranium is expected to exist primarily as the divalent uranyl cation, UO_2^{2+} , in the top sediment layer. Although the uranyl ion is known to form neutral complexes with ligands such as sulphate, carbonate, or chloride, these are not expected to be present in significant concentrations. Depending on the clay and organics content of the sediment, the K_d

value for uranium had been reported to vary widely between 0.063×10^{-3} to $63 \times 10^{-3} \text{ m}^3/\text{g}$ at pH = 7.0. The upper value most likely corresponds to precipitated U(VI) compounds, since some researchers do not differentiate between adsorbed and precipitated uranium. The estimated Kd value for uranium in the present study is in line with expectations (Curtis et al., 2004).

It is also noteworthy, that divalent cations such as copper and zinc were estimated to have essentially the same Kd values as uranium. The sorption coefficients for copper and zinc are higher than those normally observed in sandy sediments (Hassan et al., 1996). The higher Kd values are attributed to the elevated iron and aluminum oxide levels in the Judge Sissons Lake sediments. Iron and aluminum oxides and hydroxides are known to provide a good matrix for adsorbing divalent cations (U.S. EPA, 1999); the affinity of the iron oxide surface for copper and zinc may be two orders of magnitude higher than the common clay mineral surfaces (Takematsu, 1979).

Between pH of 5 to 8, thorium is expected to have a sorption coefficient between 1.7×10^{-3} and $170 \times 10^{-3} \text{ m}^3/\text{g}$ (U.S. EPA, 1999). As in the case of lead and lead-210, thorium-230 is expected to have a Kd value similar to native thorium. The distribution coefficient of thorium is highly variable, particularly humic substances are known to influence the sorption. The estimated Kd value of $3.9 \times 10^{-3} \text{ m}^3/\text{g}$ for thorium-230 is near the lower limit of the range. The sorption coefficient is consistent with the calculated and measured Kd values reported by Kaplan and Serkiz (2000), and is expected for the low organic environment of the Judge Sissons Lake sediments.

The estimated Kd value for radium-226 is similar to that for thorium-230. The Kd values are consistent with the reported distribution of thorium-230 and radium-226 at various locations in northern Saskatchewan (Neame et al, 1988).

The metalloid polonium resembles bismuth and tellurium in chemical properties. The somewhat lower Kd value of polonium-210 ($1.1 \times 10^{-3} \text{ m}^3/\text{g}$) is likely due to its semi-metal character.

Another dataset of site-specific Kd values, developed from solid phase concentrations and surface water concentrations, was used to characterize the variance. The site-specific $K_{d_{\text{sed}}}$ values were assumed to represent the average and the standard deviation from the Kd values was used to estimate a geometric mean for the lognormal distribution. Similarly, the geometric standard deviation calculated from the Kd values was used as the geometric standard deviation for the lognormal distribution. These distributions were used as a starting point and were further calibrated based on the model results and sediment behaviour under baseline conditions. Table 5.1-2 provides the calibrated site-specific $K_{d_{\text{sed}}}$ values used for the assessment. It is noted that $K_{d_{\text{sed}}}$ values are not presented for the conventional constituents. Ammonia, calcium, chloride, sulphate and TDS were assumed to not undergo removal from the water column to sediment through sorption; therefore, water-to-sediment distribution coefficients were not necessary for these parameters.

Table 5.1-2 Summary of Site-Specific Water-to-Sediment Distribution Coefficients – $K_{d_{sed}}$

LogNormal Distribution for Water-to-Sediment Distribution Coefficients $K_{d_{sed}}$ ($m^3/(g\ dw)$)				
Constituent	Geometric Mean	GSD	Min	Max
Uranium	2.3×10^{-4}	2.2	2.3×10^{-5}	2.4×10^{-3}
Thorium-230	4.0×10^{-4}	1.8	7.2×10^{-5}	2.2×10^{-3}
Lead-210	9.4×10^{-4}	1.4	3.3×10^{-4}	2.7×10^{-3}
Radium-226	1.7×10^{-3}	1.5	4.9×10^{-4}	5.7×10^{-3}
Polonium-210	1.9×10^{-4}	2.2	1.7×10^{-5}	2.2×10^{-3}
Arsenic	6.4×10^{-4}	2.2	6.4×10^{-5}	6.4×10^{-3}
Cadmium	1.5×10^{-4} (a)	1.5	4.4×10^{-5}	5.1×10^{-4}
Cobalt	8.5×10^{-3}	1.5	2.5×10^{-3}	2.9×10^{-2}
Copper	7.3×10^{-5}	2.8	3.3×10^{-6}	1.6×10^{-3}
Lead	2.7×10^{-4}	2.7	1.3×10^{-5}	5.6×10^{-3}
Molybdenum	7.4×10^{-5}	2.7	3.6×10^{-6}	1.5×10^{-3}
Nickel	5.0×10^{-4}	2.0	6.3×10^{-5}	4.0×10^{-3}
Selenium	1.0×10^{-3}	1.6	2.3×10^{-4}	4.4×10^{-3}
Zinc	1.0×10^{-4}	2.8	4.6×10^{-6}	2.2×10^{-3}
Note: calibrated site-specific $K_{d_{sed}}$ values a = based on $K_{d_{wat}}$ calculated from site-specific data, calibrated and the GSD selected so that the minimum and maximum values encompass the range of literature values. Lognormal distribution (Geomean, Geo Std Dev, Min, Max). $\mu g/g$ = micrograms per gram; Bq/g = Bequerels per gram. dw = dry weight basis; ww = wet weight basis.				

5.1.2 Aquatic Biota Transfer Factors

Section 2.8 provided the aquatic biota model equations for the use of transfer factors. The following sections present the transfer factors used in the current assessment and basis for their development.

5.1.2.1 Fish Transfer Factors

The fish chemistry database from work carried out in 2002 and 2005 at both the McClean Lake and Rabbit Lake sites in northern Saskatchewan were pooled and analyzed to investigate alternative methods for estimating fish concentrations based on measured water concentrations. A minimum level in fish approach is suggested, which is set based on analysis of data from areas where the water concentrations was at or near the method detection limit (MDL). A linear transfer factor is used to estimate fish concentrations. These transfer factors were estimated from the data collected in areas with higher concentrations in the water. This approach is similar in concept to the “hockey-stick regression” in the Toll-Brix model (Toll et al. 2005, Brix et al. 2005). The site-specific data for water and fish collected from the site were analyzed with transfer factors developed from other sites and it was determined that the Kiggavik fish data

was consistent with the method outlined above. The parameters of the fish model are outlined in Table 5.1-3. Attachment E provides a comparison of the model calculated fish concentrations with measured fish concentrations from the site.

Table 5.1-3 Summary of Fish Concentration Model

Constituent	Geometric Mean	GSD	Min	Max
LogNormal Distribution for Minimum Fish Concentrations ($\mu\text{g/g ww}$ or Bq/g ww)				
Uranium	1.1×10^{-3}	2.8	5.3×10^{-5}	2.4×10^{-2}
Uranium-238	2.6×10^{-5}	2.8	1.3×10^{-6}	5.8×10^{-4}
Thorium-230	1.1×10^{-4}	2.5	7.1×10^{-6}	1.6×10^{-3}
Lead-210	6.2×10^{-4}	1.9	8.8×10^{-5}	4.3×10^{-3}
Radium-226	7.0×10^{-5}	2.3	5.5×10^{-6}	8.8×10^{-4}
Polonium-210	4.6×10^{-4}	3.0	1.7×10^{-5}	1.3×10^{-2}
Arsenic	4.9×10^{-2}	2.4	3.4×10^{-3}	7.2×10^{-1}
Cadmium	6.2×10^{-3}	4.7	6.1×10^{-5}	6.3×10^{-1}
Cobalt	4.8×10^{-3}	1.7	9.9×10^{-4}	2.3×10^{-2}
Copper	2.3×10^{-1}	1.6	5.6×10^{-2}	9.5×10^{-1}
Lead	1.3×10^{-2}	4.0	2.0×10^{-4}	8.3×10^{-1}
Molybdenum	1.8×10^{-2}	1.7	3.4×10^{-3}	9.3×10^{-2}
Nickel	1.2×10^{-2}	2.0	1.4×10^{-3}	9.5×10^{-2}
Selenium	3.7×10^{-1}	1.5	1.0×10^{-1}	1.4
Zinc	5.1	1.5	1.5	17.
LogNormal Distribution for Water-to-Fish Transfer Factors ($\text{m}^3/\text{g ww}$)				
Uranium	4.8×10^{-7}	2.0	5.9×10^{-8}	4.0×10^{-6}
Thorium-230	3.6×10^{-5}	3.0	6.9×10^{-6}	1.9×10^{-4}
Lead-210	8.5×10^{-5}	1.1	6.6×10^{-5}	1.1×10^{-4}
Radium-226	9.3×10^{-5}	1.6	2.5×10^{-5}	3.5×10^{-4}
Polonium-210	2.5×10^{-4}	2.7	1.3×10^{-5}	5.1×10^{-3}
Arsenic	2.4×10^{-5}	1.5	7.4×10^{-6}	7.5×10^{-5}
Cadmium	2.0×10^{-4}	2.5	5.1×10^{-5}	7.9×10^{-4}
Cobalt	5.7×10^{-5}	1.7	1.2×10^{-5}	2.8×10^{-4}
Copper	3.7×10^{-5}	1.9	1.5×10^{-5}	9.3×10^{-5}
Lead	2.2×10^{-5}	4.0	3.5×10^{-7}	1.3×10^{-3}
Molybdenum	1.1×10^{-7}	5.2	7.6×10^{-10}	1.6×10^{-6}
Nickel	1.6×10^{-6}	2.0	2.0×10^{-7}	1.2×10^{-5}
Selenium	2.2×10^{-3}	1.5	1.1×10^{-3}	4.1×10^{-3}
Zinc	1.2×10^{-3}	1.6	3.2×10^{-4}	4.7×10^{-3}
Note: Fish model parameters: minimum fish concentrations represent fish concentrations at the lowest water concentrations; transfer factors dominate once the water concentration results in a fish concentration above the minimum fish concentration. Lognormal distribution (Geometric Mean, GSD, Min, Max). m^3/g = cubic meters per gram. ww = wet weight basis.				

5.1.2.2 Aquatic Vegetation Transfer Factors

Site-specific water-to-aquatic vegetation transfer factors were developed using the baseline water quality (Section 3.2.3) and baseline aquatic vegetation quality (Section 3.2.6). Lognormal distributions, summarized in Table 5.1-4, were derived from the site-specific data. Attachment E provides a comparison of the model calculated aquatic vegetation concentrations with measured aquatic vegetation concentrations from the site.

Table 5.1-4 Summary of Site-Specific Transfer Factors – Aquatic Vegetation

Constituent	Geometric Mean	GSD	Min	Max
LogNormal Distribution for Water-to-Aquatic Vegetation Transfer Factor (m³/g ww)				
Uranium	5.5x10 ⁻⁵	3.6	1.2x10 ⁻⁶	2.6x10 ⁻³
Thorium-230 ^a	4.6x10 ⁻⁴	2.4	3.3x10 ⁻⁵	6.4x10 ⁻³
Lead-210	6.0x10 ⁻⁴	1.9	9.3x10 ⁻⁵	3.9x10 ⁻³
Radium-226	1.2x10 ⁻⁴	2.1	1.2x10 ⁻⁵	1.2x10 ⁻³
Polonium-210	1.6x10 ⁻³	2.1	1.6x10 ⁻⁴	1.6x10 ⁻²
Arsenic	1.0x10 ⁻³	8.5	1.7x10 ⁻⁶	6.3x10 ⁻¹
Cadmium ^b	4.2x10 ⁻⁴	2.5	2.7x10 ⁻⁵	6.5x10 ⁻³
Cobalt	8.0x10 ⁻⁴	4.9	6.8x10 ⁻⁶	9.5x10 ⁻²
Copper	1.6x10 ⁻³	2.0	2.0x10 ⁻⁴	1.3x10 ⁻²
Lead	5.0x10 ⁻⁴	6.3	2.0x10 ⁻⁶	1.2x10 ⁻¹
Molybdenum	1.1x10 ⁻³	2.6	5.8x10 ⁻⁵	2.0x10 ⁻²
Nickel	5.7x10 ⁻⁴	2.6	3.4x10 ⁻⁵	9.6x10 ⁻³
Selenium	1.4x10 ⁻⁴	2.0	1.8x10 ⁻⁵	1.1x10 ⁻³
Zinc	1.0x10 ⁻³	2.4	7.0x10 ⁻⁵	1.4x10 ⁻²
Note: site-specific TF water-to-aqveg values a – calibrated from SLEEA (SENES 2008, based on SENES 2006), not from site-specific data. b – calibrated from Bird and Schwartz (1996). Lognormal distribution (Geometric Mean, GSD, Min, Max). m ³ /g = cubic meters per gram. ww = wet weight basis.				

5.1.2.3 Benthic Invertebrate Transfer Factors

Water-to-benthic invertebrate transfer factors were taken from site-specific data for the McClean Lake site in northern Saskatchewan collected in Summer 2010. Hard- and soft-bodied benthic invertebrate samples were collected from eight locations. These data were consolidated and represented by lognormal distributions, with the geometric mean calculated from the data and the GSD derived to represent the arithmetic mean of the data. The minimum and maximum values were defined at 3 standard deviations. Data from the McClean site was used in favour of literature data, since it was considered to be more relevant to the Kiggavik site. The distributions are summarized in Table 5.1-5. Attachment E provides a comparison of the model calculated benthic invertebrate concentrations with measured insect concentrations from the site.

Table 5.1-5 Summary of Transfer Factors – Benthic Invertebrates

Constituent	Geometric Mean	GSD	Min	Max
LogNormal Distribution for Water-to-Benthic Invertebrate Transfer Factor (m³/g ww)				
Uranium	7.1x10 ⁻⁴	1.5	2.3x10 ⁻⁴	2.2x10 ⁻³
Thorium-230	6.0x10 ⁻⁵	2.5	3.8x10 ⁻⁶	9.3x10 ⁻⁴
Lead-210	2.2x10 ⁻⁴	2.5	1.4x10 ⁻⁵	3.4x10 ⁻³
Radium-226	9.7x10 ⁻⁴	2.5	6.2x10 ⁻⁵	1.5x10 ⁻²
Polonium-210	1.5x10 ⁻³	2.5	9.7x10 ⁻⁵	2.4x10 ⁻²
Arsenic	7.0x10 ⁻⁴	2.2	6.5x10 ⁻⁵	7.4x10 ⁻³
Cadmium ^a	1.4x10 ⁻³	2.5	6.5x10 ⁻⁵	7.4x10 ⁻³
Cobalt	5.1x10 ⁻⁴	2.6	3.0x10 ⁻⁵	8.4x10 ⁻³
Copper	5.1x10 ⁻³	1.5	1.5x10 ⁻³	1.7x10 ⁻²
Lead	1.1x10 ⁻⁴	2.9	4.6x10 ⁻⁶	2.5x10 ⁻³
Molybdenum	5.6x10 ⁻⁵	2.2	5.3x10 ⁻⁶	6.0x10 ⁻⁴
Nickel	3.0x10 ⁻⁴	3.6	6.5x10 ⁻⁶	1.4x10 ⁻²
Selenium	6.2x10 ⁻⁴	2.5	4.0x10 ⁻⁵	9.8x10 ⁻³
Zinc	5.7x10 ⁻³	2.9	2.3x10 ⁻⁴	1.4x10 ⁻¹
Note: TFwater-to-benthic values from McClean Lake site data a – from U.S. EPA (1979) and COGEMA (1997). Lognormal distribution (Geometric Mean, GSD, Min, Max). m ³ /g = cubic meters per gram. ww = wet weight basis.				

5.1.3 Terrestrial Biota Transfer Factors

Section 2.9 provided the terrestrial biota model equations for the use of transfer factors. The following sections present the transfer factors used in the current assessment and basis for their development.

5.1.3.1 Terrestrial Vegetation Transfer Factors

The measured data for terrestrial vegetation at the site was used with the baseline soil data to develop site-specific transfer factors for terrestrial vegetation. The transfer factors are used to predict concentrations in terrestrial vegetation in the future to reflect potential changes in soil concentrations.

Table 5.1-6 summarizes the site-specific transfer factors developed for browse, forage, and berry. Attachment E provides a comparison of the model calculated terrestrial vegetation concentrations with measured terrestrial vegetation concentrations from the site.

Table 5.1-6 Summary of Site-Specific Transfer Factors – Terrestrial Vegetation

Constituent	Geometric Mean	GSD	Min	Max
LogNormal Distribution for Soil-to-Browse Transfer Factor ((Bq/g ww)/(µg/g dw) and (µg/g ww)/(µg/g dw))				
Uranium	0.0009	2.0 ^a	0.0001	0.007
Thorium-230 ^b	0.009	1.7	0.002	0.04
Lead-210 ^c	1.7	1.5	0.49	6.2
Radium-226	0.04	1.8	0.008	0.22
Polonium-210	1.7	1.5	0.49	6.2
Arsenic	0.027	3.2 ^d	0.0008	0.87
Cadmium ^e	1.0	2.5	0.064	15.6
Cobalt	0.06	3.1	0.002	1.9
Copper	0.63	1.8	0.11	3.5
Lead	0.013	1.9	0.002	0.09
Molybdenum	0.12	4.5	0.001	10.9
Nickel	0.1	2.1	0.01	0.92
Selenium ^b	0.01	3.2	0.001	0.1
Zinc	8.8	2.0 ^a	2.2	35.2
LogNormal Distribution for Soil-to-Forage Transfer Factor ((Bq/g ww)/(µg/g dw) and (µg/g ww)/(µg/g dw))				
Uranium	0.04	3.0 ^a	0.0015	1.1
Thorium-230	0.09	4.0 ^a	0.0002	42.5
Lead-210	3.0	3.6 ^d	0.07	136
Radium-226	0.06	7.8	0.0001	29.6
Polonium-210	2.2	2.8 ^a	0.1	48.3
Arsenic ^f	0.005	4.5	0.00005	0.46
Cadmium ^g	0.2	2.5	0.032	1.3
Cobalt	0.03	3.0 ^a	0.001	0.81
Copper	0.26	2.0 ^a	0.033	2.1
Lead	0.02	2.5 ^a	0.001	0.31
Molybdenum	0.24	3.0 ^a	0.009	6.5
Nickel	0.07	2.5 ^a	0.004	1.1
Selenium ^b	Uniform Distribution		0.004	0.5
Zinc	1.1	2.0 ^a	0.14	8.8
LogNormal Distribution for Soil-to-Berry Transfer Factor ((Bq/g ww)/(µg/g dw) and (µg/g ww)/(µg/g dw))				
Uranium ^{b,f}	0.0011	2.0	0.00014	0.0088
Thorium-230	0.002	13 ^d	0.000001	4.9
Lead-210 ^b	0.013	5.2	0.007	0.13
Radium-226	0.004	2.9	0.0002	0.1
Polonium-210	0.02	1.9	0.003	0.15
Arsenic	0.004	2.5 ^d	0.0003	0.067
Cadmium ^e	0.05	2.0	0.0063	0.4
Cobalt	0.009	1.8	0.002	0.05
Copper	0.11	2.4	0.008	1.6

Constituent	Geometric Mean	GSD	Min	Max
Lead	0.002	2.5	0.0002	0.04
Molybdenum ^f	0.018	4.0	0.00028	1.2
Nickel	0.03	2.6	0.002	0.5
Selenium ^b	0.0029	2.5	0.0002	0.045
Zinc	0.65	3.3	0.02	23.3
Note: Lognormal distribution (Geomean, Geo Std Dev, Min, Max) a – calibrated GSD b – distribution from SLEEA c – assumed same as Po-210 d – GSD from SLEEA e – from NCRP (1996) f – calibrated g – from NCRP(1996), EPA (1998) µg/g = micrograms per gram; Bq/g = Bequerels per gram. dw = dry weight basis; ww = wet weight basis.				

As described in Section 2.9.3, lichen concentrations are estimated in the model using a COPC-specific component to represent uptake, retention, and subsequent release. This COPC-specific term was calibrated using measured lichen data from the site and verified using lichen data from other sites in northern Saskatchewan. Attachment E provides a comparison of the model calculated lichen concentrations with measured lichen concentrations from the site.

Table 5.1-7 Summary of Site-Specific Transfer Factors – Lichen

Constituent	Min	Max
Uniform Distribution for COPC-Specific Lichen Transfer Factor ((Bq/g ww)/(µg/g dw) and (µg/g ww)/(µg/g dw))		
Uranium	7.8×10^{-10}	3.1×10^{-9}
Thorium-230	4.7×10^{-9}	1.9×10^{-8}
Lead-210	7.5×10^{-10}	3.0×10^{-9}
Radium-226	1.9×10^{-9}	7.6×10^{-9}
Polonium-210	1.8×10^{-10}	7.1×10^{-10}
Arsenic	9.8×10^{-10}	3.9×10^{-9}
Cadmium ^e	4.4×10^{-10}	1.8×10^{-9}
Cobalt	1.5×10^{-10}	5.8×10^{-10}
Copper	1.3×10^{-8}	5.0×10^{-8}
Lead	5.1×10^{-9}	2.1×10^{-8}
Molybdenum	5.5×10^{-9}	2.2×10^{-8}
Nickel	2.6×10^{-10}	1.0×10^{-9}
Selenium ^b	3.1×10^{-10}	1.2×10^{-9}
Zinc	4.0×10^{-10}	1.6×10^{-9}

5.1.3.2 Bird Transfer Factors

Feed-to-bird transfer factors are used in the model to estimate the concentration of COPC in the flesh of birds, based on predicted intake rates of COPC, as shown Section 2.9.

Transfer factors are generally derived for domestic agricultural animals (cattle and poultry). For chickens, according to the Chicken Farmers of Canada (CFC), chickens are ready for market at approximately 2 kg (CFC 2007, internet site). The typical body weight at 42 days is 2.7 kg (Havenstein *et al.* 2003); this value was used in the calculations.

There is limited data available on avian species. Clulow *et al.* (1992) measured a concentration ratio of 0.075 on a fresh weight basis for grouse. Using the appropriate intake rate a transfer factor of 0.3 d/kg can be determined. Using the poultry value (0.13 d/kg, Sheppard *et al.*, 2005), the TF for radium exposure to a grouse is estimated to be 0.4 d/kg.

Due to the lack of available transfer factors for different non-human biota for all elements, it is recommended that allometric scaling of the transfer factors based on beef or chicken is used. This approach provides a reasonable estimate of the transfer factor that can be used to calculate the concentration of non-human biota.

To obtain a more appropriate transfer factor, allometric scaling can be applied to the transfer factor with a relationship of -0.75. This approach is consistent with the allometric scaling for intake rates and inhalation by wildlife, as used in the ecological profiles (U.S. EPA 1993), which has shown a similar relationship. Allometric scaling of transfer factors has been discussed by others (e.g. Nalezinski *et al.* 1996; Higley *et al.* 2003) as a useful method for deriving transfer factors for biota. It is acknowledged that not all radionuclides would scale to the same factor, as shown by the U.S. DOE (2002). However, the use of the -0.75 factor is a conservative approach. Other factors that can be found in the literature (e.g. 0.25 may be appropriate for actinides) would result in smaller predicted transfer factors for smaller biota than the reference animal. As most of the ecological receptors are smaller than cattle, the -0.75 is used as a conservative approach.

The scaling can be applied as follows in equation (5.1-1):

$$TF_w = TF_A \left(\frac{BW_w}{BW_A} \right)^{-0.75} \quad (5.1-1)$$

where:

TF_w	Transfer factor for wildlife (d/kg)
TF_A	Transfer factor for animal available from literature (d/kg)
BW_w	Body weight of wildlife (kg)
BW_A	Body weight of animal (kg)

Scaling for the selected bird species was conducted from a selected reference bird species.

When the allometric equations for the transfer factor are combined with the allometric equation for food intake, it results in generally a constant trans-species ratio between whole-body and dietary activity concentrations (e.g. Beresford 2007). This approach was used in the Framework for Assessment of Environmental Impact (FASSET 2003). This approach would be appropriate however, as data in literature is generally reported as transfer factors, as opposed to concentration ratios, the use of the selected approach allowed a larger database to be selected.

Feed-to-bird transfer factors from literature were used as a starting point and model outputs for predicted concentrations in Lapland longspur under baseline conditions were compared with the measured site data for sparrow (Table 3.2-12). This comparison was considered reasonable because Lapland longspur is described as being “sparrow-like” and has a similar diet and body weight to the sparrow. Modifications were made to the feed-to-bird transfer factors from literature to achieve comparable concentrations in the Lapland longspur. Feed-to-bird transfer factors were scaled by body weight for each avian VEC using equation (5.1-2).

$$TF_{VEC} = TF_{bird} \times \left(\frac{BW_{VEC}}{BW_{bird}} \right)^{-0.75} \quad (5.1-2)$$

Table 5.1-8 presents the calibrated feed-to-bird transfer factors used in the assessment. Lognormal probabilistic distributions were derived using an assumed geometric standard deviation of 2.5. Attachment E provides a comparison of the model calculated bird concentrations with measured bird concentrations from the site.

Table 5.1-8 Summary of Feed-to-Bird Transfer Factors

Constituent	Geometric Mean	GSD	Min	Max
LogNormal Distribution for Feed-to-Falcon Transfer Factors (d/g ww)				
Uranium	1.3x10 ⁻⁴	2.5	8.6x10 ⁻⁶	2.1x10 ⁻³
Thorium-230	6.0x10 ⁻⁴	2.5	3.8x10 ⁻⁵	9.4x10 ⁻³
Lead-210	1.5x10 ⁻²	2.5	9.5x10 ⁻⁴	2.3x10 ⁻¹
Radium-226	1.2x10 ⁻³	2.5	7.8x10 ⁻⁵	1.9x10 ⁻²
Polonium-210	4.6x10 ⁻³	2.5	2.9x10 ⁻⁴	7.2x10 ⁻²
Arsenic	1.5x10 ⁻⁴	2.5	9.7x10 ⁻⁶	2.4x10 ⁻³
Cadmium	3.2x10 ⁻⁴	2.5	2.1x10 ⁻⁵	5.1x10 ⁻³
Cobalt	3.6x10 ⁻⁴	2.5	2.3x10 ⁻⁵	5.6x10 ⁻³
Copper	1.1x10 ⁻³	2.5	6.9x10 ⁻⁵	1.7x10 ⁻²
Lead	4.0x10 ⁻⁴	2.5	2.5x10 ⁻⁵	6.2x10 ⁻³
Molybdenum	1.2x10 ⁻³	2.5	7.5x10 ⁻⁵	1.8x10 ⁻²
Nickel	1.8x10 ⁻⁴	2.5	1.2x10 ⁻⁵	2.8x10 ⁻³
Selenium	9.3x10 ⁻³	2.5	6.0x10 ⁻⁴	1.5x10 ⁻¹
Zinc	1.0x10 ⁻³	2.5	6.7x10 ⁻⁵	1.6x10 ⁻²

Constituent	Geometric Mean	GSD	Min	Max
LogNormal Distribution for Feed-to-Longspur Transfer Factors (d/g ww)				
Uranium	1.7×10^{-3}	2.5	1.1×10^{-4}	2.7×10^{-2}
Thorium-230	7.7×10^{-3}	2.5	4.9×10^{-4}	1.2×10^{-1}
Lead-210	1.9×10^{-1}	2.5	1.2×10^{-2}	3.0
Radium-226	1.6×10^{-2}	2.5	1.0×10^{-3}	2.4×10^{-1}
Polonium-210	5.9×10^{-2}	2.5	3.8×10^{-3}	9.2×10^{-1}
Arsenic	1.9×10^{-3}	2.5	1.2×10^{-4}	3.0×10^{-2}
Cadmium	4.2×10^{-3}	2.5	2.7×10^{-4}	6.5×10^{-2}
Cobalt	4.6×10^{-3}	2.5	2.9×10^{-4}	7.2×10^{-2}
Copper	1.4×10^{-2}	2.5	8.8×10^{-4}	2.1×10^{-1}
Lead	5.1×10^{-3}	2.5	3.3×10^{-4}	8.0×10^{-2}
Molybdenum	1.5×10^{-2}	2.5	9.6×10^{-4}	2.3×10^{-1}
Nickel	2.3×10^{-3}	2.5	1.5×10^{-4}	3.6×10^{-2}
Selenium	1.2×10^{-1}	2.5	7.7×10^{-3}	1.9
Zinc	1.3×10^{-2}	2.5	8.6×10^{-4}	2.1×10^{-1}
LogNormal Distribution for Feed-to-Longtail Duck Transfer Factors (d/g ww)				
Uranium	1.5×10^{-4}	2.5	9.4×10^{-6}	2.3×10^{-3}
Thorium-230	6.5×10^{-4}	2.5	4.2×10^{-5}	1.0×10^{-2}
Lead-210	1.6×10^{-2}	2.5	1.0×10^{-3}	2.5×10^{-1}
Radium-226	1.3×10^{-3}	2.5	8.5×10^{-5}	2.1×10^{-2}
Polonium-210	5.0×10^{-3}	2.5	3.2×10^{-4}	7.9×10^{-2}
Arsenic	1.7×10^{-4}	2.5	1.1×10^{-5}	2.6×10^{-3}
Cadmium	3.5×10^{-4}	2.5	2.3×10^{-5}	5.5×10^{-3}
Cobalt	3.9×10^{-4}	2.5	2.5×10^{-5}	6.1×10^{-3}
Copper	1.2×10^{-3}	2.5	7.5×10^{-5}	1.8×10^{-2}
Lead	4.3×10^{-4}	2.5	2.8×10^{-5}	6.8×10^{-3}
Molybdenum	1.3×10^{-3}	2.5	8.1×10^{-5}	2.0×10^{-2}
Nickel	2.0×10^{-4}	2.5	1.3×10^{-5}	3.1×10^{-3}
Selenium	1.0×10^{-2}	2.5	6.5×10^{-4}	1.6×10^{-1}
Zinc	1.1×10^{-3}	2.5	7.3×10^{-5}	1.8×10^{-2}
LogNormal Distribution for Feed-to-Merganser Transfer Factors (d/g ww)				
Uranium	1.2×10^{-4}	2.5	8.0×10^{-6}	1.9×10^{-3}
Thorium-230	5.5×10^{-4}	2.5	3.5×10^{-5}	8.6×10^{-3}
Lead-210	1.4×10^{-2}	2.5	8.8×10^{-4}	2.1×10^{-1}
Radium-226	1.1×10^{-3}	2.5	7.2×10^{-5}	1.8×10^{-2}
Polonium-210	4.3×10^{-3}	2.5	2.7×10^{-4}	6.6×10^{-2}
Arsenic	1.4×10^{-4}	2.5	9.0×10^{-6}	2.2×10^{-3}
Cadmium	3.0×10^{-4}	2.5	1.9×10^{-5}	4.7×10^{-3}
Cobalt	3.3×10^{-4}	2.5	2.1×10^{-5}	5.2×10^{-3}
Copper	9.9×10^{-4}	2.5	6.3×10^{-5}	1.5×10^{-2}
Lead	3.7×10^{-4}	2.5	2.4×10^{-5}	5.7×10^{-3}
Molybdenum	1.1×10^{-3}	2.5	6.9×10^{-5}	1.7×10^{-2}

Constituent	Geometric Mean	GSD	Min	Max
Nickel	1.7×10^{-4}	2.5	1.1×10^{-5}	2.6×10^{-3}
Selenium	8.6×10^{-3}	2.5	5.5×10^{-4}	1.3×10^{-1}
Zinc	9.7×10^{-4}	2.5	6.2×10^{-5}	1.5×10^{-2}
LogNormal Distribution for Feed-to-Pintail Transfer Factors (d/g ww)				
Uranium	1.2×10^{-4}	2.5	8.0×10^{-6}	1.9×10^{-3}
Thorium-230	5.5×10^{-4}	2.5	3.5×10^{-5}	8.6×10^{-3}
Lead-210	1.4×10^{-2}	2.5	8.8×10^{-4}	2.1×10^{-1}
Radium-226	1.1×10^{-3}	2.5	7.2×10^{-5}	1.8×10^{-2}
Polonium-210	4.3×10^{-3}	2.5	2.7×10^{-4}	6.6×10^{-2}
Arsenic	1.4×10^{-4}	2.5	9.0×10^{-6}	2.2×10^{-3}
Cadmium	3.0×10^{-4}	2.5	1.9×10^{-5}	4.7×10^{-3}
Cobalt	3.3×10^{-4}	2.5	2.1×10^{-5}	5.2×10^{-3}
Copper	9.9×10^{-4}	2.5	6.3×10^{-5}	1.5×10^{-2}
Lead	3.7×10^{-4}	2.5	2.4×10^{-5}	5.7×10^{-3}
Molybdenum	1.1×10^{-3}	2.5	6.9×10^{-5}	1.7×10^{-2}
Nickel	1.7×10^{-4}	2.5	1.1×10^{-5}	2.6×10^{-3}
Selenium	8.6×10^{-3}	2.5	5.5×10^{-4}	1.3×10^{-1}
Zinc	9.7×10^{-4}	2.5	6.2×10^{-5}	1.5×10^{-2}
LogNormal Distribution for Feed-to-Ptarmigan Transfer Factors (d/g ww)				
Uranium	1.8×10^{-4}	2.5	1.1×10^{-5}	2.8×10^{-3}
Thorium-230	7.9×10^{-4}	2.5	5.1×10^{-5}	1.2×10^{-2}
Lead-210	2.0×10^{-2}	2.5	1.3×10^{-3}	3.1×10^{-1}
Radium-226	1.6×10^{-3}	2.5	1.0×10^{-4}	2.5×10^{-2}
Polonium-210	6.1×10^{-3}	2.5	3.9×10^{-4}	9.5×10^{-2}
Arsenic	2.0×10^{-4}	2.5	1.3×10^{-5}	3.1×10^{-3}
Cadmium	4.3×10^{-4}	2.5	2.7×10^{-5}	6.7×10^{-3}
Cobalt	4.8×10^{-4}	2.5	3.0×10^{-5}	7.4×10^{-3}
Copper	1.4×10^{-3}	2.5	9.1×10^{-5}	2.2×10^{-2}
Lead	5.3×10^{-4}	2.5	3.4×10^{-5}	8.2×10^{-3}
Molybdenum	1.5×10^{-3}	2.5	9.9×10^{-5}	2.4×10^{-2}
Nickel	2.4×10^{-4}	2.5	1.5×10^{-5}	3.8×10^{-3}
Selenium	1.2×10^{-2}	2.5	7.9×10^{-4}	1.9×10^{-1}
Zinc	1.4×10^{-3}	2.5	8.9×10^{-5}	2.2×10^{-2}
LogNormal Distribution for Feed-to-Sandpiper Transfer Factors (d/g ww)				
Uranium	1.7×10^{-3}	2.5	1.1×10^{-4}	2.7×10^{-2}
Thorium-230	7.7×10^{-3}	2.5	4.9×10^{-4}	1.2×10^{-1}
Lead-210	1.9×10^{-1}	2.5	1.2×10^{-2}	3.0
Radium-226	1.6×10^{-2}	2.5	1.0×10^{-3}	2.4×10^{-1}
Polonium-210	5.9×10^{-2}	2.5	3.8×10^{-3}	9.2×10^{-1}
Arsenic	1.9×10^{-3}	2.5	1.2×10^{-4}	3.0×10^{-2}
Cadmium	4.2×10^{-3}	2.5	2.7×10^{-4}	6.5×10^{-2}
Cobalt	4.6×10^{-3}	2.5	2.9×10^{-4}	7.2×10^{-2}

Constituent	Geometric Mean	GSD	Min	Max
Copper	1.4×10^{-2}	2.5	8.8×10^{-4}	2.1×10^{-1}
Lead	5.1×10^{-3}	2.5	3.3×10^{-4}	8.0×10^{-2}
Molybdenum	1.5×10^{-2}	2.5	9.6×10^{-4}	2.3×10^{-1}
Nickel	2.3×10^{-3}	2.5	1.5×10^{-4}	3.6×10^{-2}
Selenium	1.2×10^{-1}	2.5	7.7×10^{-3}	1.9
Zinc	1.3×10^{-2}	2.5	8.6×10^{-4}	2.1×10^{-1}
Source: Literature values calibrated to measured sparrow site data. Note: GSD = geometric standard deviation. Min = minimum; Max = maximum. d/g = day per gram. ww = wet weight basis.				

5.1.3.3 Animal Transfer Factors

Feed-to-animal transfer factors are used in the model to estimate the concentration of COPC in the flesh of animals, based on predicted intake rates of COPC, as shown Section 2.9.

Allometric scaling for the feed-to-animal transfer factors was completed similar to the allometric scaling described in the previous section for feed-to-bird transfer factors. The scaling for the selected mammalian species was conducted from a reference mammal species.

Transfer factors are generally derived for domestic agricultural animals (cattle and poultry). Beef cattle were assumed to be the agricultural animal of interest and thus the body weight can be taken to be approximately 400 kg (NRC 2000; CCA 1999, internet site).

Note that this approach provides transfer factors that are consistent with the limited amount of measured values that are available. This can be illustrated using the transfer factor for lead. A feed to beef transfer 0.0004 d/kg can be obtained from literature (IAEA 1994). Using a body weight of 400 kg for cattle and 0.03 kg for a vole allometric scaling can be applied. This provides a predicted transfer factor for a vole of 0.5 d/kg. Measurements taken for voles have demonstrated a transfer factor for lead of 0.14 d/kg (Thomas 1997). The difference in the transfer factor for small mammal (0.5 d/kg) compared to that for beef (0.0004 d/kg) demonstrates that, although there is uncertainty in the scaling, there is a need to adjust the transfer factors, particularly when the body size are significantly different. Using the same extrapolation approach a transfer factor for radium uptake by a vole can be calculated to be 2.4 d/kg compared to a measured value of 2.5 d/kg (Thomas 1997). Information on the uptake of contaminants by small mammals can also be obtained from Sample *et al.* (1998), which provides concentration ratios for different types of small mammals (herbivore, insectivore, omnivore and general). Using the characteristics of a vole the transfer factor can be estimated from information provided by Sample *et al.* (1998) and compared to the predictions from the allometric scaling. Many of the contaminants (e.g. Fe, Se) are shown to be well-represented by the predicted transfer factor using allometric scaling.

Due to the lack of available transfer factors for different non-human biota for all elements, it is recommended that allometric scaling of the transfer factors based on beef is used. This approach provides a reasonable estimate of the transfer factor that can be used to calculate the concentration of non-human biota.

When the allometric equations for the transfer factor are combined with the allometric equation for food intake, it results in generally a constant trans-species ratio between whole-body and dietary activity concentrations (e.g. Beresford 2007). This approach was used in FASSET (2003). This approach would be appropriate however, as data in literature is generally reported as transfer factors, as opposed to concentration ratios, the use of the selected approach allowed a larger database to be selected.

Feed-to-beef transfer factors from literature were used as a starting point and model outputs for predicted concentrations in lemming under baseline conditions were compared with the measured site data for lemming (Table 3.2-13). A similar comparison was made for model outputs for predicted concentrations in caribou under baseline conditions and the measured caribou data from the site. Modifications were made to the feed-to-beef transfer factors from literature to achieve comparable concentrations in the lemming and caribou. The modifications for lemming were applied to the other small mammals, such as shrew and squirrel, while the modifications for caribou were applied to the large animals, such as bear, fox, muskox, wolf, and wolverine. The modified feed-to-beef transfer factors were scaled by body weight for each mammal VEC using equation (5.1-3).

$$TF_{VEC} = TF_{beef} \times \left(\frac{BW_{VEC}}{BW_{beef}} \right)^{-0.75} \quad (5.1-3)$$

Table 5.1-9 presents the calibrated feed-to-beef transfer factors used in the assessment. Lognormal probabilistic distributions were derived using an assumed geometric standard deviation of 2.5. Attachment E provides a comparison of the model calculated lemming and caribou concentrations with measured lemming and caribou concentrations from the site.

Table 5.1-9 Summary of Feed-to-Mammal Transfer Factors

Constituent	Geometric Mean	GSD	Min	Max
LogNormal Distribution for Feed-to-Bear Transfer Factors (d/g ww)				
Uranium	4.0x10 ⁻⁶	2.5	2.5x10 ⁻⁷	6.2x10 ⁻⁵
Thorium-230	1.0x10 ⁻⁶	2.5	6.4x10 ⁻⁸	1.6x10 ⁻⁵
Lead-210	1.4x10 ⁻⁷	2.5	9.1x10 ⁻⁹	2.2x10 ⁻⁶
Radium-226	1.1x10 ⁻⁶	2.5	7.3x10 ⁻⁸	1.8x10 ⁻⁵
Polonium-210	4.1x10 ⁻⁶	2.5	2.6x10 ⁻⁷	6.5x10 ⁻⁵
Arsenic	1.3x10 ⁻⁵	2.5	8.1x10 ⁻⁷	2.0x10 ⁻⁴
Cadmium	2.4x10 ⁻⁶	2.5	1.6x10 ⁻⁷	3.8x10 ⁻⁵
Cobalt	1.6x10 ⁻⁶	2.5	1.0x10 ⁻⁷	2.6x10 ⁻⁵

Constituent	Geometric Mean	GSD	Min	Max
Copper	4.5×10^{-5}	2.5	2.9×10^{-6}	7.0×10^{-4}
Lead	1.0×10^{-6}	2.5	6.6×10^{-8}	1.6×10^{-5}
Molybdenum	4.7×10^{-6}	2.5	3.0×10^{-7}	7.3×10^{-5}
Nickel	9.8×10^{-7}	2.5	6.3×10^{-8}	1.5×10^{-5}
Selenium	4.4×10^{-5}	2.5	2.8×10^{-6}	6.9×10^{-4}
Zinc	4.7×10^{-5}	2.5	3.0×10^{-6}	7.4×10^{-4}
LogNormal Distribution for Feed-to-Caribou Transfer Factors (d/g ww)				
Uranium	7.2×10^{-6}	2.5	4.6×10^{-7}	1.1×10^{-4}
Thorium-230	1.8×10^{-6}	2.5	1.2×10^{-7}	2.9×10^{-5}
Lead-210	2.6×10^{-7}	2.5	1.7×10^{-8}	4.1×10^{-6}
Radium-226	2.1×10^{-6}	2.5	1.3×10^{-7}	3.2×10^{-5}
Polonium-210	7.5×10^{-6}	2.5	4.8×10^{-7}	1.2×10^{-4}
Arsenic	2.3×10^{-5}	2.5	1.5×10^{-6}	3.6×10^{-4}
Cadmium	4.4×10^{-6}	2.5	2.8×10^{-7}	6.9×10^{-5}
Cobalt	3.0×10^{-6}	2.5	1.9×10^{-7}	4.6×10^{-5}
Copper	8.2×10^{-5}	2.5	5.2×10^{-6}	1.3×10^{-3}
Lead	1.9×10^{-6}	2.5	1.2×10^{-7}	2.9×10^{-5}
Molybdenum	8.5×10^{-6}	2.5	5.4×10^{-7}	1.3×10^{-4}
Nickel	1.8×10^{-6}	2.5	1.1×10^{-7}	2.8×10^{-5}
Selenium	8.0×10^{-5}	2.5	5.1×10^{-6}	1.2×10^{-3}
Zinc	8.6×10^{-5}	2.5	5.5×10^{-6}	1.3×10^{-3}
LogNormal Distribution for Feed-to-Fox Transfer Factors (d/g ww)				
Uranium	1.0×10^{-4}	2.5	6.4×10^{-6}	1.6×10^{-3}
Thorium-230	2.6×10^{-5}	2.5	1.6×10^{-6}	4.0×10^{-4}
Lead-210	3.6×10^{-6}	2.5	2.3×10^{-7}	5.7×10^{-5}
Radium-226	2.9×10^{-5}	2.5	1.9×10^{-6}	4.5×10^{-4}
Polonium-210	1.1×10^{-4}	2.5	6.7×10^{-6}	1.6×10^{-3}
Arsenic	3.2×10^{-4}	2.5	2.1×10^{-5}	5.1×10^{-3}
Cadmium	6.2×10^{-5}	2.5	4.0×10^{-6}	9.7×10^{-4}
Cobalt	4.2×10^{-5}	2.5	2.7×10^{-6}	6.5×10^{-4}
Copper	1.1×10^{-3}	2.5	7.3×10^{-5}	1.8×10^{-2}
Lead	2.6×10^{-5}	2.5	1.7×10^{-6}	4.1×10^{-4}
Molybdenum	1.2×10^{-4}	2.5	7.6×10^{-6}	1.9×10^{-3}
Nickel	2.5×10^{-5}	2.5	1.6×10^{-6}	3.9×10^{-4}
Selenium	1.1×10^{-3}	2.5	7.2×10^{-5}	1.7×10^{-2}
Zinc	1.2×10^{-3}	2.5	7.7×10^{-5}	1.9×10^{-2}
LogNormal Distribution for Feed-to-Lemming Transfer Factors (d/g ww)				
Uranium	9.8×10^{-4}	2.5	6.3×10^{-5}	1.5×10^{-2}
Thorium-230	6.3×10^{-3}	2.5	4.0×10^{-4}	9.8×10^{-2}
Lead-210	8.5×10^{-3}	2.5	5.4×10^{-4}	1.3×10^{-1}
Radium-226	8.4×10^{-3}	2.5	5.4×10^{-4}	1.3×10^{-1}
Polonium-210	1.3×10^{-3}	2.5	8.5×10^{-5}	2.1×10^{-2}

Constituent	Geometric Mean	GSD	Min	Max
Arsenic	6.0×10^{-3}	2.5	3.8×10^{-4}	9.3×10^{-2}
Cadmium	9.6×10^{-3}	2.5	6.1×10^{-4}	1.5×10^{-1}
Cobalt	9.1×10^{-3}	2.5	5.8×10^{-4}	1.4×10^{-1}
Copper	2.2×10^{-2}	2.5	1.4×10^{-3}	3.4×10^{-1}
Lead	3.7×10^{-3}	2.5	2.4×10^{-4}	5.8×10^{-2}
Molybdenum	5.4×10^{-3}	2.5	3.5×10^{-4}	8.4×10^{-2}
Nickel	3.7×10^{-3}	2.5	2.3×10^{-4}	5.7×10^{-2}
Selenium	6.3×10^{-3}	2.5	4.0×10^{-4}	9.8×10^{-2}
Zinc	2.9×10^{-2}	2.5	1.9×10^{-3}	4.5×10^{-1}
LogNormal Distribution for Feed-to-Muskox Transfer Factors (d/g ww)				
Uranium	4.0×10^{-6}	2.5	2.5×10^{-7}	6.2×10^{-5}
Thorium-230	1.0×10^{-6}	2.5	6.4×10^{-8}	1.6×10^{-5}
Lead-210	1.4×10^{-7}	2.5	9.1×10^{-9}	2.2×10^{-6}
Radium-226	1.1×10^{-6}	2.5	7.3×10^{-8}	1.8×10^{-5}
Polonium-210	4.1×10^{-6}	2.5	2.6×10^{-7}	6.5×10^{-5}
Arsenic	1.3×10^{-5}	2.5	8.1×10^{-7}	2.0×10^{-4}
Cadmium	2.4×10^{-6}	2.5	1.6×10^{-7}	3.8×10^{-5}
Cobalt	1.6×10^{-6}	2.5	1.0×10^{-7}	2.6×10^{-5}
Copper	4.5×10^{-5}	2.5	2.9×10^{-6}	7.0×10^{-4}
Lead	1.0×10^{-6}	2.5	6.6×10^{-8}	1.6×10^{-5}
Molybdenum	4.7×10^{-6}	2.5	3.0×10^{-7}	7.3×10^{-5}
Nickel	9.8×10^{-7}	2.5	6.3×10^{-8}	1.5×10^{-5}
Selenium	4.4×10^{-5}	2.5	2.8×10^{-6}	6.9×10^{-4}
Zinc	4.7×10^{-5}	2.5	3.0×10^{-6}	7.4×10^{-4}
LogNormal Distribution for Feed-to-Shrew Transfer Factors (d/g ww)				
Uranium	8.5×10^{-3}	2.5	5.4×10^{-4}	1.3×10^{-1}
Thorium-230	5.4×10^{-2}	2.5	3.5×10^{-3}	8.5×10^{-1}
Lead-210	7.3×10^{-2}	2.5	4.7×10^{-3}	1.1
Radium-226	7.3×10^{-2}	2.5	4.7×10^{-3}	1.1
Polonium-210	1.2×10^{-2}	2.5	7.4×10^{-4}	1.8×10^{-1}
Arsenic	5.2×10^{-2}	2.5	3.3×10^{-3}	8.1×10^{-1}
Cadmium	8.3×10^{-2}	2.5	5.3×10^{-3}	1.3
Cobalt	7.9×10^{-2}	2.5	5.0×10^{-3}	1.2
Copper	1.9×10^{-1}	2.5	1.2×10^{-2}	2.9
Lead	3.2×10^{-2}	2.5	2.1×10^{-3}	5.0×10^{-1}
Molybdenum	4.7×10^{-2}	2.5	3.0×10^{-3}	7.3×10^{-1}
Nickel	3.2×10^{-2}	2.5	2.0×10^{-3}	4.9×10^{-1}
Selenium	5.4×10^{-2}	2.5	3.5×10^{-3}	8.5×10^{-1}
Zinc	2.5×10^{-1}	2.5	1.6×10^{-2}	3.9
LogNormal Distribution for Feed-to-Squirrel Transfer Factors (d/g ww)				
Uranium	1.6×10^{-4}	2.5	1.0×10^{-5}	2.5×10^{-3}
Thorium-230	1.0×10^{-3}	2.5	6.5×10^{-5}	1.6×10^{-2}

Constituent	Geometric Mean	GSD	Min	Max
Lead-210	1.4×10^{-3}	2.5	8.8×10^{-5}	2.1×10^{-2}
Radium-226	1.4×10^{-3}	2.5	8.8×10^{-5}	2.1×10^{-2}
Polonium-210	2.2×10^{-4}	2.5	1.4×10^{-5}	3.4×10^{-3}
Arsenic	9.7×10^{-4}	2.5	6.2×10^{-5}	1.5×10^{-2}
Cadmium	1.6×10^{-3}	2.5	1.0×10^{-4}	2.4×10^{-2}
Cobalt	1.5×10^{-3}	2.5	9.5×10^{-5}	2.3×10^{-2}
Copper	3.5×10^{-3}	2.5	2.2×10^{-4}	5.5×10^{-2}
Lead	6.0×10^{-4}	2.5	3.9×10^{-5}	9.4×10^{-3}
Molybdenum	8.8×10^{-4}	2.5	5.6×10^{-5}	1.4×10^{-2}
Nickel	5.9×10^{-4}	2.5	3.8×10^{-5}	9.3×10^{-3}
Selenium	1.0×10^{-3}	2.5	6.5×10^{-5}	1.6×10^{-2}
Zinc	4.7×10^{-3}	2.5	3.0×10^{-4}	7.4×10^{-2}
LogNormal Distribution for Feed-to-Wolf Transfer Factors (d/g ww)				
Uranium	1.7×10^{-5}	2.5	1.1×10^{-6}	2.7×10^{-4}
Thorium-230	4.3×10^{-6}	2.5	2.8×10^{-7}	6.8×10^{-5}
Lead-210	6.1×10^{-7}	2.5	3.9×10^{-8}	9.6×10^{-6}
Radium-226	4.9×10^{-6}	2.5	3.1×10^{-7}	7.7×10^{-5}
Polonium-210	1.8×10^{-5}	2.5	1.1×10^{-6}	2.8×10^{-4}
Arsenic	5.5×10^{-5}	2.5	3.5×10^{-6}	8.5×10^{-4}
Cadmium	1.0×10^{-5}	2.5	6.7×10^{-7}	1.6×10^{-4}
Cobalt	7.0×10^{-6}	2.5	4.5×10^{-7}	1.1×10^{-4}
Copper	1.9×10^{-4}	2.5	1.2×10^{-5}	3.0×10^{-3}
Lead	4.4×10^{-6}	2.5	2.8×10^{-7}	6.9×10^{-5}
Molybdenum	2.0×10^{-5}	2.5	1.3×10^{-6}	3.1×10^{-4}
Nickel	4.2×10^{-6}	2.5	2.7×10^{-7}	6.6×10^{-5}
Selenium	1.9×10^{-4}	2.5	1.2×10^{-5}	2.9×10^{-3}
Zinc	2.0×10^{-4}	2.5	1.3×10^{-5}	3.2×10^{-3}
LogNormal Distribution for Feed-to-Wolverine Transfer Factors (d/g ww)				
Uranium	4.2×10^{-5}	2.5	2.7×10^{-6}	6.5×10^{-4}
Thorium-230	1.1×10^{-5}	2.5	6.8×10^{-7}	1.7×10^{-4}
Lead-210	1.5×10^{-6}	2.5	9.6×10^{-8}	2.3×10^{-5}
Radium-226	1.2×10^{-5}	2.5	7.7×10^{-7}	1.9×10^{-4}
Polonium-210	4.4×10^{-5}	2.5	2.8×10^{-6}	6.8×10^{-4}
Arsenic	1.3×10^{-4}	2.5	8.6×10^{-6}	2.1×10^{-3}
Cadmium	2.6×10^{-5}	2.5	1.6×10^{-6}	4.0×10^{-4}
Cobalt	1.7×10^{-5}	2.5	1.1×10^{-6}	2.7×10^{-4}
Copper	4.7×10^{-4}	2.5	3.0×10^{-5}	7.4×10^{-3}
Lead	1.1×10^{-5}	2.5	6.9×10^{-7}	1.7×10^{-4}
Molybdenum	4.9×10^{-5}	2.5	3.1×10^{-6}	7.7×10^{-4}
Nickel	1.0×10^{-5}	2.5	6.6×10^{-7}	1.6×10^{-4}
Selenium	4.6×10^{-4}	2.5	3.0×10^{-5}	7.2×10^{-3}
Zinc	5.0×10^{-4}	2.5	3.2×10^{-5}	7.8×10^{-3}

5.1.4 Dose Coefficients

5.1.4.1 Human

The assessment used the dose coefficients (DCs) recommended by the International Commission on Radiological Protection (ICRP). Ingestion DCs depend on the chemical form of the radionuclide and the consequent gut-to-blood transfer factor (f_1). Table 5.1-10 reflects the ICRP Publication 72 (1996) recommended f_1 values and DCFs for members of the public. Inhalation DCFs depend on the chemical form of the radionuclide and the consequent rate of clearance from the lungs to body fluids - slow (S), moderate (M) or fast (F). The ICRP recommends type M for most unspecified conditions with the exception of thorium-230 for which type S is recommended. To be conservative, the generally larger DCFs (i.e. less soluble S type DCFs) were used for all radionuclides in this assessment.

Dose coefficients for exposure through inhalation and ingestion are shown in Table 5.1-10.

Table 5.1-10 Dose Coefficients Used for Human Receptors

Constituent	Toddler ^a		Child ^b		Adult	
	Inhalation	Ingestion	Inhalation	Ingestion	Inhalation	Ingestion
Uranium-nat	52.5	0.25	36	0.185	17.8	0.0995
Thorium-230	35	0.41	24	0.31	14	0.21
Lead-210+	18.3	3.6	11	2.2	5.6	0.69
Radium-226+	29	0.96	19	0.62	9.5	0.28
Polonium-210	14	8.8	8.6	4.4	4.3	1.2
Note: Units: $\mu\text{Sv/Bq}$ References: ICRP 72 (1996) a Taken to be equivalent to a 1-year old b Taken to be equivalent to a 5-year old						

5.1.4.2 Ecological

Table 5.1-11 shows the selected Dose Coefficients (DCs) for the estimation of dose to ecological receptors. The DCs were obtained from Amiro (1997); DCs for internal and external exposure are provided.

Table 5.1-11 Dose Coefficients Used for Ecological Receptors

COPC ^b	DC (in mGy/d per Bq/g) ^a	
	Internal	External ^c
Uranium-238+	1.42×10^{-1}	8.57×10^{-3}
Thorium-230	6.58×10^{-2}	2.93×10^{-5}
Lead-210+	6.03×10^{-3}	2.50×10^{-3}
Radium-226+	1.59×10^{-1}	3.68×10^{-2}
Polonium-210	7.40×10^{-2}	1.41×10^{-7}
Reference: a Dose (mGy/d) per Bq/g tissue concentration for internal dose and per Bq/g of environmental concentration for external dose b The radionuclides included in each dose coefficient (DC) for decay series were derived from the DCs in Amiro (1997) as follows Uranium-238+ = U-238 + Th-234 + U-234 + 0.046 U-235 (internal or external) Radium-226+ = Ra-226 + 0.3* Rn-222 (internal) where 0.3 = fraction of Rn-222 retained in organism (Blaylock et al. 1993) = Ra-226 + 1.0* Rn-222 (external) Lead-210 = Pb-210 + Bi-210 (internal or external) c For external dose, the external DCs from Amiro (1997) for soil were used. d In Amiro (1997), Th-234 = Pa-234m + 0.0012*Pa-234; and Rn-222 = Po-218 + Pb-214 + Bi-214 + Po-214		

5.2 PREDICTED INTAKES

The predicted intakes by terrestrial biota and human receptors are provided in Attachment F. These intakes are considered with the toxicity data to evaluate the potential for negative impacts from the Project. The predicted intakes show that, in general, for ecological receptors, there is not much change in intakes over the course of the assessment period, which indicates that there is not much noticeable difference from the Project activities. However, receptors at the Kiggavik Camp and discharge locations to Judge Sissons Lake do occasionally show an increase in intakes during the operating phase of the Project.

For human receptors, the predicted intakes show that the Judge Sissons Lake hunter and family are the most exposed to effects from the Project, with the Baker Lake residents and non-NEW Camp worker less exposed.

6 TOXICITY ASSESSMENT

This section outlines the assessment endpoints for the ecological and human health risk assessment. The assessment endpoints, or toxicity reference values (TRVs), selected for aquatic species and wildlife are considered threshold concentrations or doses/intakes of the non-radioactive and radioactive constituents that can cause harm in ecological species (i.e., VECs). The TRVs for humans are intended to protect the most sensitive individuals (i.e., the elderly, pregnant women and children). For COPC that have non-carcinogenic effects, the TRVs are based on threshold effects concentrations. For COPC that have carcinogenic effects (i.e., those COPC that can cause cancer), the TRVs are based on non-threshold effects.

For the radiological COPC, the effects assessment is based on total exposures (dose rates) for VECs. Humans are evaluated on an incremental exposure basis.

6.1 ASSESSMENT CRITERIA FOR ECOLOGICAL TOXICITY

By convention, the assessment of effects of non-radiological COPC considers total exposure concentrations (levels) for aquatic VECs and total intakes for terrestrial VECs. Within an ecological risk assessment framework, VEC assessment endpoints represent biological populations and communities to be protected. Hence, TRVs are used in risk assessments to judge whether the predicted (estimated) exposures (or doses or intakes) may potentially have an adverse effect on ecological species at the population level as opposed to individual members of the species. An exception to this general rule applies to rare or endangered species where an adverse effect at the individual level represents a concern.

The TRVs for aquatic species are generally based on acute and/or chronic toxicity tests carried out under standardized conditions in the laboratory using sensitive test species (e.g., rainbow trout). There is a lack of data on the individual terrestrial mammals; in the absence of species-specific toxicity data, data for laboratory animals (often mice and rats) are selected. For avian receptors, the test species are generally ducks or chickens for which large datasets are available. The background information for the toxicity reference values selected for this assessment are provided in Attachment G. The TRVs selected for use for the Kiggavik Project are consistent with those used in a recently completed assessment for the water management project at the Cigar Lake uranium mine in northern Saskatchewan (Cameco 2010).

6.1.1 Non-radioactive Toxicity Reference Values for Aquatic Species

The U.S. EPA ECOTOXicology database (ECOTOX) (U.S. EPA 2000) was the primary source used for the derivation of the TRVs for aquatic biota. This database reports toxicity data for a wide range of aquatic species as well as laboratory and field studies. Other sources included the Environment Canada Priority Substance Lists, the datasets underlying the Canadian

Council of Ministers of the Environment (CCME) Water Quality Guidelines, U.S. Environmental Protection Agency (U.S.EPA) Water Quality Guidelines and recent compilations of aquatic toxicity information (e.g. USGS 2010). For most non-radionuclides, ECOTOX includes toxicity data in literature from 1972 to the present. All data are quality assured according to the EPA's criteria, and the system is updated quarterly.

For the purpose of this assessment, the following principles were applied in the data selection from ECOTOX.

- Endpoints involving growth, reproduction and survival were considered to be relevant to the persistence of aquatic populations.
- Only freshwater toxicity studies were considered.
- Records without test duration, endpoint and exposure concentrations were eliminated.
- Chronic toxicity data were preferred in the selection. When chronic data were not sufficient (less than of 2 data points), acute data were considered and converted to chronic values. The adjustment from acute LC_{50} to chronic EC_{20} (a 1/10 factor) was used based on the work by Environment Canada and Health Canada (EC/HC 2003) from a review of aquatic toxicity literature for uranium.
- Chronic EC_{20} concentrations were preferred. If not reported, other endpoints were considered and adjusted to an estimated EC_{20} value. For adjustment from chronic LC_{50} to chronic EC_{20} , a $\frac{1}{4}$ factor was used based on an assumed linear chronic dose-response with zero response at EC_0 and 50% response at the EC_{50} concentration.

The TRVs derived for aquatic biota included five categories: forage fish, predator fish, aquatic plants, zooplankton and benthic invertebrates. If more than 20 chronic EC_{20} were available in each category, a 5th percentile of the EC_{20} distribution was used as a recommended TRV; if there were less than 20 chronic EC_{20} values, the lowest EC_{20} was used as a recommended TRV for the category. The recommended TRVs for each category in this review are summarized in Table 6.1-1. As seen from Table 6.1-1, the TRVs for aquatic biota are based on water concentrations; the exception to this is selenium, where the TRVs for fish are based on tissue concentrations since selenium is known to bioconcentrate in the aquatic environment. In a few cases, the TRVs were set equal to the Canadian Water Quality Guideline (CWQG) to avoid unrealistic values. Additional details on the basis of the TRVs are provided in Attachment G. It should be noted that TDS is an integrative constituent which is used as a measure of common ions such as sulphate and chloride in water. TDS is not a robust predictor of toxicity for a range of water qualities (Mount et al. 1997) and thus its toxicity is implicitly evaluated for chloride and sulphate in this assessment. Hardness was included in the modelling; it is not considered a COPC but affects the toxicity of other parameters. For example, the toxicity of several metals is dependent on hardness with decreasing toxicity at higher hardness levels.

Table 6.1-1 Selected Toxicity Reference Values for Aquatic Biota

COPC	Units	Forage Fish	Predator Fish	Aquatic Plants	Phyto-plankton	Zoo-plankton	Benthic Invertebrates
Arsenic	µg/L	123	630	252	5 ^(c)	340	122
Cadmium	µg/L	7.3	0.6	16	3	0.07	0.5
Cobalt	µg/L	203	118	54.3	212	4.8	4
Copper ^(a)	µg/L	6	4	38	9.2	4	4
Lead ^(a)	µg/L	132	14.2	439	114	40	1 ^(d)
Molybdenum	µg/L	5,000	183	15,000	15,000	233	250
Nickel ^(a)	µg/L	535	62	84	93.2	38	53.5
Selenium	µg/L	^(b)	^(b)	680	31.7	10	10
Uranium	µg/L	550	1,500	5,500	400	60	27
Zinc ^(a)	µg/L	35	30 ^(e)	116	30 ^(e)	30 ^(e)	30 ^(e)
Ammonia (un-ionized)	µg/L	173	90	-	800	160	120
Chloride	mg/L	220	360	1260	590	290	143
Sulphate	mg/L	501	933	828	1112	246	1056
Note: a = Toxicity reference values (TRVs) based on low hardness water. b = TRV for selenium based on 10 µg/g whole body fish concentration. c = TRV set equal to CWQG for arsenic. d = TRV set equal to CWQG for lead in low hardness water. e = TRV set equal to CWQG for zinc. - = no data available. COPC = constituents of potential concern; µg/L = micrograms per litre							

6.1.2 Non-radioactive Toxicity Reference Values for Terrestrial Species

6.1.2.1 Phytotoxicity

The literature has a number of studies relating to adverse effects in vegetation related to exposure to sulphur dioxide and nitrogen oxides.

Sulphur dioxide is known to have adverse effects on plants. Sulphur dioxide penetrates the stomata of plants. External factors such as humidity, temperature, and light intensity influence the rate of uptake of SO₂ and thus the degree of injury.

High concentrations of sulphur dioxide over a short duration of exposure are known to cause acute injury in the form of foliar necrosis. However, longer term effects of SO₂ exposure are more important since they occur at much lower concentrations and are cumulative in nature resulting in adverse effects such as reduced growth and yield and increased aging which may not be visible or manifested as chlorosis. Dose-response relationships have been developed

for various agricultural crops and some temperate forest tree species but data on native herbaceous vegetation are scarce (WHO 2000). The current WHO phytotoxic guidelines for SO₂ are 20 µg/m³ as an annual average for forests and natural vegetation (WHO 2000). A lower value of 10 µg/m³ is also provided for lichen. A value of 100 µg/m³ as a 24 hour average, although not officially adopted by the WHO was also used in the assessment (WHO 2000).

Nitrogen containing air pollutants can affect vegetation indirectly, via chemical reactions in the atmosphere or directly by deposition on vegetation soil or water. NO and NO₂ are precursors to tropospheric ozone which is also known to be phytotoxic. Uptake of NO_x (NO and NO₂) in the leaves from wet deposition is generally via the cuticle. As with SO₂, environmental conditions such as humidity and temperature affect the phytotoxicity of NO_x. The WHO (2000) suggests that threshold values are the best way to evaluate the phytotoxic effects of NO_x. They indicate that a critical effects level (CLE) is a threshold that can be used to examine the direct effects of NO_x since the CLE is the concentration in the atmosphere above which direct adverse effects on receptors such as plants and ecosystems may occur according to present information.

The WHO provides a CLE for NO_x of 30 µg/m³ on an annual basis. This level is used in the assessment. It was supported by the recent evaluation of nitrogen oxides by the US EPA that concluded that the existing secondary for oxides of nitrogen of 0.053 ppm (equivalent to 100 µg/m³) are adequate to protect plants from the direct effects of oxides of nitrogen in the ambient air.

For metals, the plant concentration can be compared to levels known to illicit phytotoxicity. A summary of some phytotoxicity benchmarks is provided in Table 6.1-2.

Table 6.1-2 Summary of Phytotoxicity Levels

COPC	Units	Phytotoxic Leaf Conc. ^a	Phytotoxic foliage Conc. ^b	Upper Critical Level in leaves and shoots ^c
Arsenic	mg/kg dw	5-20	3-10	11-26
Cadmium	mg/kg dw	5-30	5-700	14-16
Cobalt	mg/kg dw	15-50	25-100	3-9
Copper	mg/kg dw	-	25-40	-
Lead	mg/kg dw	30-300	-	20-35
Molybdenum	mg/kg dw	10-50	100	130-140
Nickel	mg/kg dw	-	50-100	-
Selenium	mg/kg dw	5-30	100	7-90
Uranium	mg/kg dw	-	-	-
Zinc	mg/kg dw	100-400	500-1500	160-320
Note: a = Leaf tissue concentration in plants that are neither sensitive or tolerant McBride, M.B. 1994 Environmental Chemistry of Soils. Oxford University Press Inc. New York, NY.. b =Phytotoxic conc. In plant foilage. Langmuir, D., P. Chrostowski, B. Vigneault and R. Chaney 2004. Issue Paper on the Environmental Chemistry of Metals. Submitted to U.S. Environmental Protection Agency, Risk Assessment Forum, Washington, DC. ERG, Lexington, MA c = Upper Critical Level in leaves and shoots of spring barley associated with reduced yield. Davis, R.D., P.H.T. Beckett and E. Wollan 1978. Critical Levels of Twenty Potentially Toxic Elements in Young Spring Barley. Plant Soil 49: 395-408. - = no data available. COPC = constituents of potential concern; dw = dry weight				

6.1.2.2 Wildlife

For the terrestrial species, the U.S. EPA risk-based ecological soil screening levels (Eco-SSLs) were used as the primary data source for the derivation of terrestrial TRVs. The Eco-SSLs were developed to limit the need by the EPA and other risk assessors to perform repetitious toxicity data literature searches and evaluations for the same COPC at every site. For this assessment, benchmark TRVs based on growth and reproduction were selected. Endpoints involving growth and reproduction are considered to be the most relevant endpoints related to maintenance and persistence of wildlife populations. Both no observable adverse effect levels (NOAELs) and lowest observable adverse effect levels (LOAELs) were selected for the assessment. NOAELs were only selected from the data if they had a corresponding LOAEL. All LOAELs with growth and reproductive endpoints were selected.

In the derivation of the TRVs, a number of guiding principles were followed as outlined below (with the exception of uranium).

- Studies were selected from the database where both NOAELs and LOAELs were reported as well as studies with only LOAELs. Studies that only reported NOAELs were not considered in the derivation of TRVs.
- A number of test species were selected to serve as surrogates for various wildlife species that are similar in size and diet. TRVs were calculated as the geometric mean of the selected NOAELs and LOAELs for several species for both avian and mammalian wildlife.
- The NOAEL TRV was derived from the geometric mean of the NOAEL data and the LOAEL TRV was derived from the geometric mean of the LOAEL data pooling growth and reproduction endpoints.
- NOAEL TRVs were only provided if there was an associated LOAEL TRV for the species; if only LOAELs were available then only a LOAEL TRV was provided.

For COPC without Eco-SSL data (in this case uranium), literature studies were reviewed and chronic LOAEL and NOAEL values were selected. Only growth and reproduction endpoints were considered, as described above for the Eco-SSL data. In general, TRVs from Sample et al. (1996) were used.

The Eco-SSL data base provides TRVs for a number of different species that could be used as a surrogate TRV for other species with similar diets. For example, for molybdenum the TRV for a calf was used as the surrogate for moose and caribou. If none of the test species were similar to the ecological receptors selected in this assessment, then the lowest NOAEL and LOAEL TRVs were selected as the conservative default TRV for the ecological receptor. For example, for zinc, no TRVs were available for species that had similar diets to the bear, fox, wolf, and wolverine; therefore, the lowest LOAEL that was developed for sheep was selected as the TRV for these species. Table 6.1-3 and Table 6.1-4 provide the TRVs selected for avian and mammalian receptors, respectively.

Table 6.1-3 Selected Toxicity Reference Values for Avian Species

COPC	Units	LOAEL		NOAEL	
		Waterfowl ^(a)	Terrestrial Birds ^(b)	Waterfowl ^(a)	Terrestrial Birds ^(b)
Arsenic	mg/(kg-d)	5.1	3.6	-	-
Cadmium	mg/(kg-d)	25.6	4.4	3.1	0.97
Cobalt	mg/(kg-d)	148	14.1	14.8	4.1
Copper	mg/(kg-d)	75.2	27	24.1	15.3
Lead	mg/(kg-d)	11.8*	11.8	-	-
Molybdenum	mg/(kg-d)	20.8*	20.8	-	-
Nickel	mg/(kg-d)	10.7	10.7	-	-
Selenium	mg/(kg-d)	1.37	0.59	1.18	-
Uranium	mg/(kg-d)	-	-	16	16
Zinc	mg/(kg-d)	62.7	62.7	-	-
Note: a = Waterfowl (long-tailed duck, merganser, and pintail) toxicity reference values based on duck data when available. b = Terrestrial birds include Falcon, Longspur, Ptarmigan, Sandpiper Eagle; toxicity reference values based lowest value available for all bird species. COPC = constituents of potential concern; LOAEL = lowest observable adverse effect level; NOAEL = no observable adverse effect level -: Not available; *: The lowest value (for all species) was used mg/(kg-d) = milligrams per kilogram per day					

Table 6.1-4 Selected Toxicity Reference Values for Mammalian Species

LOAEL	Unit	Bear	Caribou	Fox	Lemming	Muskox
COPC						
Arsenic	mg/(kg-d)	3.1	14.4	3.1	14.2	14.4
Cadmium	mg/(kg-d)	100	5.7	100	6.8	5.7
Cobalt	mg/(kg-d)	13.4*	20.2	13.4*	13.4	20.2
Copper	mg/(kg-d)	11.5	1.5	11.5	194	1.5
Lead	mg/(kg-d)	50	15	50	188	15
Molybdenum	mg/(kg-d)	1.9*	4.1	1.9*	1.9	4.1
Nickel	mg/(kg-d)	112	9.8	112	11.6	9.8
Selenium	mg/(kg-d)	0.21	0.33	0.21	0.63	0.33
Uranium	mg/(kg-d)	6.1*	6.1*	6.1*	6.1	6.1*
Zinc	mg/(kg-d)	34.9*	75.9	34.9*	249	75.9
COPC	Unit	Shrew	Squirrel	Wolf	Wolverine	
Arsenic	mg/(kg-d)	14.2	14.2	3.1	3.1	
Cadmium	mg/(kg-d)	6.8	6.8	100	100	
Cobalt	mg/(kg-d)	13.4	13.4	13.4*	13.4*	
Copper	mg/(kg-d)	194	194	11.5	11.5	
Lead	mg/(kg-d)	188	188	50	50	
Molybdenum	mg/(kg-d)	1.9	1.9	1.9*	1.9*	
Nickel	mg/(kg-d)	11.6	11.6	112	112	
Selenium	mg/(kg-d)	0.63	0.63	0.21	0.21	
Uranium	mg/(kg-d)	6.1	6.1	6.1*	6.1*	
Zinc	mg/(kg-d)	249	249	34.9*	34.9*	
NOAEL	Unit	Bear	Caribou	Fox	Lemming	Muskox
COPC						
Arsenic	mg/(kg-d)	1.5	-	1.5	8.1	-
Cadmium	mg/(kg-d)	8.3	-	8.3	1.4	-
Cobalt	mg/(kg-d)	5.2*	-	5.2*	5.2	-
Copper	mg/(kg-d)	5.9	-	5.9	100	-
Lead	mg/(kg-d)	-	-	-	25.5	-
Molybdenum	mg/(kg-d)	-	-	-	-	-
Nickel	mg/(kg-d)	45	3.4	45	6.2	3.4
Selenium	mg/(kg-d)	-	0.17	-	0.33	0.17
Uranium	mg/(kg-d)	3.1*	3.1*	3.1*	3.1	3.1*
Zinc	mg/(kg-d)	-	37.9	-	215	37.9
COPC	Unit	Shrew	Squirrel	Wolf	Wolverine	
Arsenic	mg/(kg-d)	8.1	8.1	1.5	1.5	
Cadmium	mg/(kg-d)	1.4	1.4	8.3	8.3	
Cobalt	mg/(kg-d)	5.2	5.2	5.2*	5.2*	
Copper	mg/(kg-d)	100	100	5.9	5.9	
Lead	mg/(kg-d)	25.5	25.5	-	-	
Molybdenum	mg/(kg-d)	-	-	-	-	
Nickel	mg/(kg-d)	6.2	6.2	45	45	
Selenium	mg/(kg-d)	0.33	0.33	-	-	

NOAEL	Unit	Bear	Caribou	Fox	Lemming
COPC					
Uranium	mg/(kg-d)	3.1	3.1	3.1*	3.1*
Zinc	mg/(kg-d)	215	215	-	-
Note: * = No surrogate species data available for these species therefore lowest TRV for other species used. mg/(kg-d) = milligrams per kilogram per day					

6.2 ASSESSMENT CRITERIA FOR HUMAN TOXICITY

To assess effects on human health, it is necessary to identify assessment endpoints by using toxicity reference values (TRVs) against which the effects will be measured. The background information used in the selection of the TRVs applied in this assessment is provided in Attachment G. Selected TRVs for assessment of oral exposure of human receptors to nonradiological and radiological COPC are discussed in the following subsections. The inhalation pathway is considered in the Project effects; however, this pathway is only considered in the total exposure evaluation, since the impacts from this pathway alone are very small.

6.2.1 Non-radioactive Toxicity Reference Values for Human Health

The TRVs for humans are intended to protect the most sensitive individuals (i.e., the elderly, pregnant women and children). For COPC that have non-carcinogenic effects, the TRVs are based on threshold effects concentrations. For COPC that have carcinogenic effects (i.e., those COPC that can cause cancer), the TRVs are based on non-threshold effects.

The COPC selected for this Environmental Impact Statement (EIS) are, for the most part, considered to be non-classifiable with respect to human carcinogenicity (with respect to the oral exposure route), meaning that there are insufficient human or animal data to indicate that they are carcinogens. The exception to this is arsenic, which is considered to have both carcinogenic and non-carcinogenic endpoints.

There are several regulatory sources that report TRVs (i.e. RfDs, TDIs, MRLs, slope factors). Some of the most frequently used sources are Health Canada, the U.S. EPA Integrated Risk Information System (IRIS) database, the U.S. EPA National Center for Environmental Assessment (NCEA), the World Health Organization (WHO), and the Agency for Toxic Substances and Disease Registry (ATSDR). Given that this assessment is within a Canadian jurisdiction, values provided by Health Canada were generally preferentially selected as TRVs for evaluation of the health impacts on human receptors. The Toxicology Evaluation Section of the Health Products and Food Branch of Health Canada has published TDIs for a number of

trace elements found in foodstuff. These values were also considered for use in this assessment. The other above-mentioned sources were used to infill data gaps in the Health Canada database.

Table 6.2-1 provides a summary of the TRVs selected for use in the assessment for oral exposure. The TRVs, health effects (toxicological endpoints), and reference sources for each TRV are provided in the table. A discussion of the rationale for selecting the oral TRVs is provided in Attachment G.

Table 6.2-1 Selected Oral Toxicity Reference Values for Human Receptors

Constituent of Potential Concern	Effect Type ^(a)	Value	Health Effect	Reference ^(b)
Arsenic	C	1.8	Internal cancers (liver, lung, bladder, kidney) (oral, human)	Health Canada (2009)
	NC	0.001	Not provided	Health Canada Food Directorate (2002)
Cadmium	NC	0.001	Significant proteinuria	Health Canada (2009) IRIS (U.S. EPA 2011, last updated 1994)
Cobalt	NC	0.01	Haematological effects (polycythemia)	ATSDR (2004a)
Copper	NC	0.09	Hepatotoxicity	Health Canada (2009)
Lead	NC	0.0036	Increase in blood lead concentrations in infants	Health Canada (2004c)
Molybdenum	NC	0.005	Increased uric acid levels	IRIS (U.S. EPA 2011, last updated 1993)
Nickel	NC	0.011	Decreased body and organ weights (oral exposure, rats)	Health Canada (2009)
Selenium	NC	0.005	Clinical selenosis	IRIS (U.S. EPA 2011, last updated 1991)
Uranium	NC	0.0006	Degenerative lesions in kidney tubules	Health Canada (2001)
Zinc	NC	0.3	Diminished copper status (required for protection against free radicals and oxidative stress)	IRIS (U.S. EPA 2011, last updated 2005)
Note: Units: mg/(kg-d) for all except for arsenic carcinogenic (C) TRVs which are in (mg/(kg-d))⁻¹ a = C – Carcinogenic (non-threshold) effect; NC - non-carcinogenic (threshold) effect b = IRIS - Integrated Risk Information System on-line database (last updated represents year of last significant revision) ATSDR = Agency for Toxic Substances and Disease Registry				

6.2.2 Health-Based Values for Gaseous Pollutants and Dust

In general, the adverse effects of exposure to gaseous air pollutants are associated with irritation of the tissues of the eyes and upper and lower respiratory systems. Exposures to the

gaseous air pollutants (i.e., SO₂, NO₂) are assessed using air quality guidelines (AQG) values obtained from the WHO that are designed to offer guidance in reducing the health impacts of air pollution. The NO₂ guidelines are health-based values with no safety factors built in and are not targets, while the SO₂ values (Tier I and II) are only targets whereas the guideline is health-based. However, since no other TRVs are presently available to evaluate the health effects relating to NO₂ and SO₂ exposure, and since the WHO values are the most current health-based values available, they were used as health-based values in the assessment. Table 6.2-2 provides a summary of the health-based values used for the assessment of gaseous air pollutants.

Table 6.2-2 Health-Based Values for Gaseous Air Pollutants

Gaseous Air Pollutants		Health-Based Concentration (µg/m ³)	Jurisdiction
NO ₂	1 hour	200	WHO (2005)
	Annual	40	WHO (2005)
SO ₂	1 hour	500	WHO (2005)
	24 hour	20*	WHO (2005)
Note: * Although the WHO has set the guideline at 20 µg/m ³ , it is acknowledged that there will be difficulty in achieving this guideline. As such, a stepped approach has been suggested, using a tier I interim guideline value of 125 µg/m ³ and a tier II interim value of 50 µg/m ³ .			

There is a growing body of scientific studies linking air pollutants to health effects. Recent assessments of the available health data are implying a stronger link between particulate matter (PM) and health effects resulting from short- and long-term exposures. In addition, the effects are estimated to occur at levels that are lower than previously believed. This has motivated some regulators to re-assess the potential impact of particulate matter pollution on public health (CARB 2008).

For particulate matter 10 micrometers or less (PM₁₀), the reference level of 25 µg/m³, based on a 24 hour averaging time which resulted in consistent associations observed in epidemiological studies with mortality and hospitalizations as well as concerns over links to chronic bronchitis and cardiovascular disease (CEPA/FPAC WGAQOG 1998), was selected as a health-based limit.

A threshold value range of 5 to 7 µg/m³ (CARB 2008) was used as the health-based level for particulate matter 2.5 micrometers or less (PM_{2.5}) (which encompasses ultrafine particles) and the epidemiological evidence related to short-term exposures are the most relevant to consider in this assessment. This threshold range was also considered in this assessment as a health-based limit.

6.3 RADIOLOGICAL ASSESSMENT CRITERIA

The assessment of effects from exposure to radioactive constituents involves estimation of the combined (total) dose that a VEC may receive from radionuclides taken into the body as well as from exposure to radiation fields in the external environment. In addition, it is standard practice to take into account differences in the effects of alpha, beta and gamma radiation. These factors are discussed below.

6.3.1 Relative Biological Effectiveness Factors

Radiation effects on biota depend not only on the absorbed dose, but also on the relative biological effectiveness (RBE) of the particular radiation (i.e., alpha, beta or gamma radiation). For example, alpha particles can produce observable damage at lower absorbed doses than gamma radiation. Thus, in order to estimate the potential harm to non-human biota from a given absorbed dose, the absorbed dose is multiplied by an appropriate radiation weighting factor. This in turn is derived from experimentally determined RBE. In this assessment, the terms “RBE” and “radiation weighting factor” are used interchangeably.

For the purposes of human radiological protection, each component of the absorbed dose to a tissue or organ is weighted according to the radiation quality. The appropriate RBE value for biota is the subject of ongoing scientific discussion. Although an RBE of 20 is used for human radiation protection, according to the review by UNSCEAR (1996):

“In the case of wild organisms, however, it is likely to be deterministic effects that are of greatest significance, and for alpha radiation the experimental data for animals indicate that a lower weighting factor, perhaps 5, would be more appropriate; the weighting factors for beta and gamma radiation would remain unity.” (para. 18)

A review of the literature by Trivedi and Gentner (2000) concluded that:

“since the majority of studies report RBE values less than or equal to 10 for endpoints, and doses and dose rates that are more ecologically significant, a value of 10 might be appropriate for weighting doses to evaluate the effects of alpha emitters at the population level, if any”.

Also, the U.S. DOE (2000) reviewed the issue and recognized that the critical biological endpoint of concern in radiation exposures of biota appears to be deterministic, and that the radiation weighting factor for deterministic effects is substantially less than the corresponding average quality factor used in radiation protection of humans (i.e., 20). Based on this information, U.S. DOE concluded that the radiation weighting factor for deterministic effects appears to lie in the range of about 5 to 10. However, as interim guidance, they recommend the use of an RBE of 20 in the proposed standard (U.S. DOE 2000).

A wide range of RBE values for internally deposited alpha particles has been published. The PSL2 assessment (EC/HC 2003) suggests an RBE of 40. A report of the (former) Advisory Committee on Radiological Protection (ACRP 2002) suggested a nominal RBE value of 10 with a range of about 5 to 20 for non-human biota (ACRP 2002). A recent report of the European Community suggests using an RBE of 10 to illustrate the effect of alpha RBE. For the purposes of this assessment, uncertainty associated with the choices of RBE is acknowledged and RBE values of 10 and 40 were used to illustrate the effects of this uncertainty.

6.3.2 Reference Dose Levels for Aquatic Biota

The International Atomic Energy Agency (IAEA) suggests a dose rate of 10 milliGrays per day (mGy/d) as the reference dose level below which population effects to aquatic biota would not be expected (IAEA 1992). This value is also suggested in UNSCEAR (1996) and has been used in recent northern Saskatchewan assessments (COGEMA 2000, 2001, 2002; Cameco 2004, 2005).

The Canadian Nuclear Safety Commission (CNSC) has recommended that a reference dose rate of 0.6 mGy/d be used for fish, a value of 3 mGy/d be used for aquatic plants (algae and macrophytes) and a value of 6 mGy/d be applied for benthic invertebrates (Bird et al. 2002; EC/HC 2003). The reference dose rate for fish was based on a reproductive effects study in carp in a Chernobyl cooling pond with a history of higher exposures (Makeyeva et al. 1995). A value of 0.6 mGy/d was found to be in the range where both effects and no effects were observed. The aquatic plant dose rate was based on information related to terrestrial plants (conifers), which are considered to be sensitive to the effects of radiation. Reproductive effects in polychaete worms were used to derive the dose rate for benthic invertebrates. These values were also considered in the assessment.

The reference dose rates for aquatic biota that were used in the assessment are summarized in Table 6.3-1.

Table 6.3-1 Reference Dose Rates for Aquatic Organisms

Aquatic Organism	Reference Dose Rate
Aquatic plants (algae and macrophytes)	3 mGy/d and 10 mGy/d
Benthic invertebrates	6 mGy/d and 10 mGy/d
Fish	0.6 mGy/d and 10 mGy/d
Note: mGy/d = milliGray per day	

6.3.3 Reference Dose Levels for Terrestrial Biota

A level of 1 mGy/d is generally used as an acceptable level for terrestrial biota. The IAEA (1992) published the results of an assessment of the effects of acute and chronic radiation on terrestrial populations and communities. They reached several general conclusions regarding

chronic radiation: reproduction is likely to be the most limiting endpoint in terms of population maintenance, and irradiation at chronic dose rates of 1 mGy/d or less does not appear likely to cause observable changes in terrestrial animal populations. Also, they concluded that irradiation at chronic dose rates of 10 mGy/d or less does not appear likely to cause observable changes in terrestrial plant populations.

The CNSC has provided a reference dose rate of 3 mGy/d as an appropriate limit for small mammals and terrestrial plants (Bird et al. 2002; EC/HC 2003). This reference dose rate is based on reproductive endpoints for small mammals. In the absence of data for avian species, the CNSC suggest that the reference dose rate for small mammals should also apply. These guidelines were also considered in the assessment. Based on the above, the reference dose rates for terrestrial biota (birds and mammals) that were used in the assessment are 1 mGy/d and 3 mGy/d.

6.3.4 Reference Dose Levels for Human Health

Assessment of radiation exposures to members of the public is commonly based on estimation of the incremental effects of a project or site. Such assessments consider the radiation dose received from direct exposure to gamma radiation as well as the dose received from ingestion of radionuclides. The human model (described in Section 2.10) converts radionuclide intake by the human receptors from the various pathways into a dose. Potential effects from radiation are compared to an incremental dose limit of 1,000 microSieverts per year ($\mu\text{Sv/y}$) (1 milliSievert per year [mSv/y]) recommended by the Canadian Nuclear Safety Commission (CNSC) for the protection of members of the public. In addition, the dose constraint of 300 $\mu\text{Sv/y}$ (0.3 mSv/y) recommended by Health Canada in the Canadian NORM Guidelines (Health Canada 2000) is considered. Doses below this level are considered as “unrestricted” and no further action is needed to control doses or materials.

7 RESULTS FOR THE RECEIVING ENVIRONMENT

Predicted air quality for the assessment area is presented for the evaluation of potential effects. Predicted water and sediment quality for Judge Sissons Lake for the O1Ex22 effluent release scenario is presented for the evaluation of potential effects on the aquatic environment. The O1Ex22 effluent release scenario was determined previously (Section 3.4.2) to be a conservative estimate of the potential effects associated with the discharge, operation, and closure options proposed. Potential effects on downstream water quality are also discussed.

7.1 PREDICTED AIR QUALITY

The air modelling documents (Appendix 4B Air Quality) present the detailed results of predicted air quality for dust, NO₂, SO₂, and metals. The predictions were made for phased site operations as well as a maximum emission scenario.

Appendix 4B Air Quality compared the predicted air concentrations to air quality criteria within the atmospheric environment assessment. The estimated concentrations of dust, NO₂ and SO₂ are used directly in the assessment of human health and for ecological receptors and this information is presented in the relevant sections of this assessment.

As outlined in Appendix 4B Air Quality, all predicted maximum 24-hour metal concentrations are well below applicable criteria (Table 7.1-1). In contrast, predicted maximum 24-hour uranium concentrations are above the recently promulgated Ontario Ambient Air Quality Criterion (AAQC) of 0.3 µg/m³. As a result a frequency analysis was completed. At the Accommodation Complex, the 24-hour uranium AAQC is only exceeded once. The frequency analysis also indicated that the number of exceedances within about 1 km of the Kiggavik site are limited to one day. Similarly, within about 500 m or less of the Sissons site, exceedances are also limited to one day.

The air concentrations from the air dispersion modeling for metals are used in the pathways assessment. The activity of U-238 was determined based on the specific activity of uranium (0.01235 Bq U-238/µg of natural uranium); the levels of the other radionuclides in the uranium-series (Th-230, Ra-226, Pb-210 and Po-210) were taken to be equal to U-238. The air concentrations were used to determine the potential impact on soil and vegetation as well as inhalation by people.

Table 7.1-1 Incremental Maximum 24-hr Concentrations of Metals at Discrete Receptor Locations

Receptor Name	24-hour Maximum Concentration (µg/m ³)									
	U	As	Cd	Co	Cu	Pb	Mo	Ni	Se	Zn
Accommodation Complex	3.1E-01	8.1E-04	5.3E-05	3.6E-03	6.1E-03	1.8E-02	7.6E-03	1.1E-02	4.9E-04	1.1E-02
Community of Baker Lake	9.7E-04	8.3E-06	2.7E-07	1.5E-05	2.8E-05	5.6E-05	1.8E-05	6.0E-05	2.9E-06	4.6E-05
Judge Sissons Lake Cabin	1.7E-02	1.6E-04	5.7E-06	2.4E-04	5.0E-04	9.7E-04	3.7E-04	1.3E-03	6.0E-05	7.1E-04
Air Quality Criteria (µg/m ³)	0.3	0.3	0.025	0.10	50	0.50	120	0.2*	10	120
Notes: Bold shaded text indicates that a value is greater than the air quality criteria. Only one (1) of exceedance was predicted at the Accommodation Complex. 24-hour criteria provided in Ontario's Ambient Air Quality Criteria, Ontario Ministry of Environment Standards and Development Branch, 2008. *Nickel AQ criteria adopted from the Ontario Ministry of Environment's new standard under Regulation 419/05 accepted June 22, 2011. EBR No. 010-7190. Uranium AQ criteria adopted from the Ontario Ministry of Environment's new AAQC under Regulation 419/05 accepted June 22, 2011. EBR No. 010-7190.										

The Kiggavik project will release both uranium-bearing dust and radon. Therefore, Pb-210 will also be present in the air from the decay of radon released from the operations. The presence of Pb-210 that is a result of the decay of Rn-222 is not considered in the air dispersion modelling. The ingrowth of Pb-210 from the radon depends on the “age” of the radon at any location/receptor, which in turn depends on the wind speed and distance of the receptor from the radon source. The greater the distance, the greater the ingrowth of Pb-210. For present purposes, receptors at varying distances from the Kiggavik project were considered; both Kiggavik and Sissons operations were assumed to be active. The furthest receptor considered was Baker Lake which is approximately 90 km from the project. At shorter distances, the ingrowth of Pb-210 would be expected to be less. Assuming conservatively that the radon decays directly to Pb-210 (the short-lived radon decay products with effective half-lives of about 30 minutes were neglected), the ingrowth of Pb-210 from radon is approximately given by (based on Evans (1955, Chapter 15, equation 2.8 for radioactive series decay):

$$Pb - 210 \left(\frac{Bq}{m^3} \right) = C_{Rn} \times \left[\frac{\lambda_b}{\lambda_b - \lambda_a} \right] \times (e^{-\lambda_a T} - e^{-\lambda_b T}) \quad (7.1-1)$$

Where:

C_{Rn} Radon concentration in air (Bq/m³)

λ_a Decay constant of Rn-222, $2.098 \times 10^{-6} \text{ s}^{-1}$ [$\ln(2)$ / half-life of Rn-222]

λ_b Decay constant of Pb-210, $9.901 \times 10^{-10} \text{ s}^{-1}$ [$\ln(2)$ / half-life of Pb-210]

T Transit time from source to location

Using the above equation, the Pb-210 in air produced from the decay of radon was calculated and compared to the Pb-210 concentration in uranium dust at the same locations. The results are shown in Table 7.1-2.

Table 7.1-2 Estimate of Pb-210 Levels in Air Consideration Contribution from Radon

Receptor	U dust concentration ^a (µg/m ³)	Radon concentration ^a (Bq/m ³)	Distance from Kiggavik sources (km)	Distance from Sissons sources (km)	Travel Time ^b (s)	Pb-210 in dust ^c (Bq/m ³)	Pb-210 from Rn ^d (Bq/m ³)
Kiggavik Camp	1.7E-02	1.2E+01	1	17.5	2.4E+02	2.1E-04	3.0E-06
Judge Sissons Lake	6.3E-04	2.9E-01	10	12.5	2.7E+03	7.8E-06	7.8E-07
Baker Lake	1.7E-05	8.2E-03	85	95	2.2E+04	2.1E-07	1.7E-07
Notes: a Annual average concentration from Scenario 2 b. Based on average wind speed of 4.1 m/s and average distance to sources, except for 1 km used for Kiggavik Camp sources. c. Based on 1 µg uranium = 0.01235 Bq U-238 = Pb-210. d. Based on Evans (1955) - see text							

The uranium and dust concentrations used were the predicted annual concentrations when both sources (Kiggavik and Sissons) were assumed to be in operation. As shown in the table, the Pb-210 concentration from the decay of radon is a small fraction (10% or less) of the Pb-210 concentration in the dust out to distances of about 10 km from the sources. At Baker Lake, an average of 90 km from the Kiggavik and Sissons operations, the ingrown Pb-210 is almost equal (84%) to the Pb-210 in the airborne dust. However, at such a distance, the radon concentration, and corresponding Pb 210, is insignificant and immeasurable relative to typical background concentrations. Therefore, Pb-210 resulting from the decay of Rn is neglected.

7.2 PREDICTED WATER QUALITY

Figure 7.2-1 presents the monthly predicted water concentrations in the eight segments of Judge Sissons Lake for the O1Ex22 effluent release scenario. The four phases of effluent release are indicated on the figures: baseline conditions (pre-operation), operation phase, final closure phase, and post-closure phase.

The baseline results provide the water quality in each segment under natural conditions and the impact of the winter ice cover is evident in this phase of the simulation. Comparison of the range of concentrations in the baseline phase among the various Judge Sissons Lake segments illustrates the effect of the ice cover on the different segments. For example, JSL-1 is shallow compared with JSL-4 and, therefore, there is much fluctuation between the summer and winter

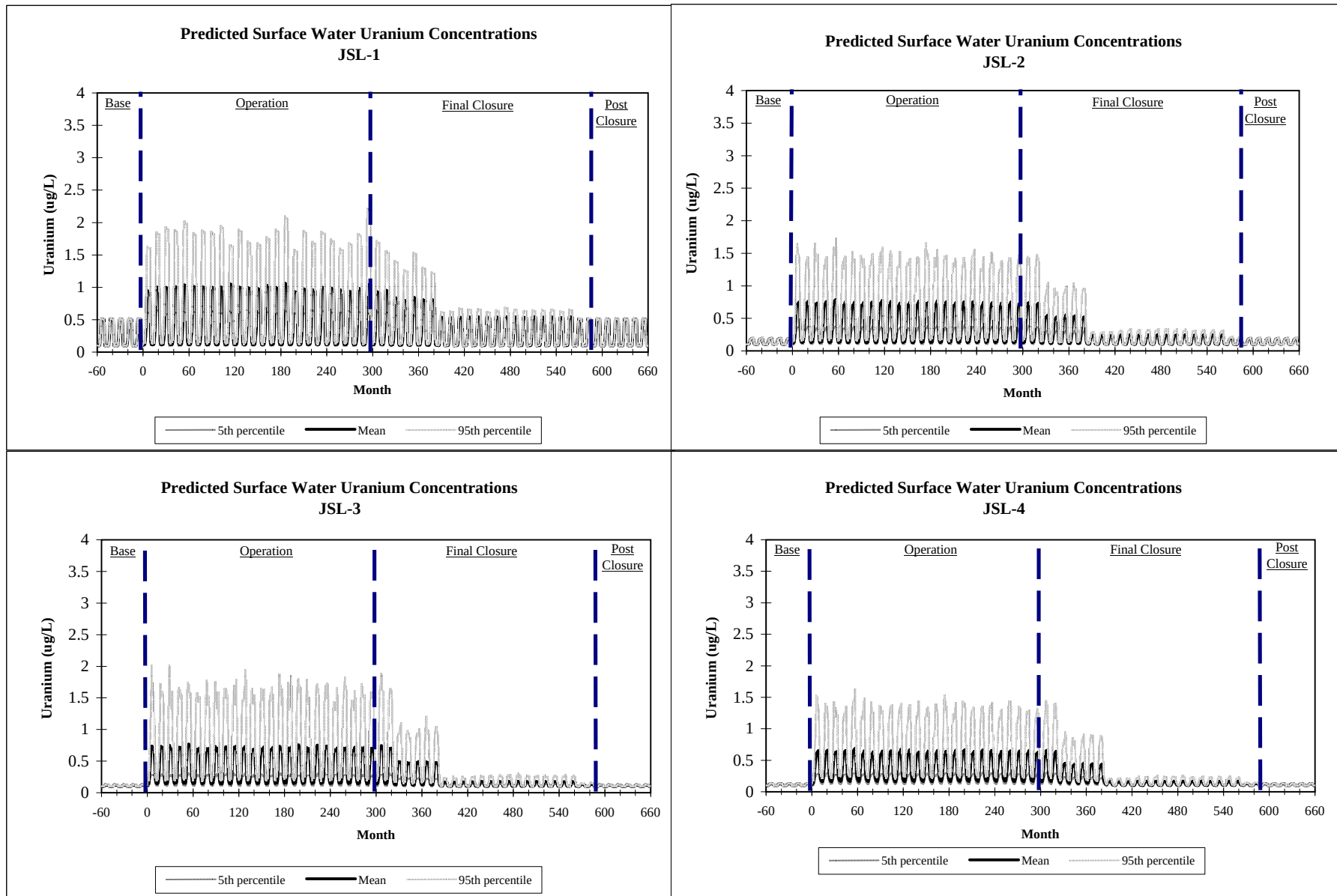


Figure 7.2-1 Water Quality Predictions

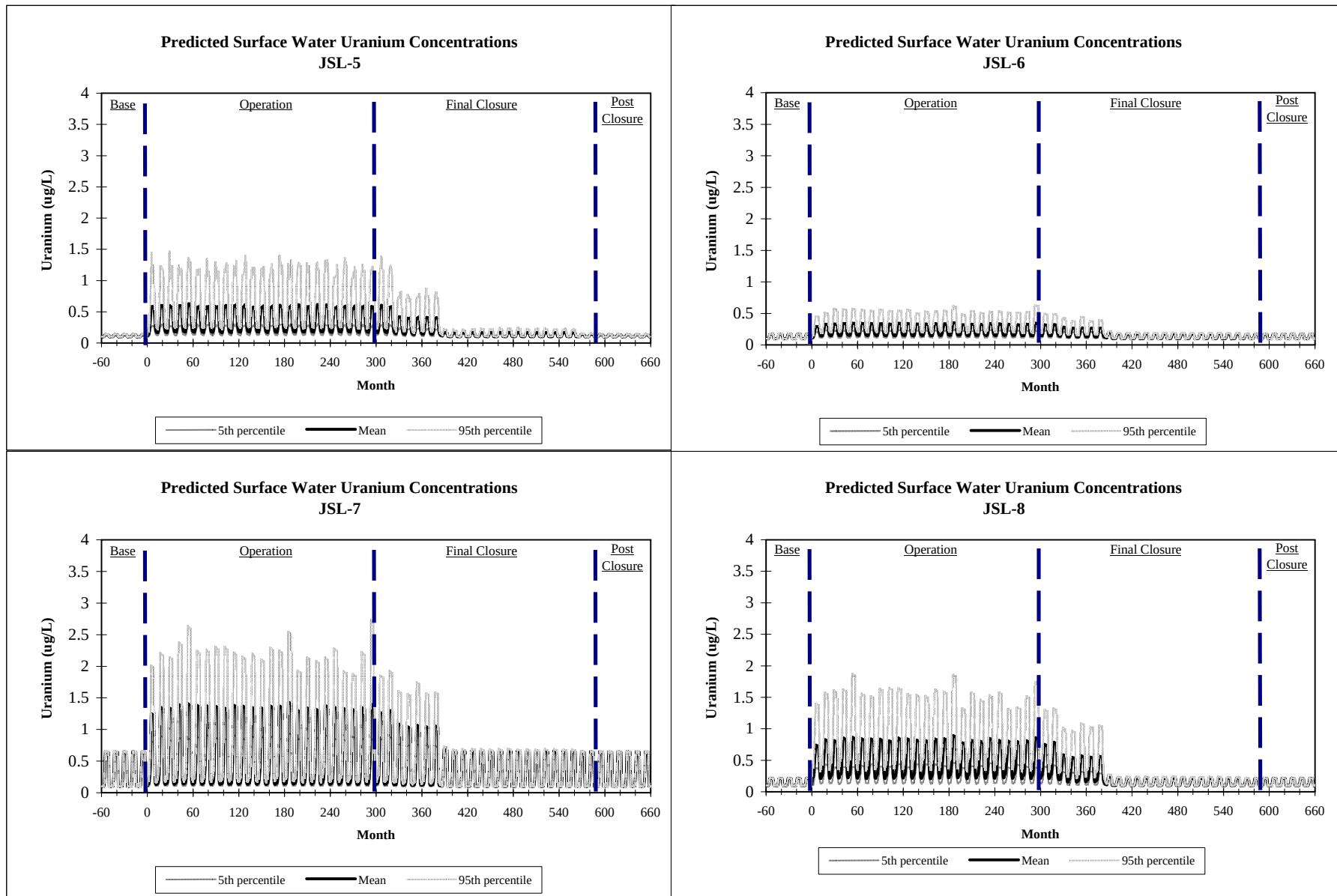


Figure 7.2-1 Water Quality Predictions

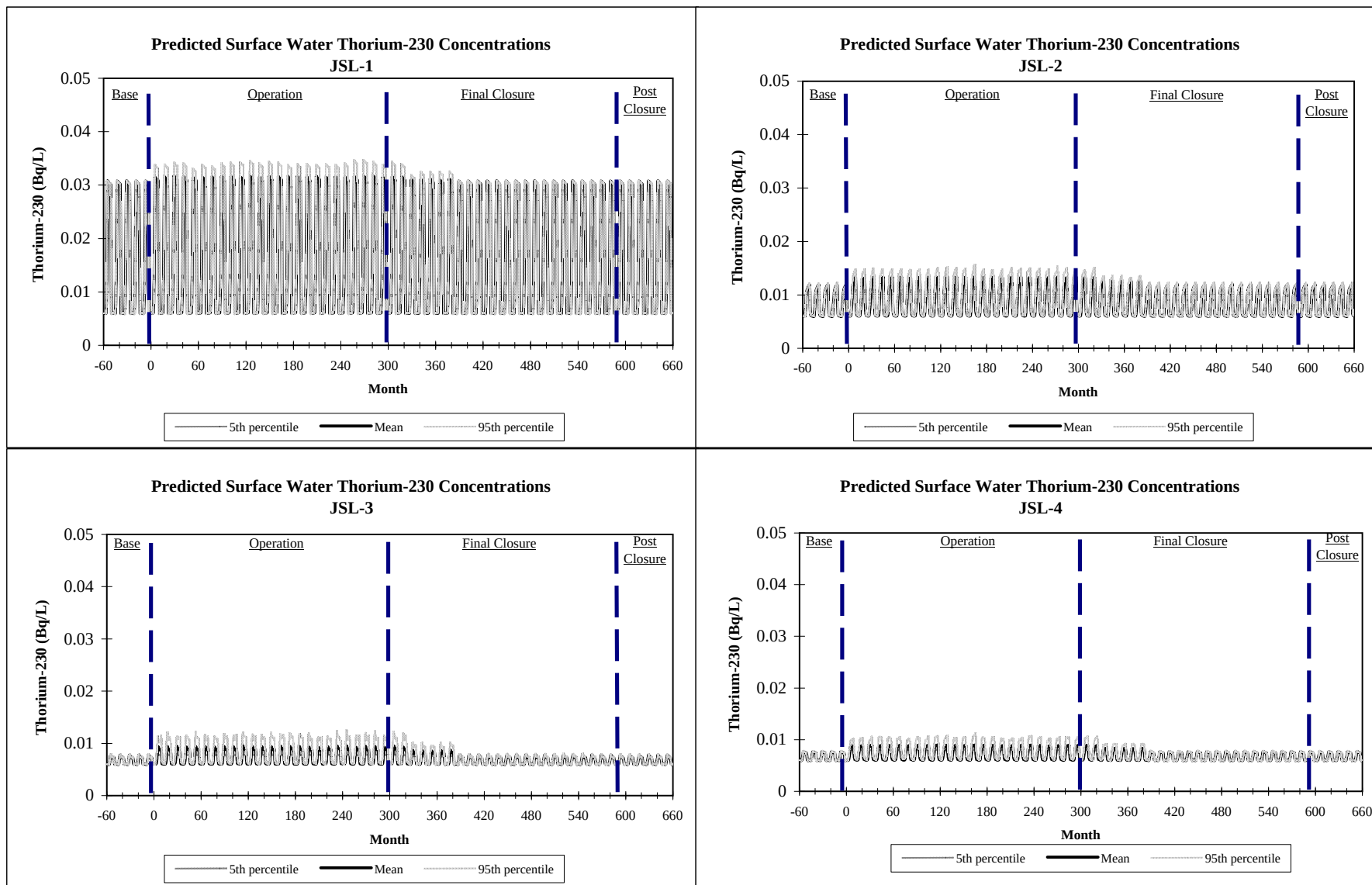


Figure 7.2-1 Water Quality Predictions

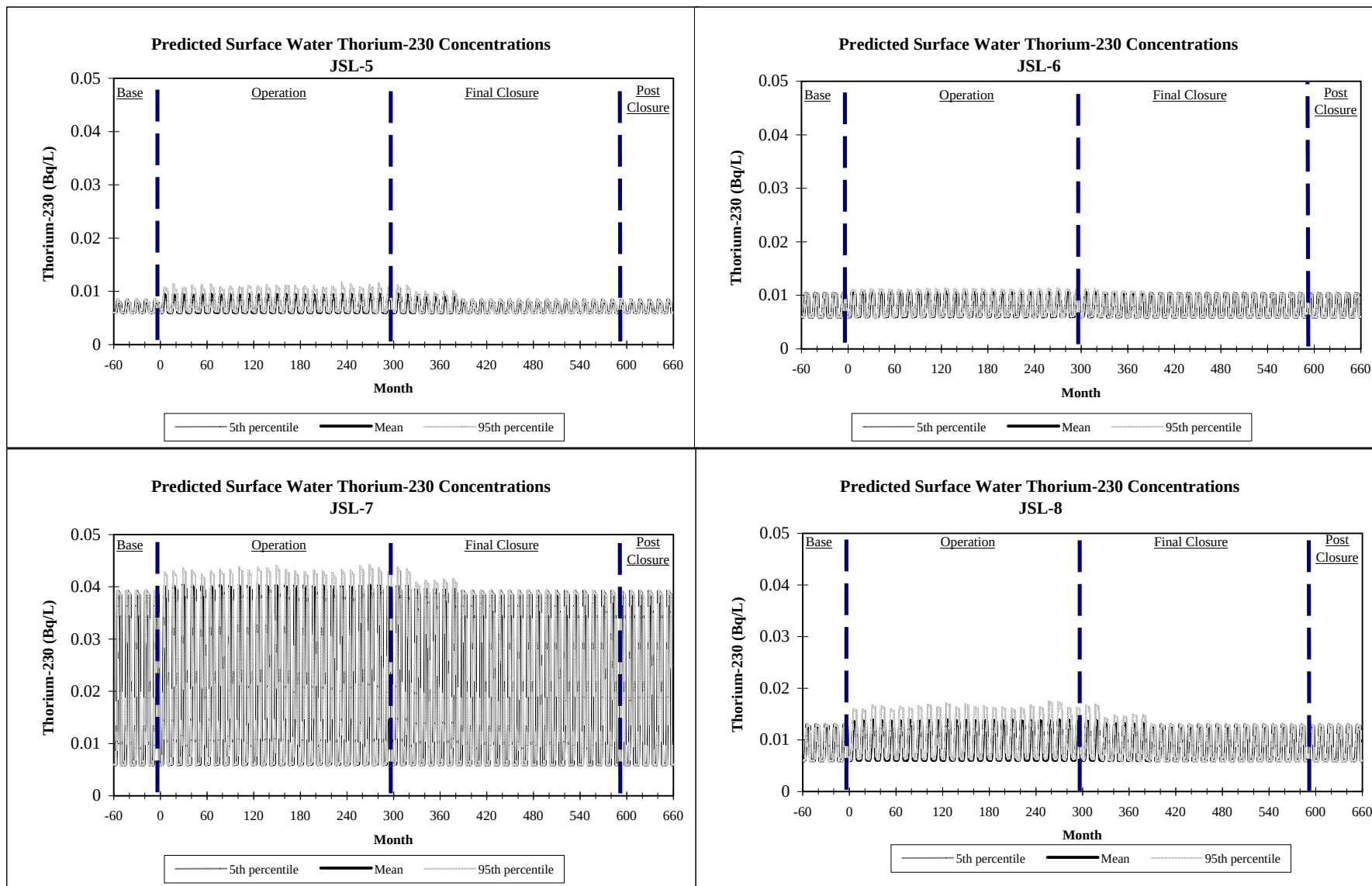


Figure 7.2-1 Water Quality Predictions

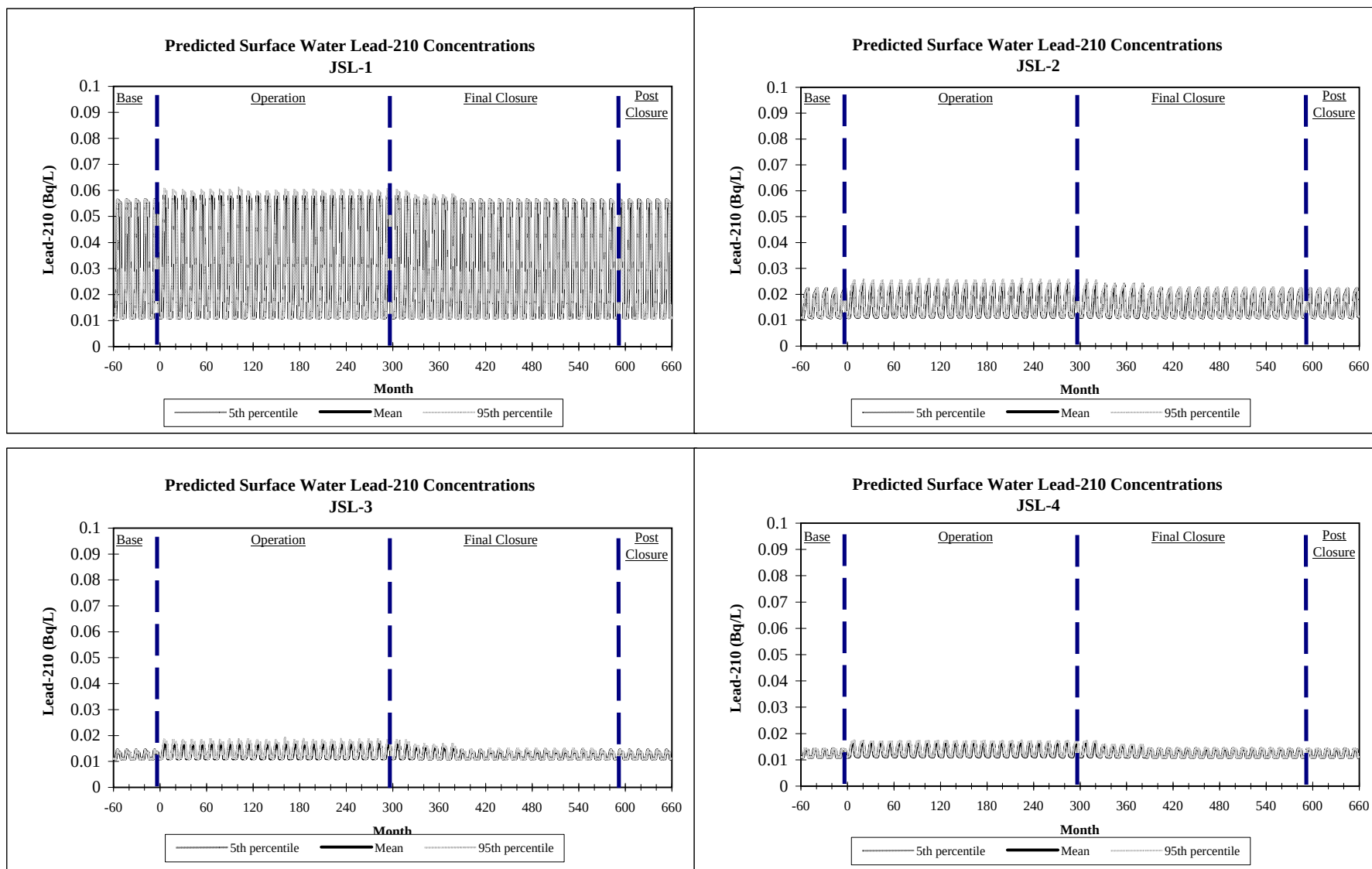


Figure 7.2-1 Water Quality Predictions

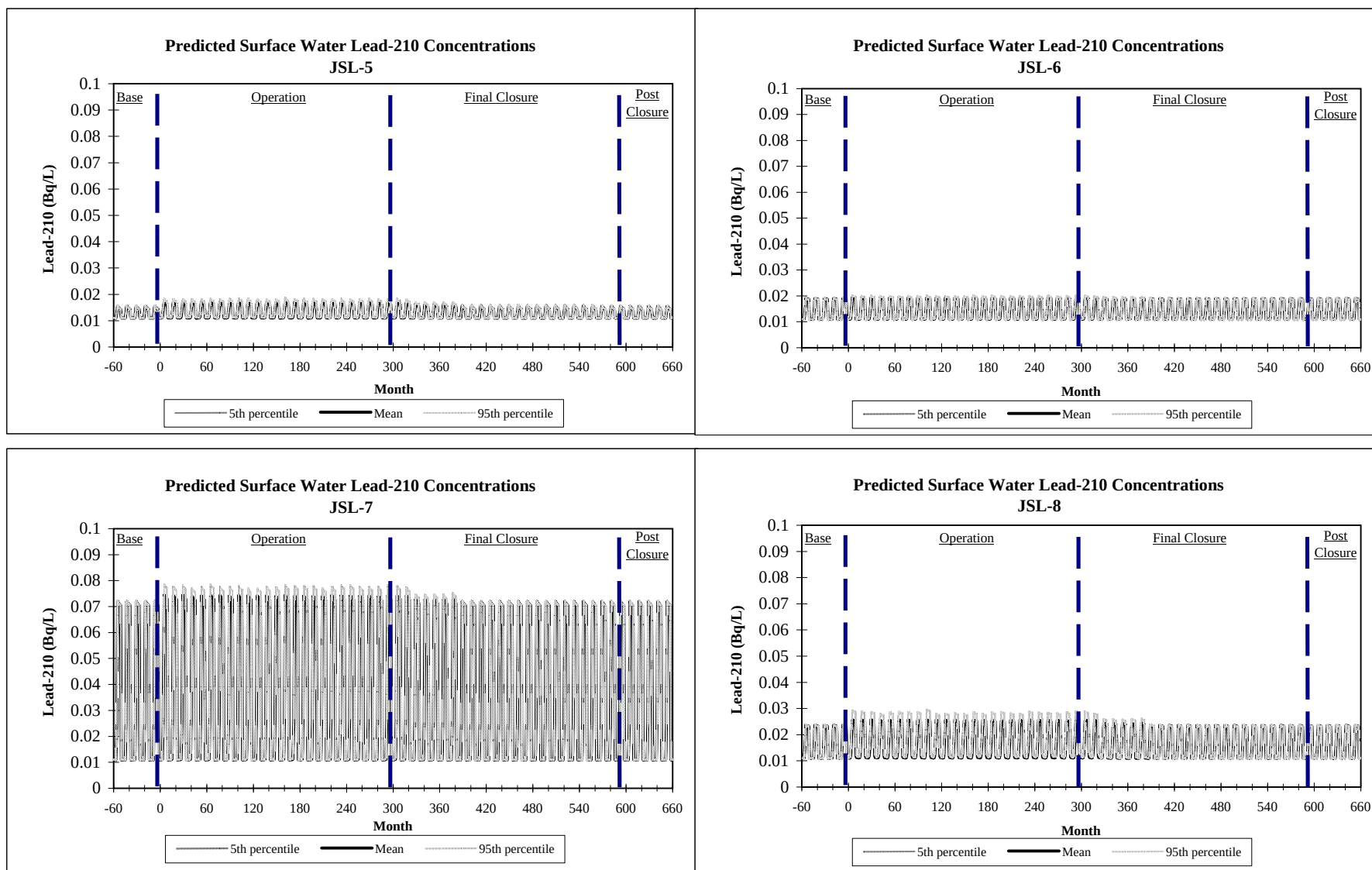


Figure 7.2-1 Water Quality Predictions

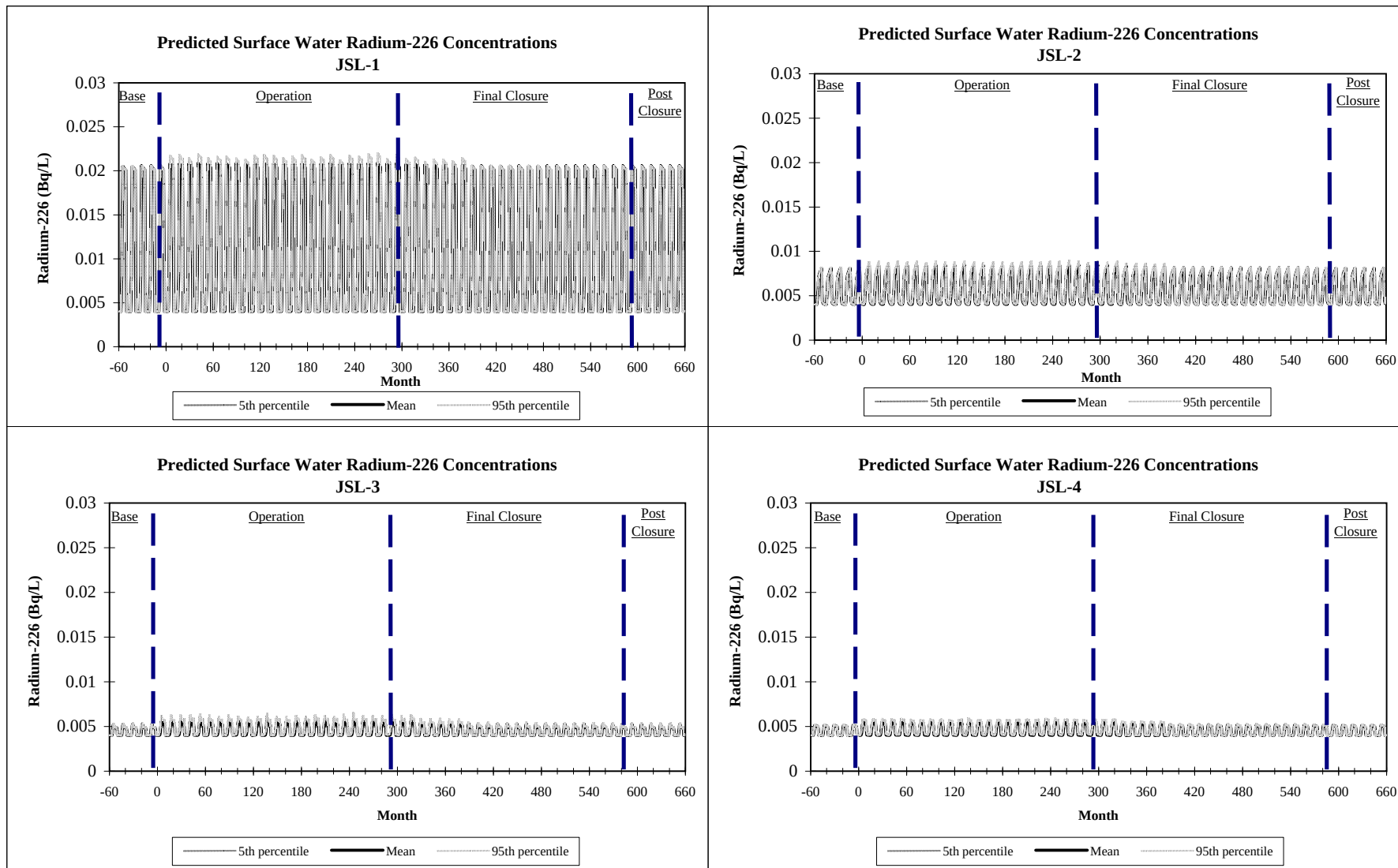


Figure 7.2-1 Water Quality Predictions

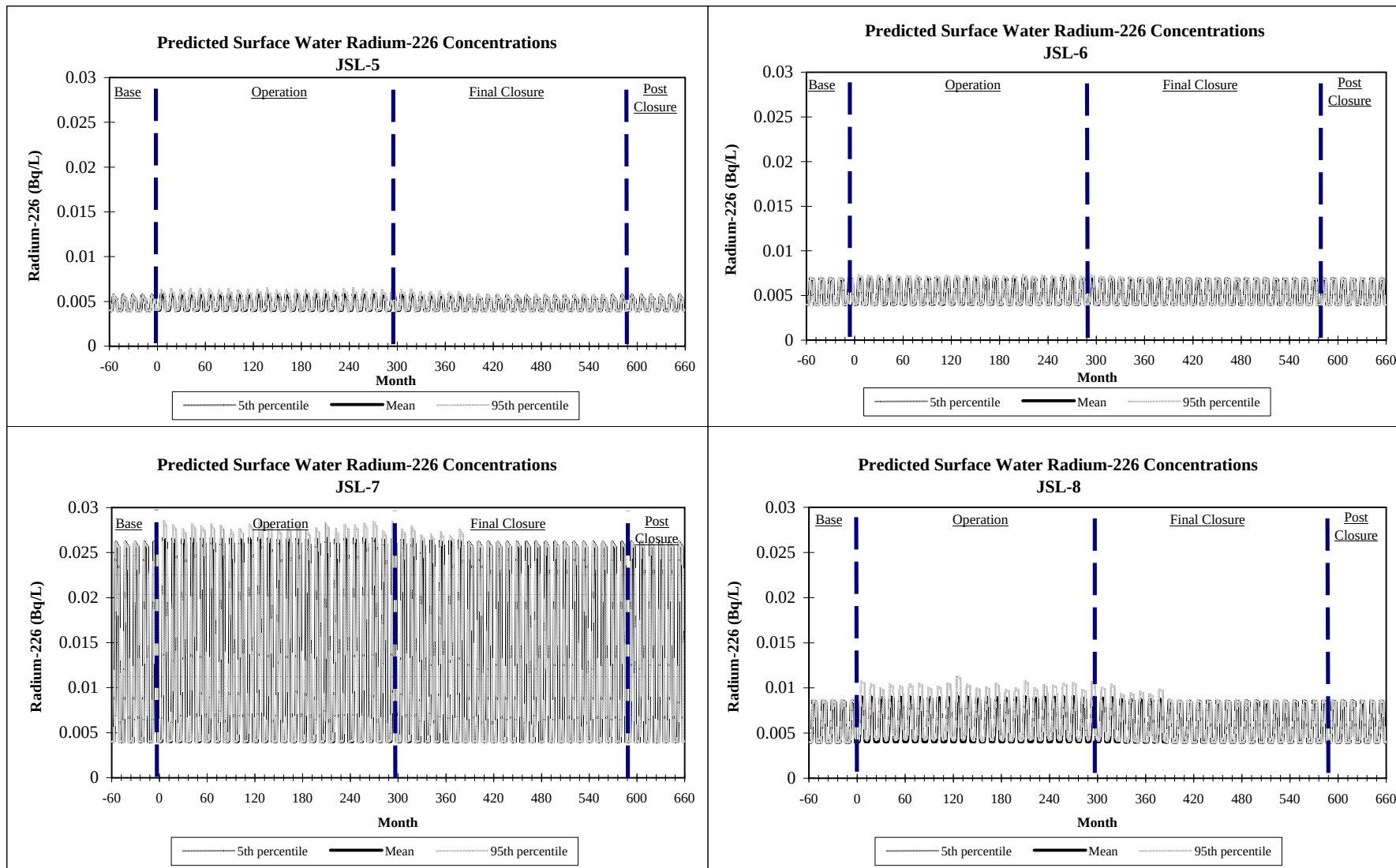


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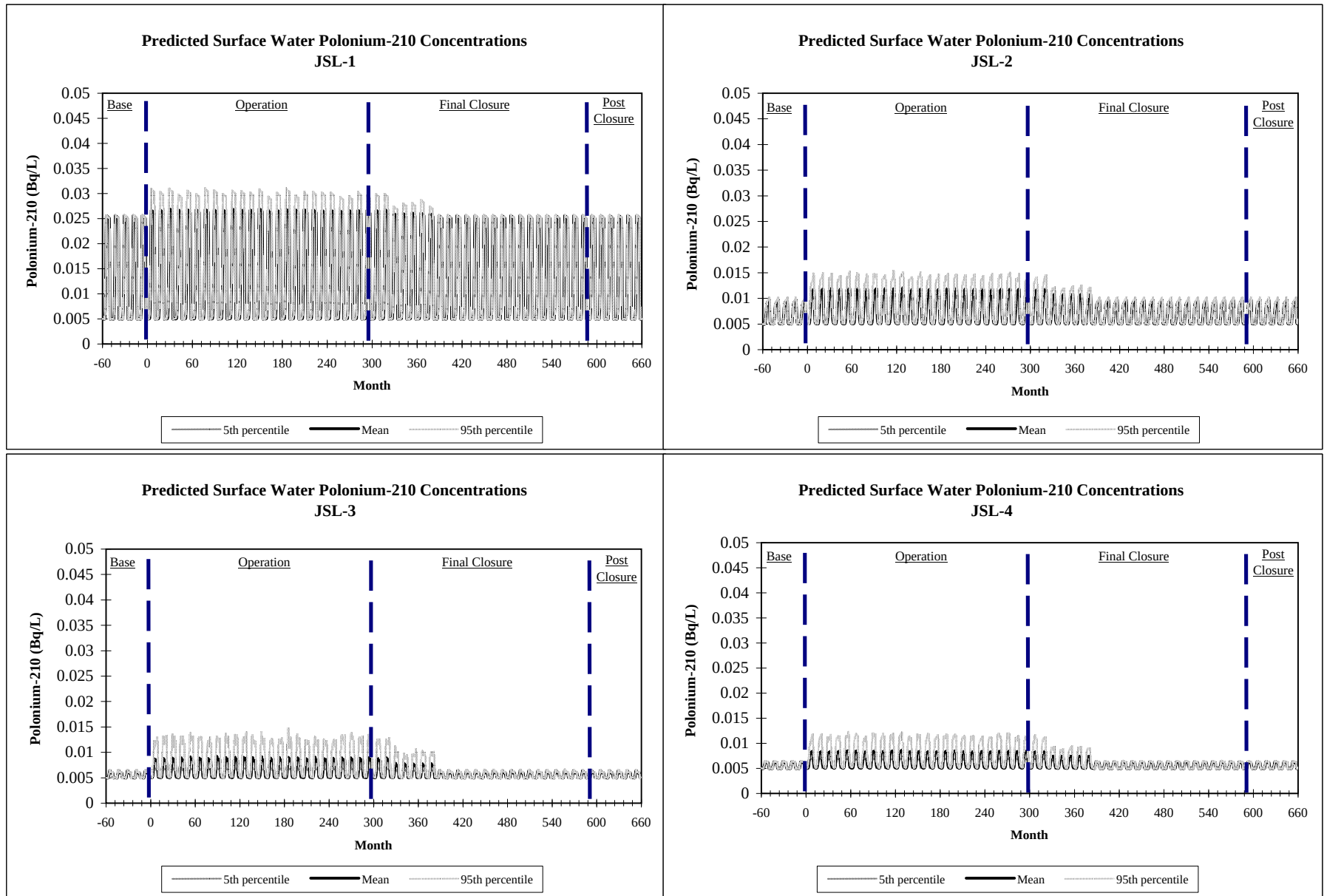


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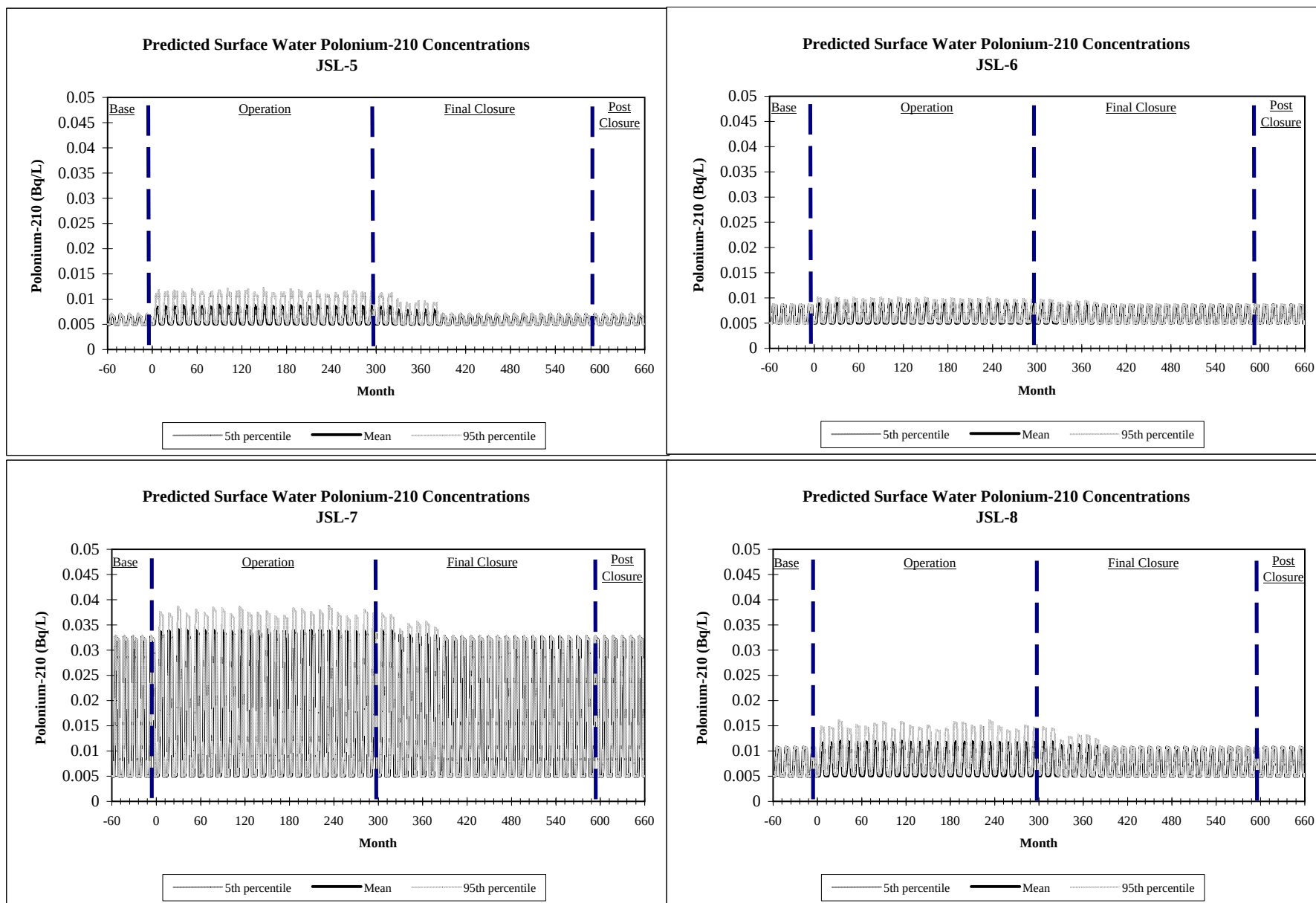


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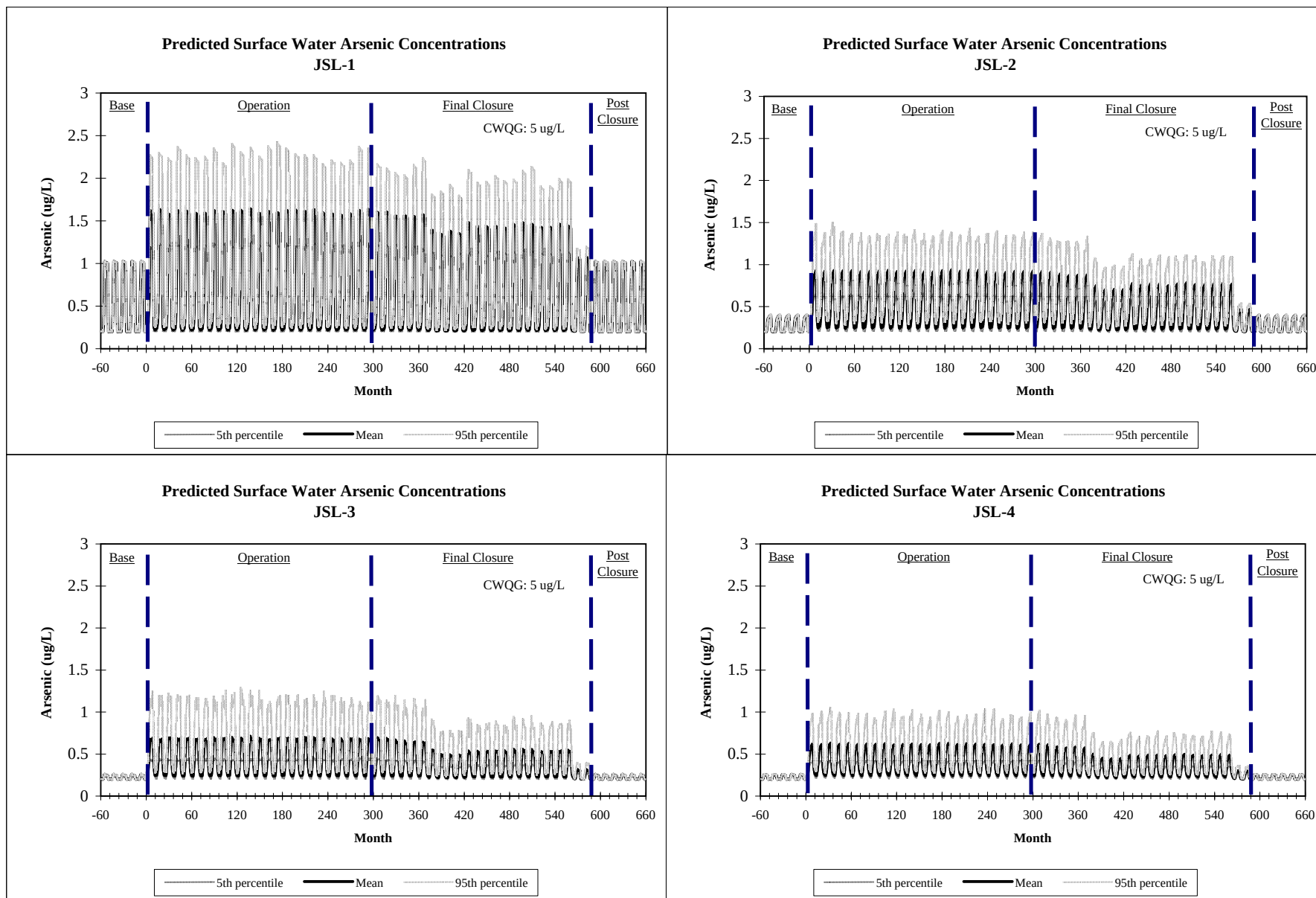


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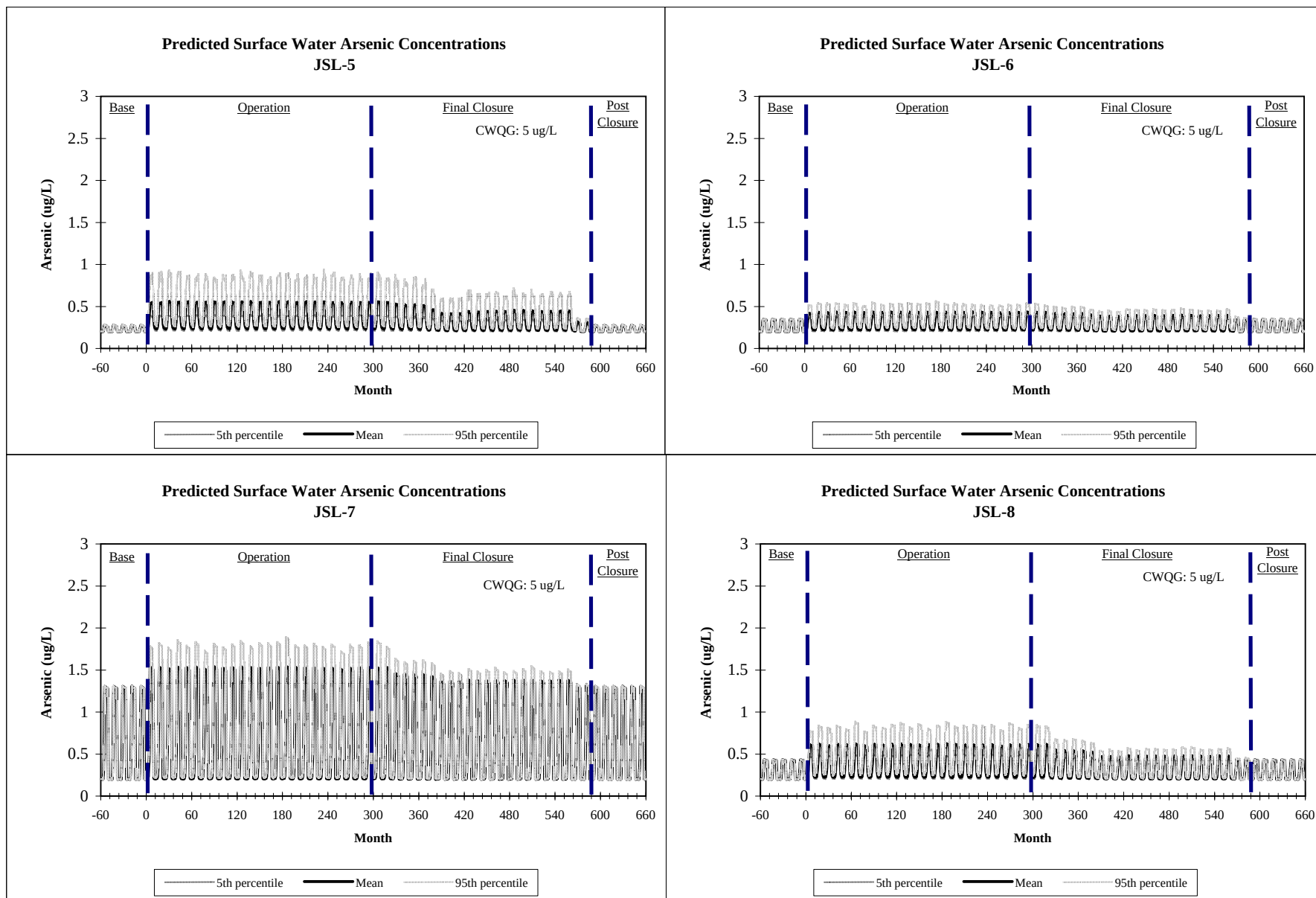


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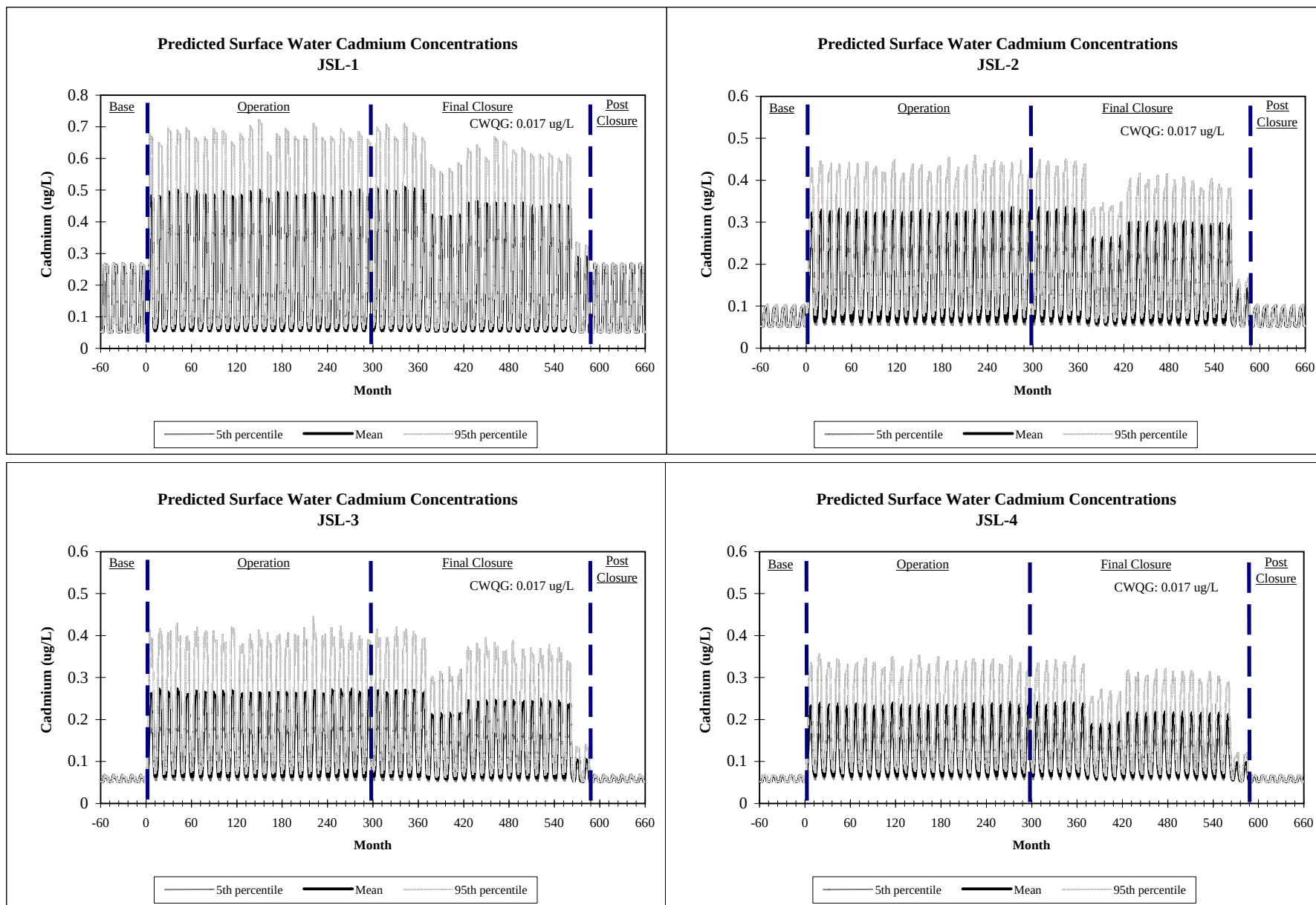


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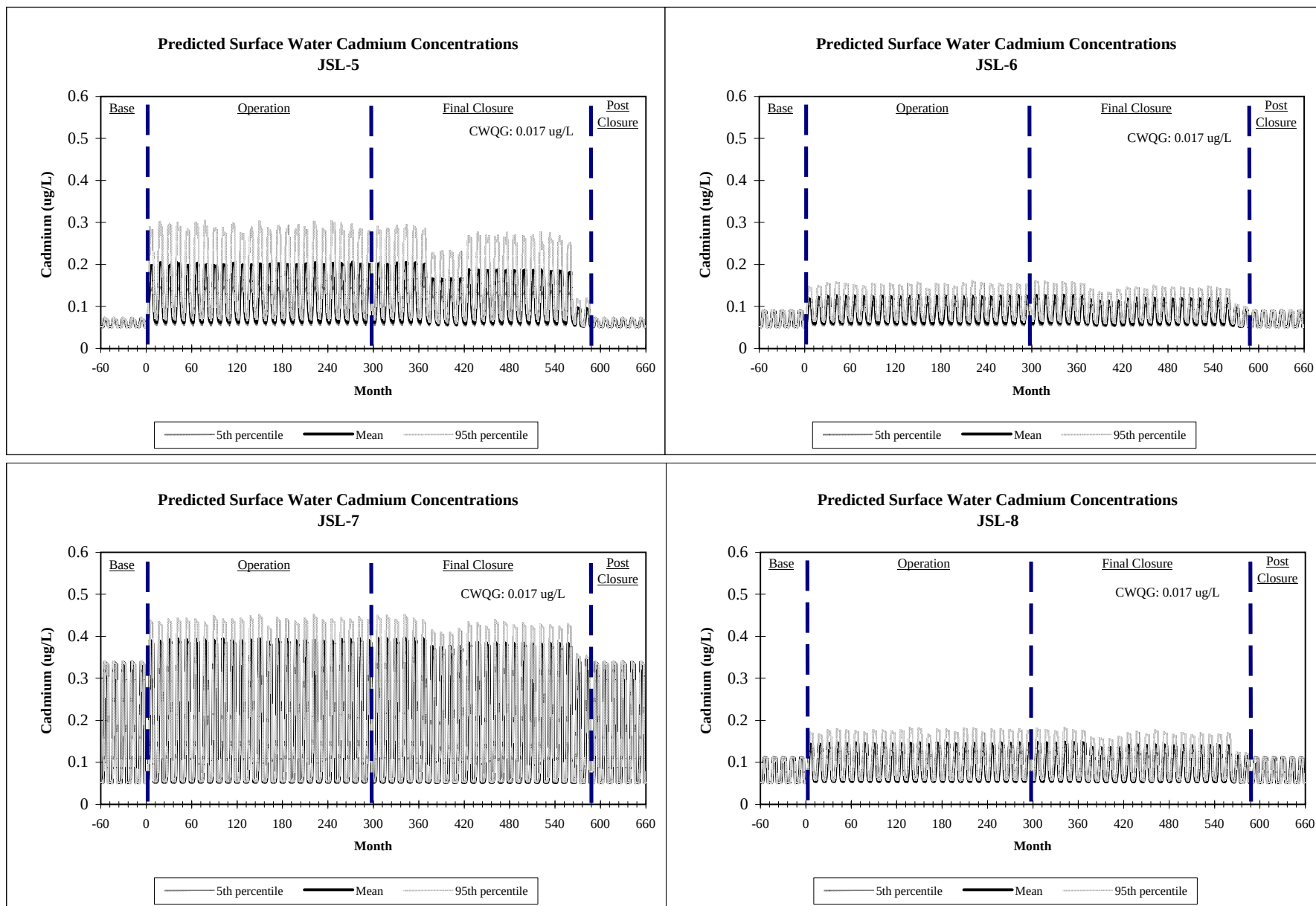


Figure 7.2-1 Water Quality Predictions

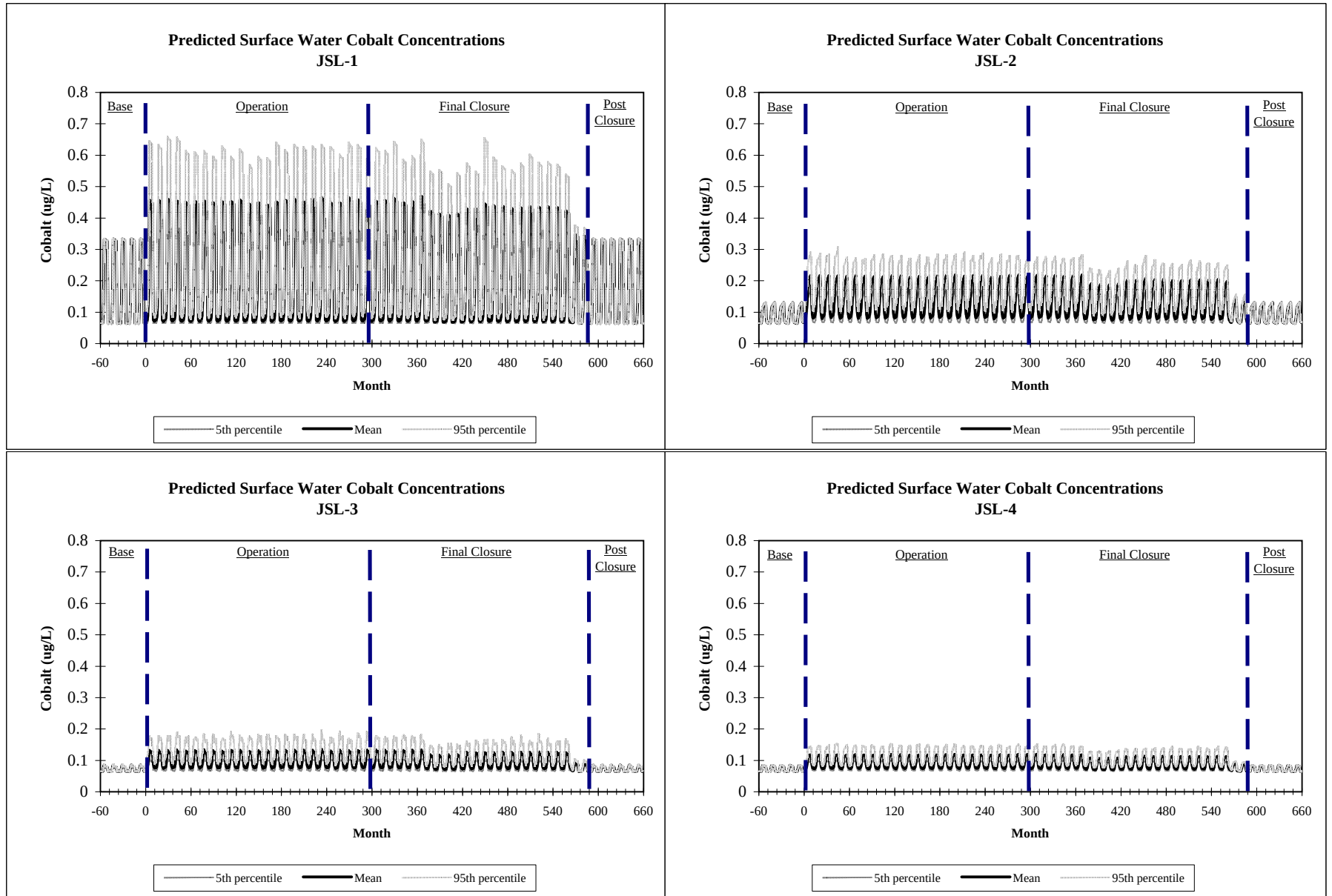


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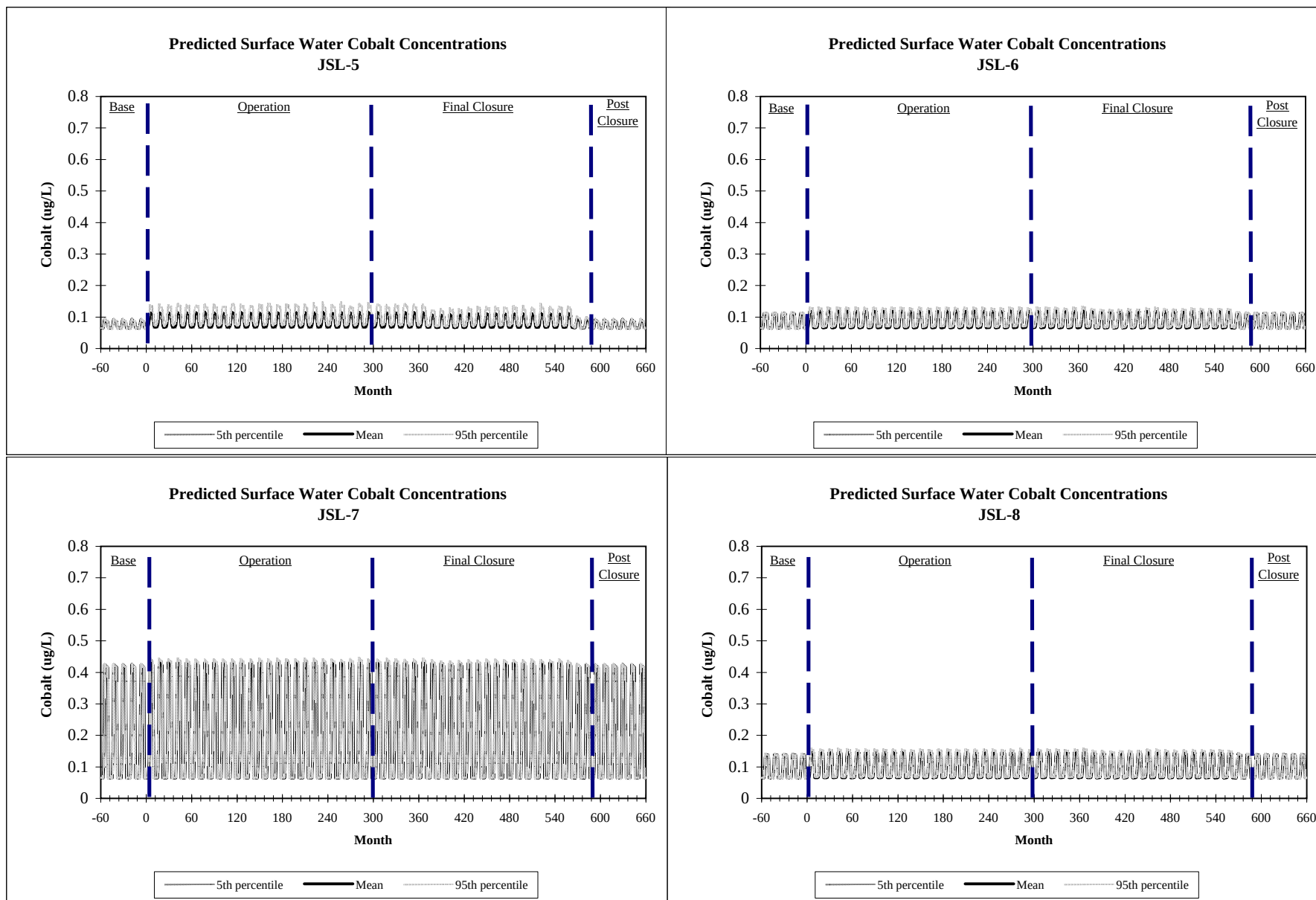


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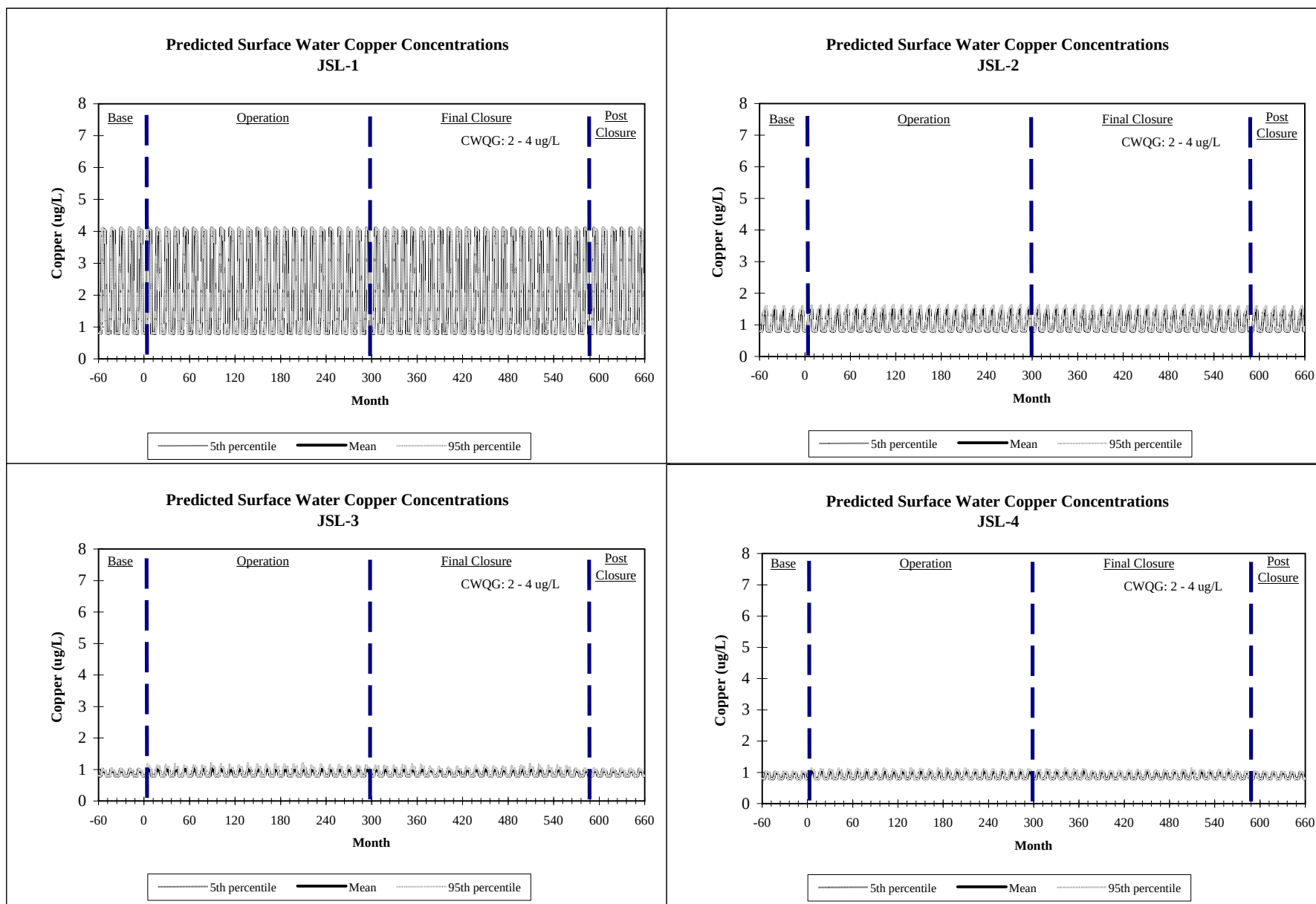


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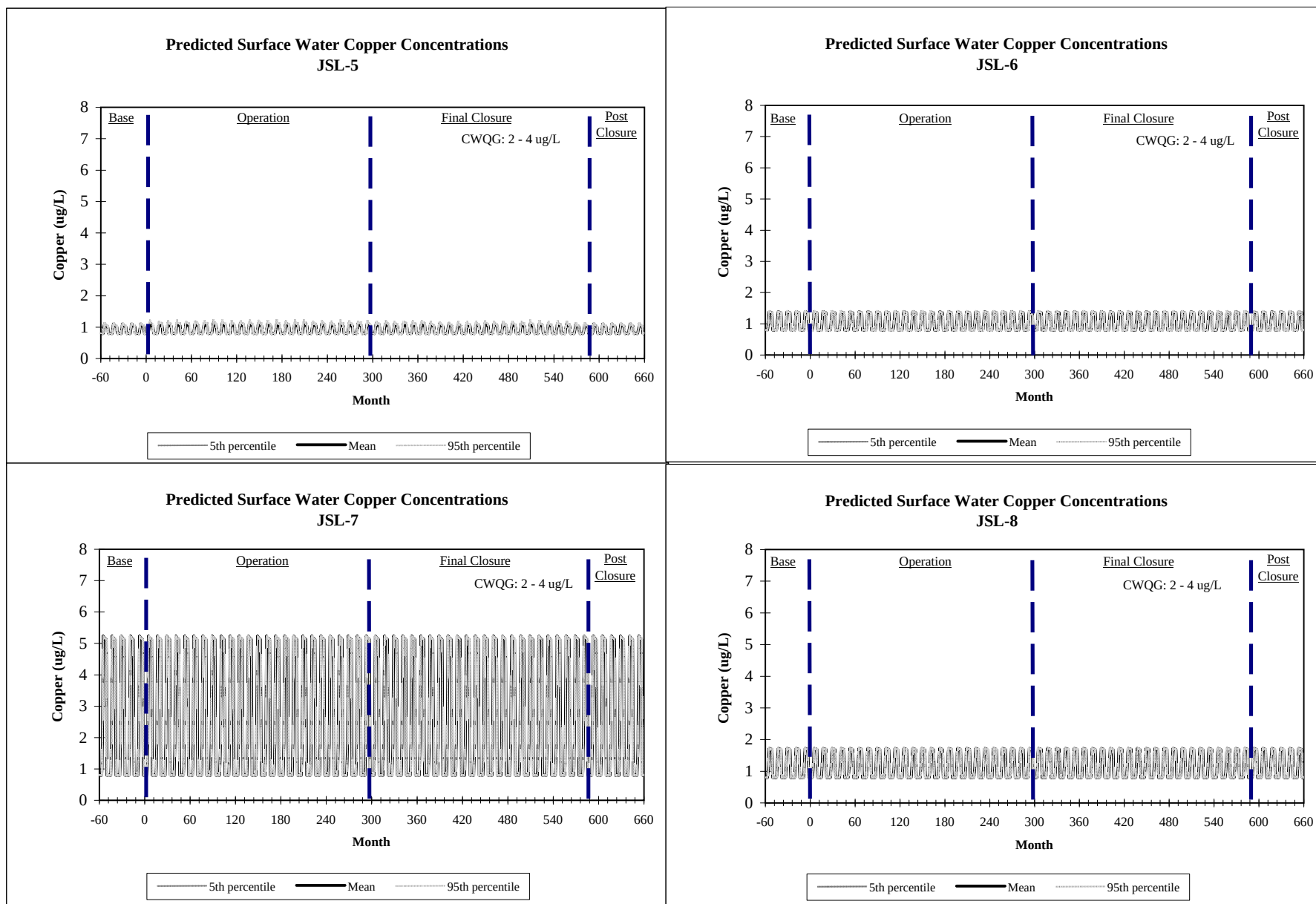


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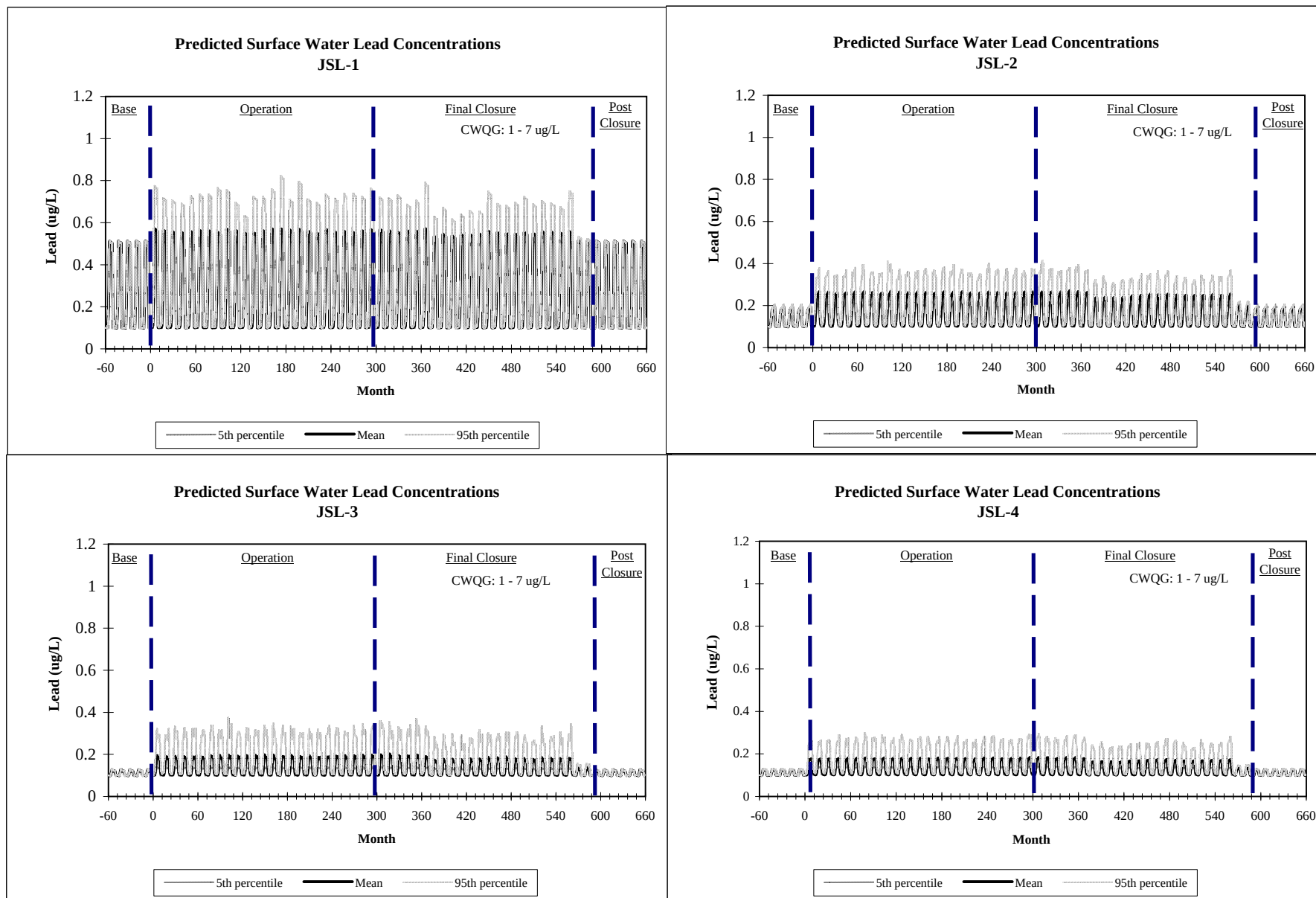


Figure 7.2-1 Water Quality Predictions

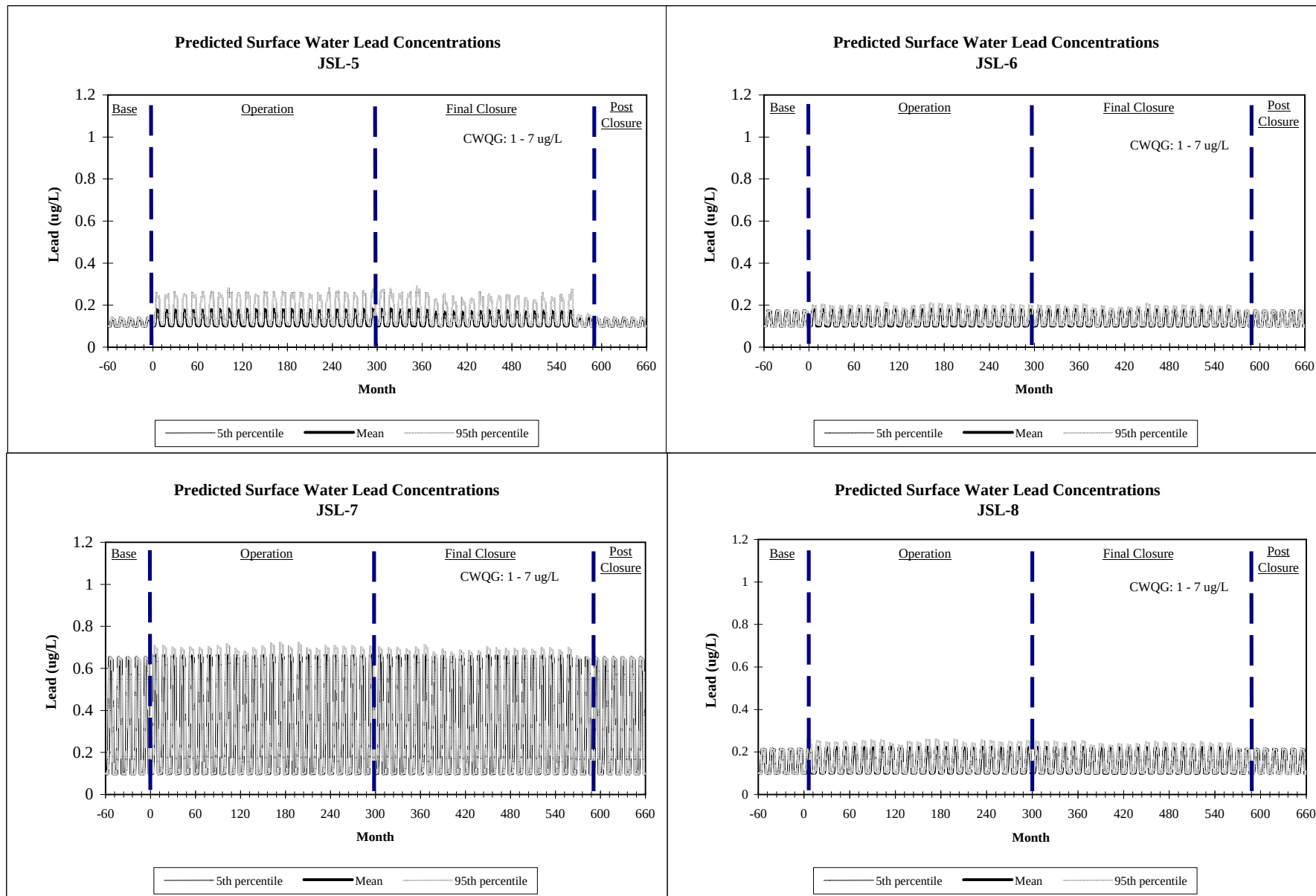


Figure 7.2-1 Water Quality Predictions

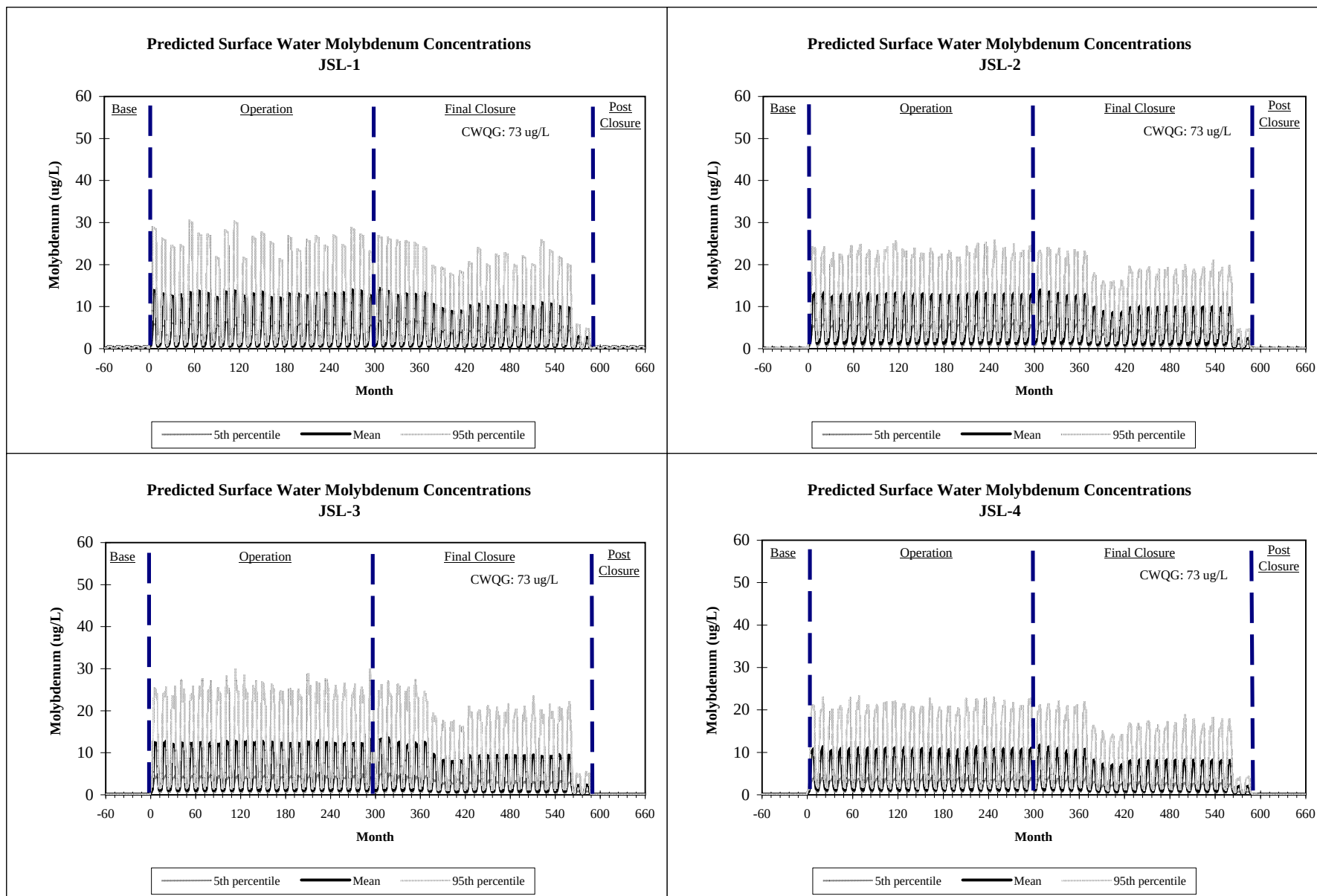


Figure 7.2-1 Water Quality Predictions

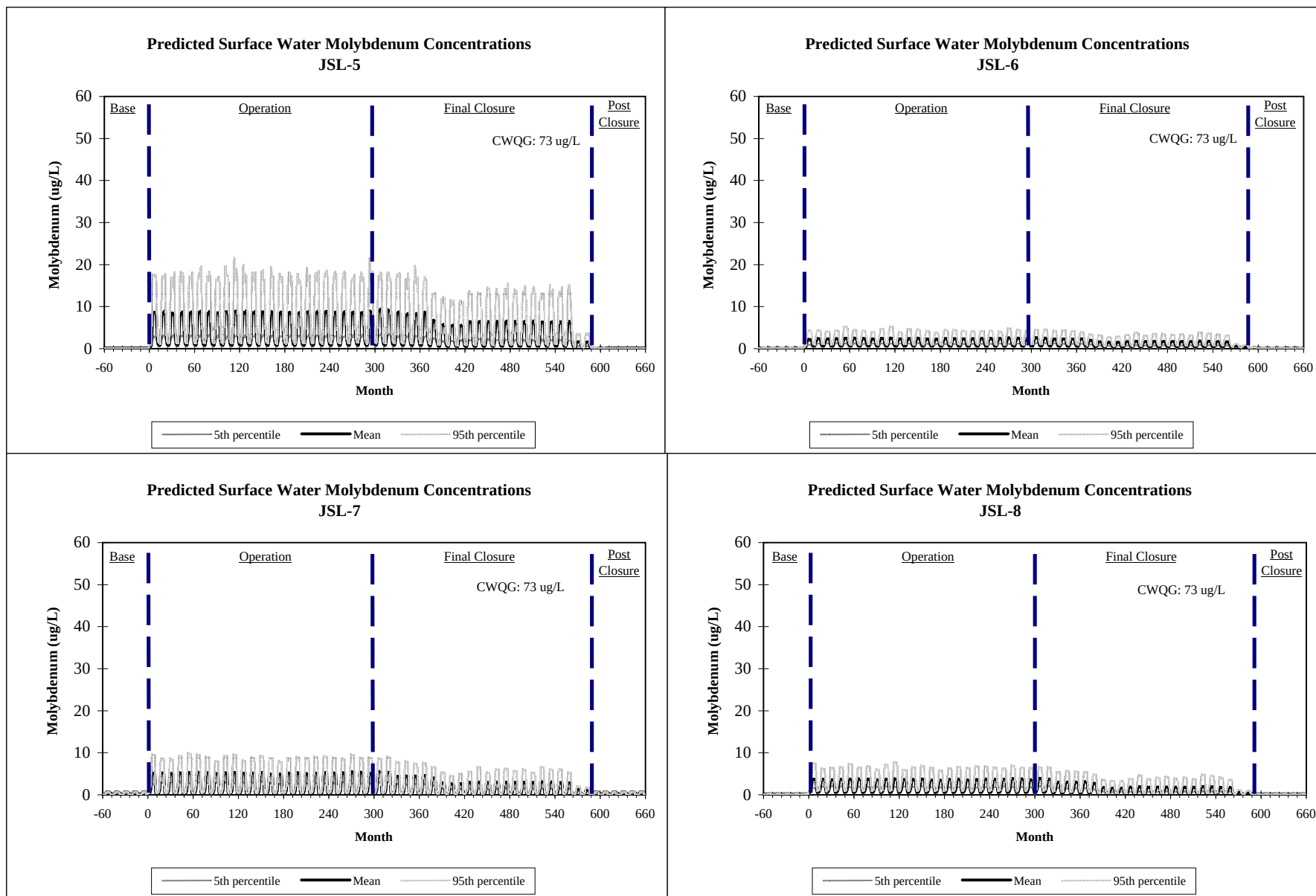


Figure 7.2-1 Water Quality Predictions

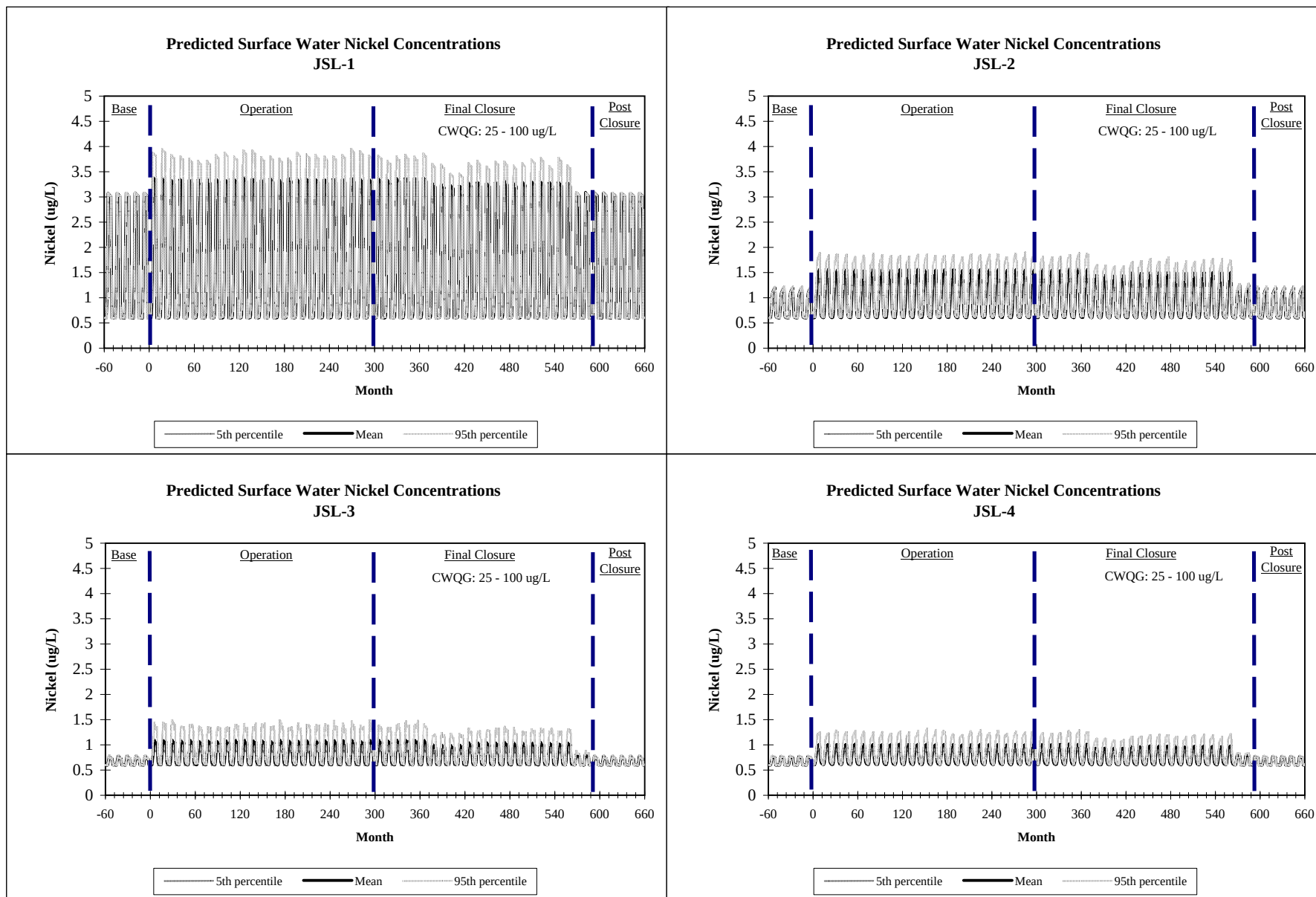


Figure 7.2-1 Water Quality Predictions

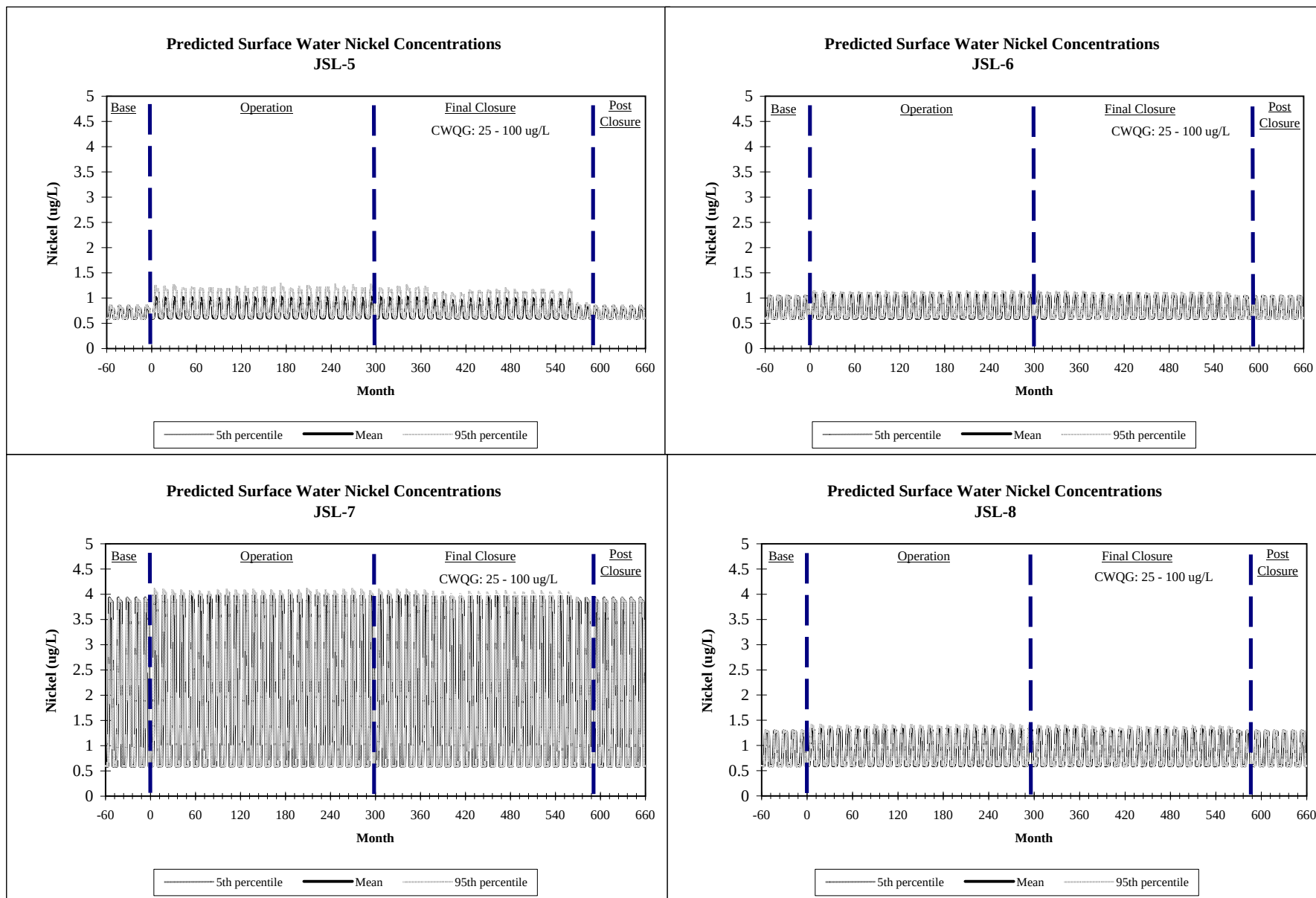


Figure 7.2-1 Water Quality Predictions

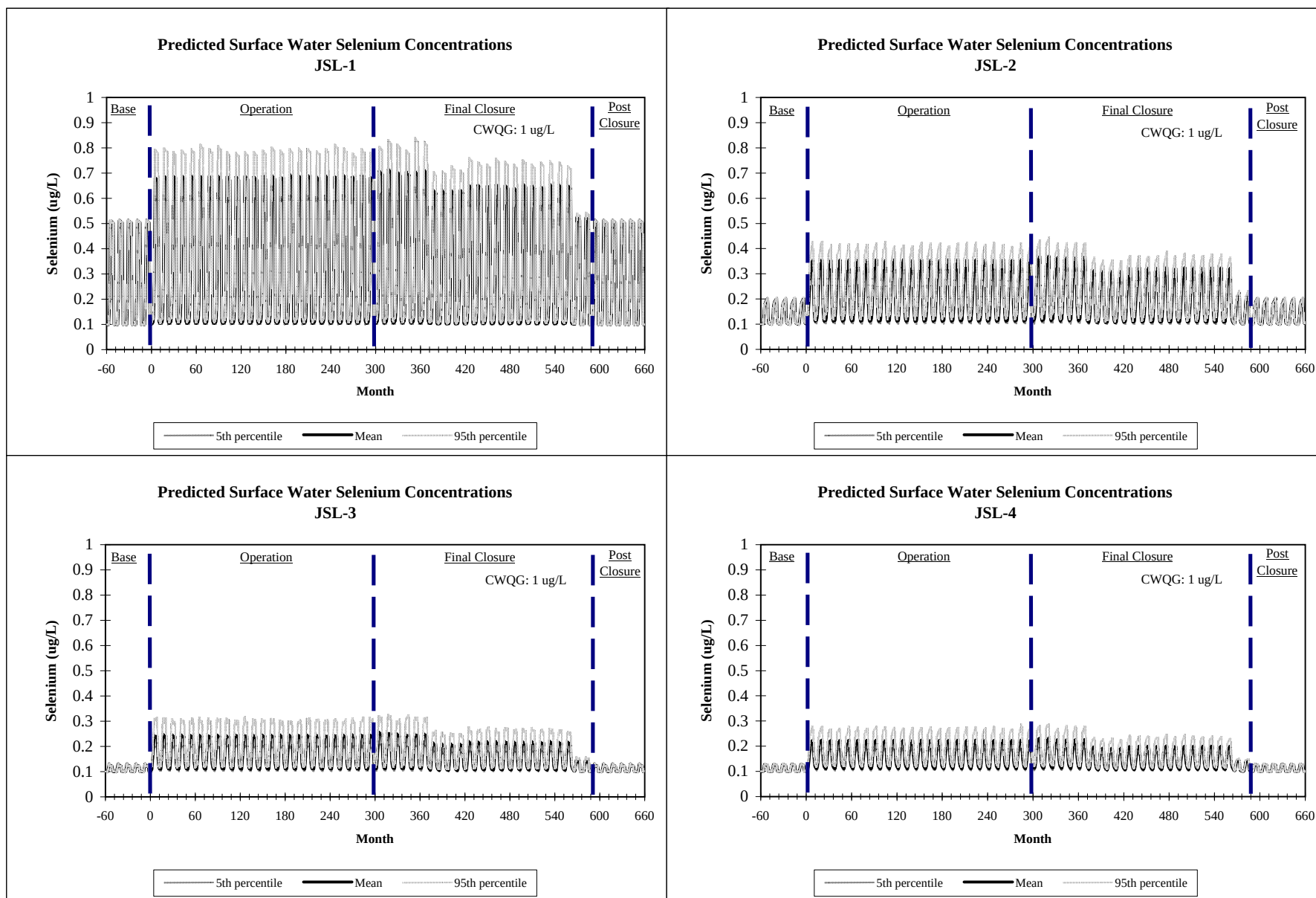


Figure 7.2-1 Water Quality Predictions

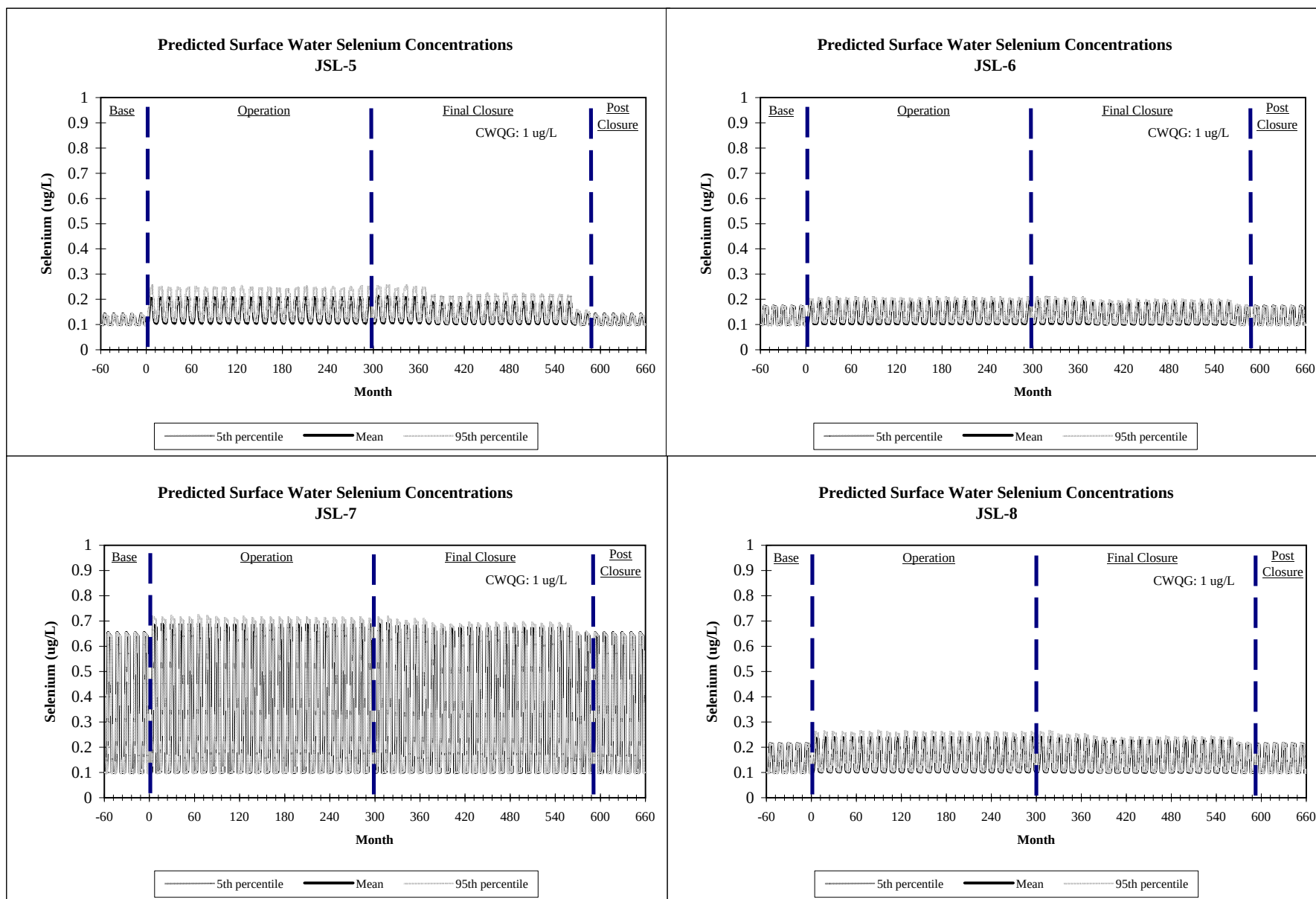


Figure 7.2-1 Water Quality Predictions

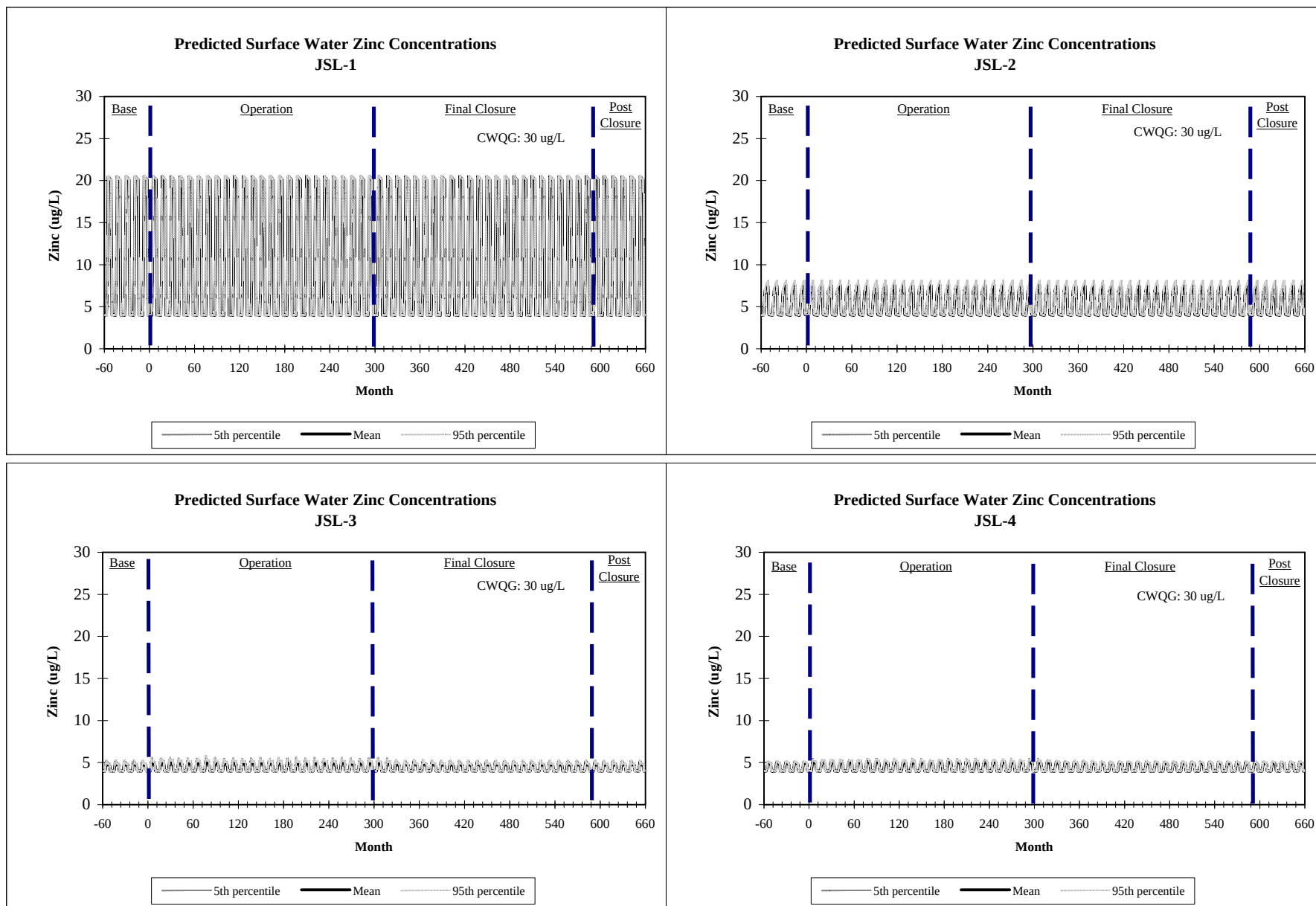


Figure 7.2-1 Water Quality Predictions

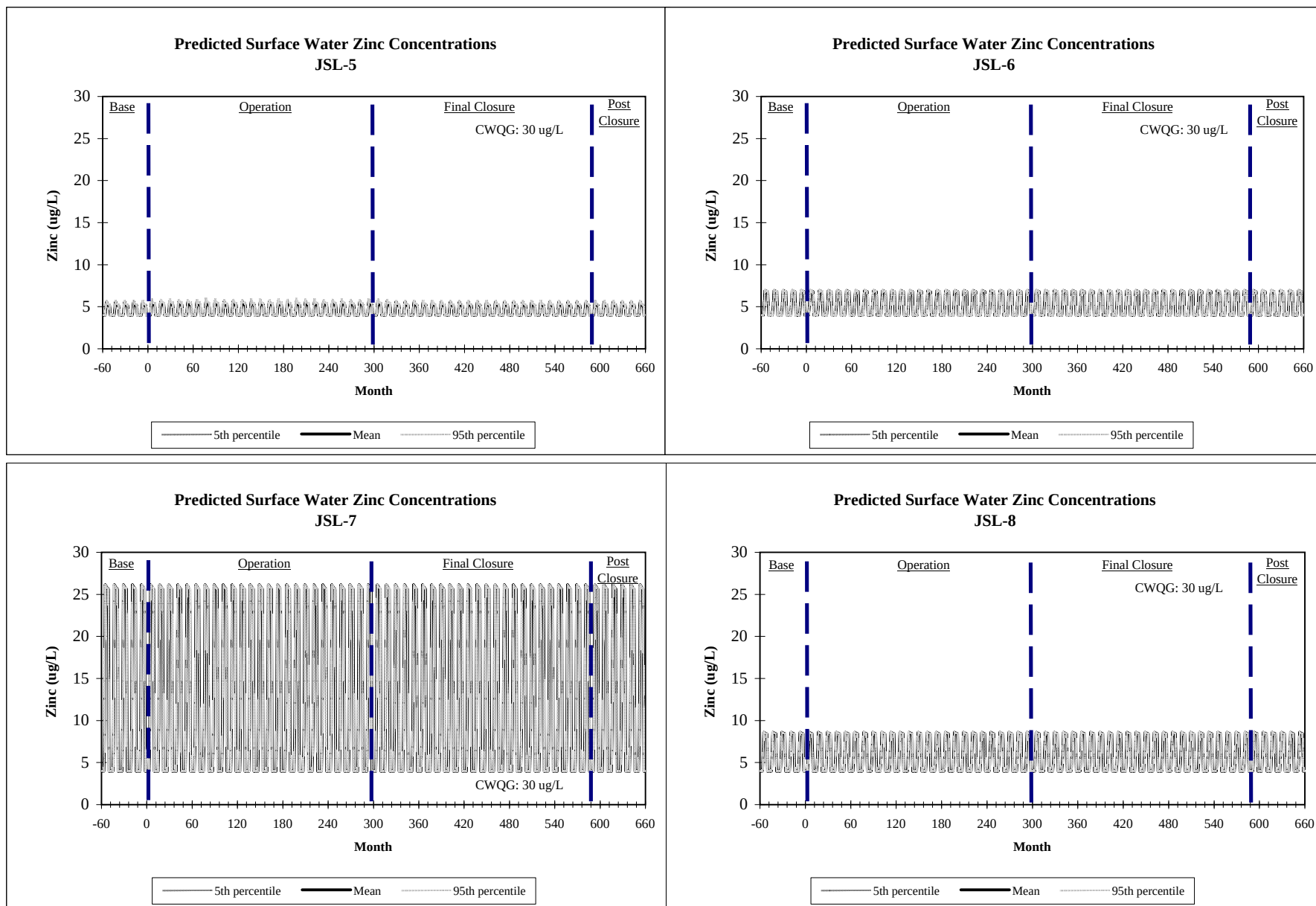


Figure 7.2-1 Water Quality Predictions

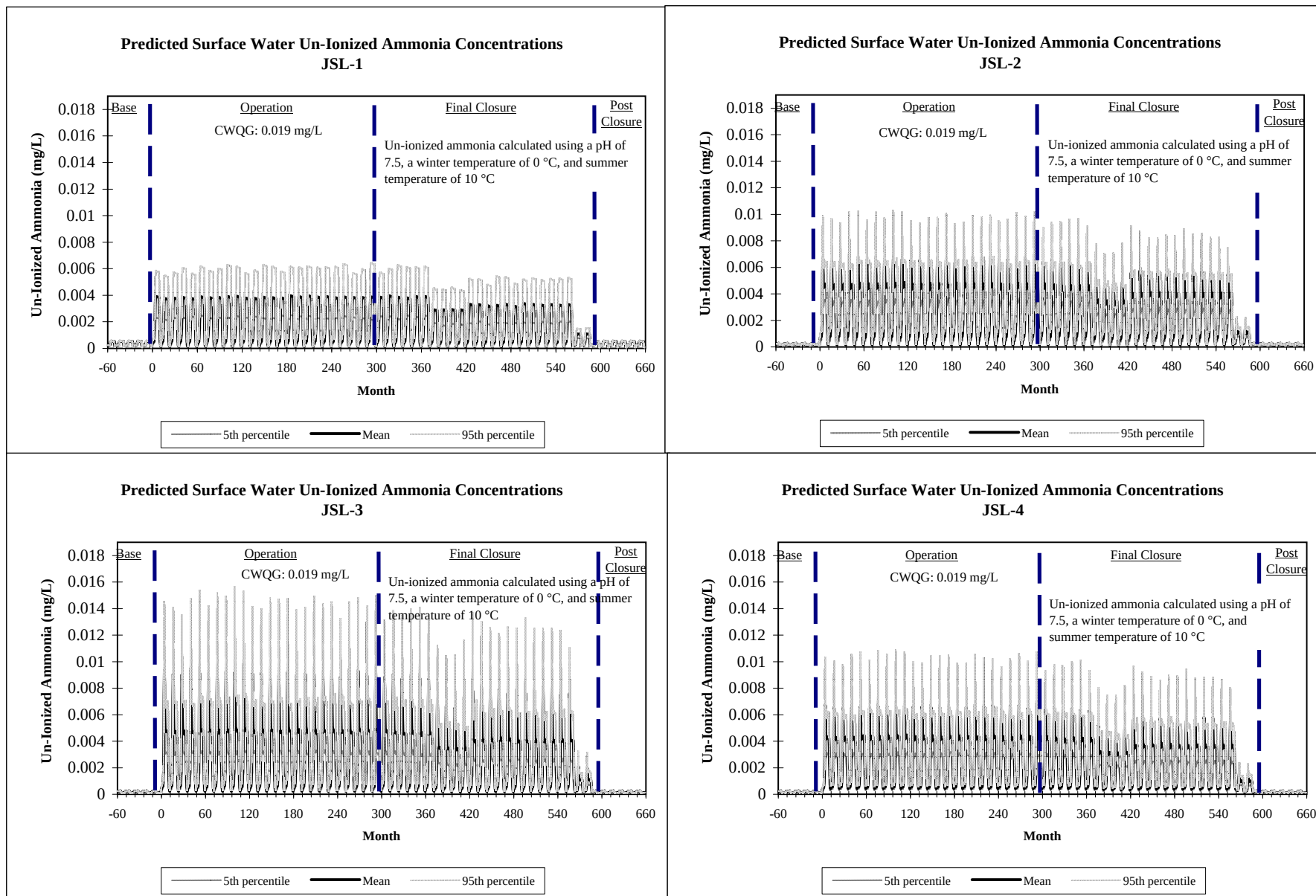


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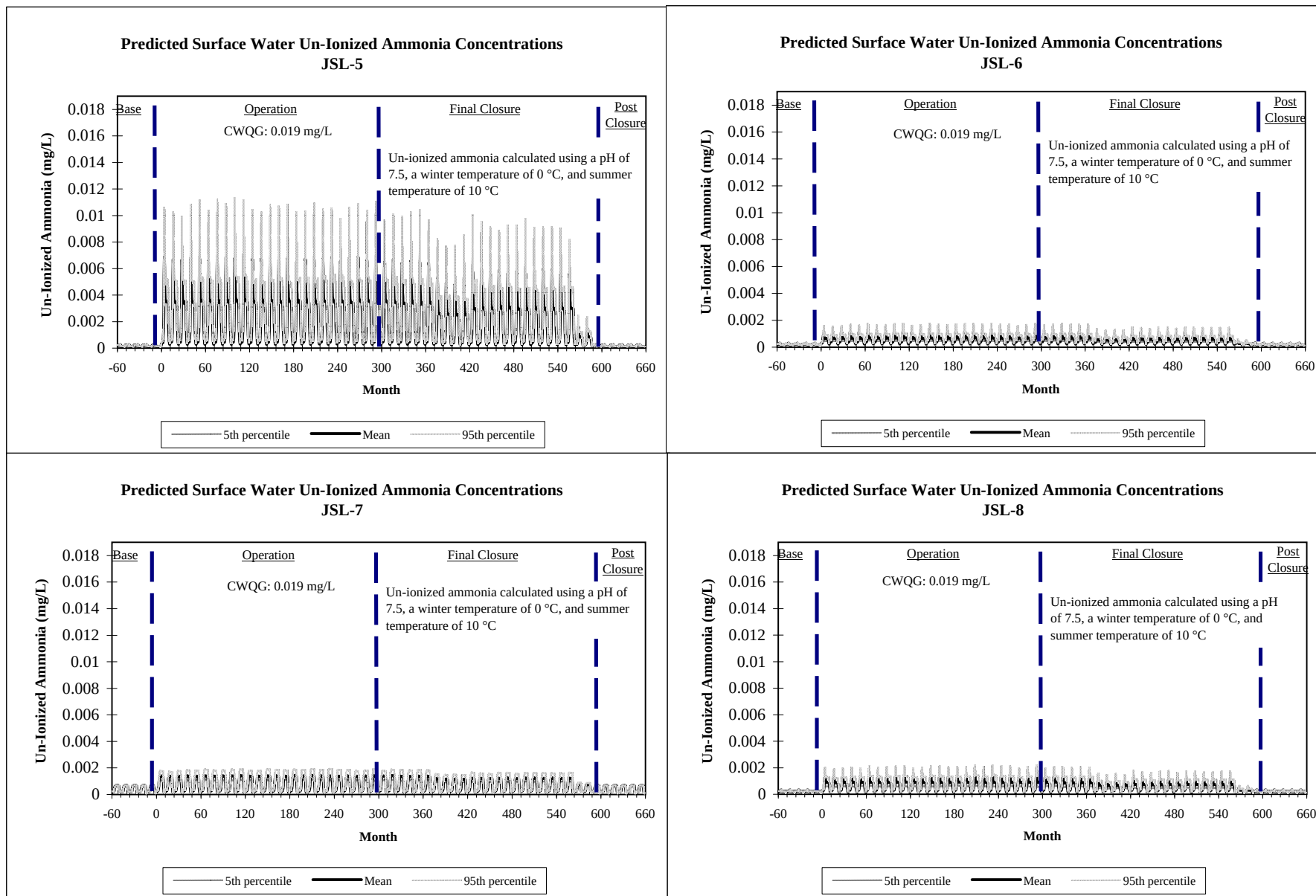


Figure 7.2-1 Water Quality Predictions

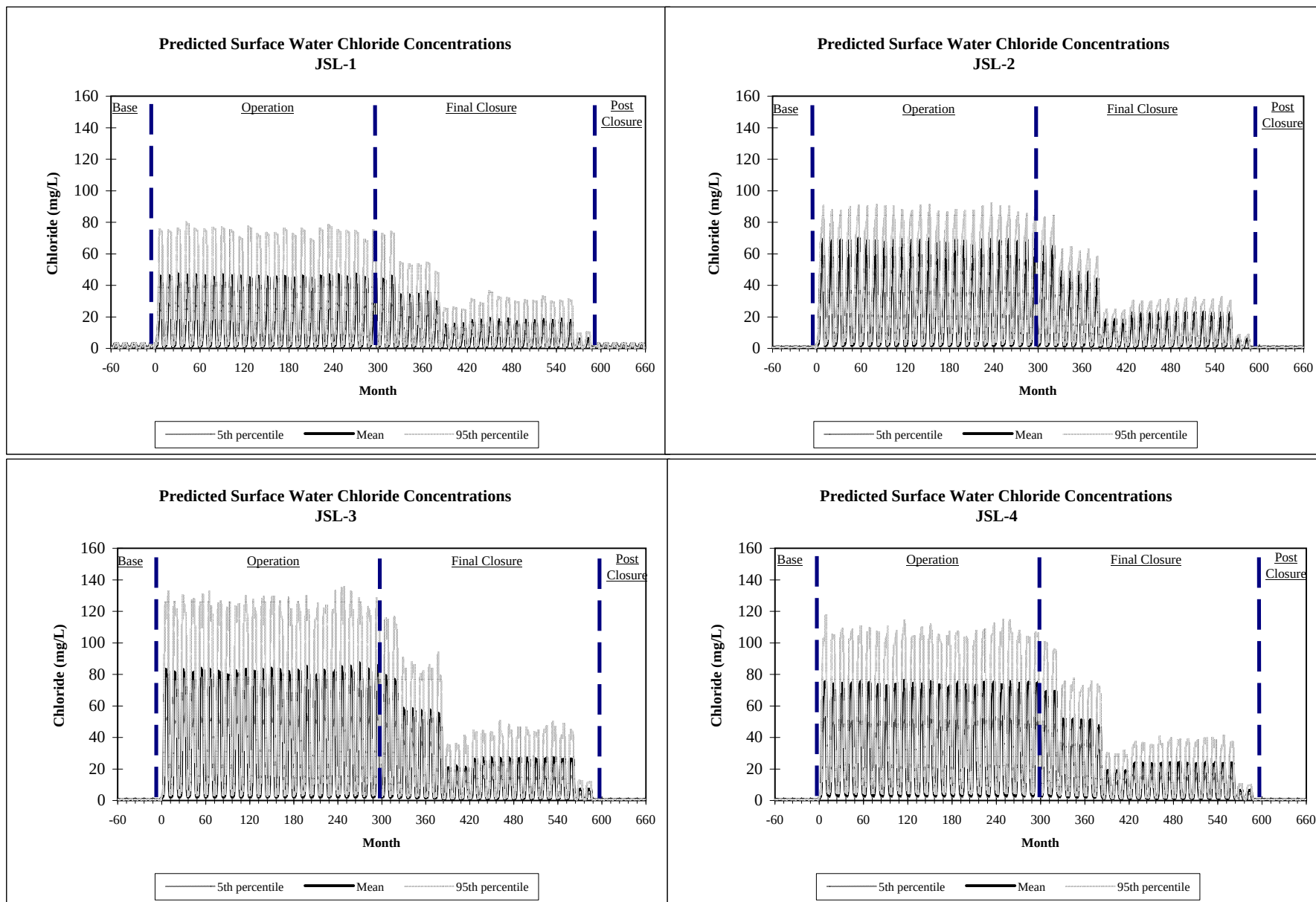


Figure 7.2-1 Water Quality Predictions

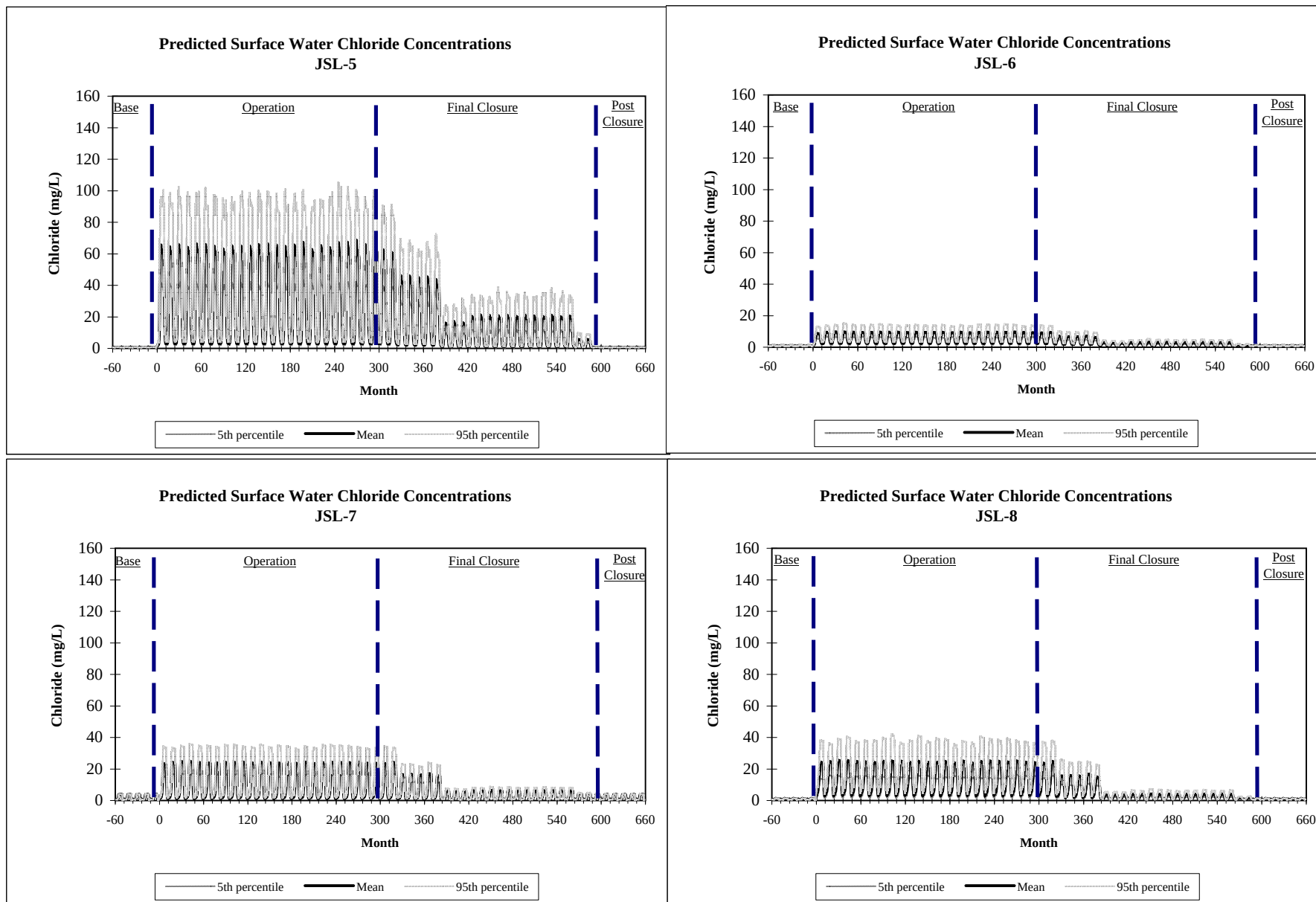


Figure 7.2-1 Water Quality Predictions

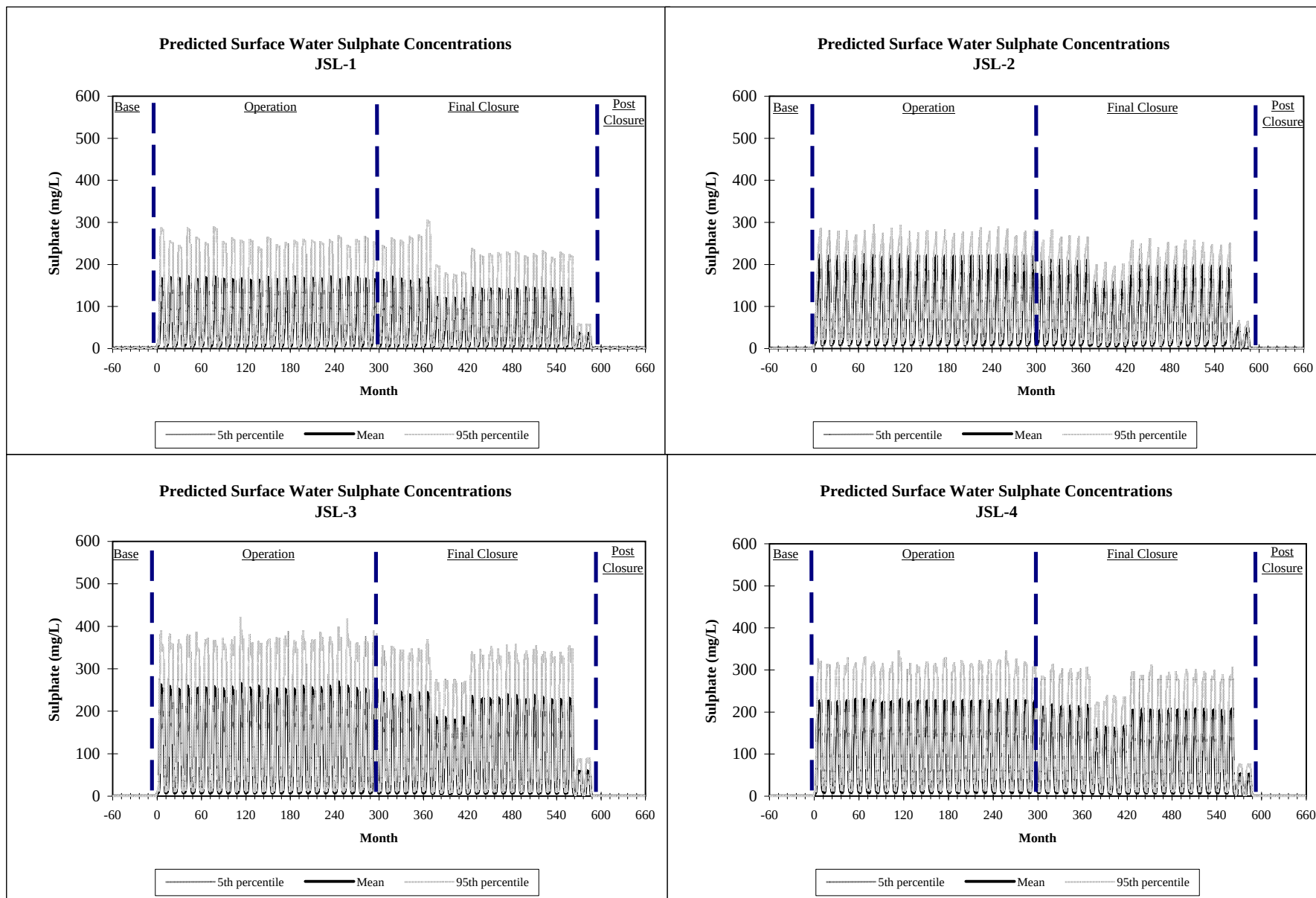


Figure 7.2-1 Water Quality Predictions

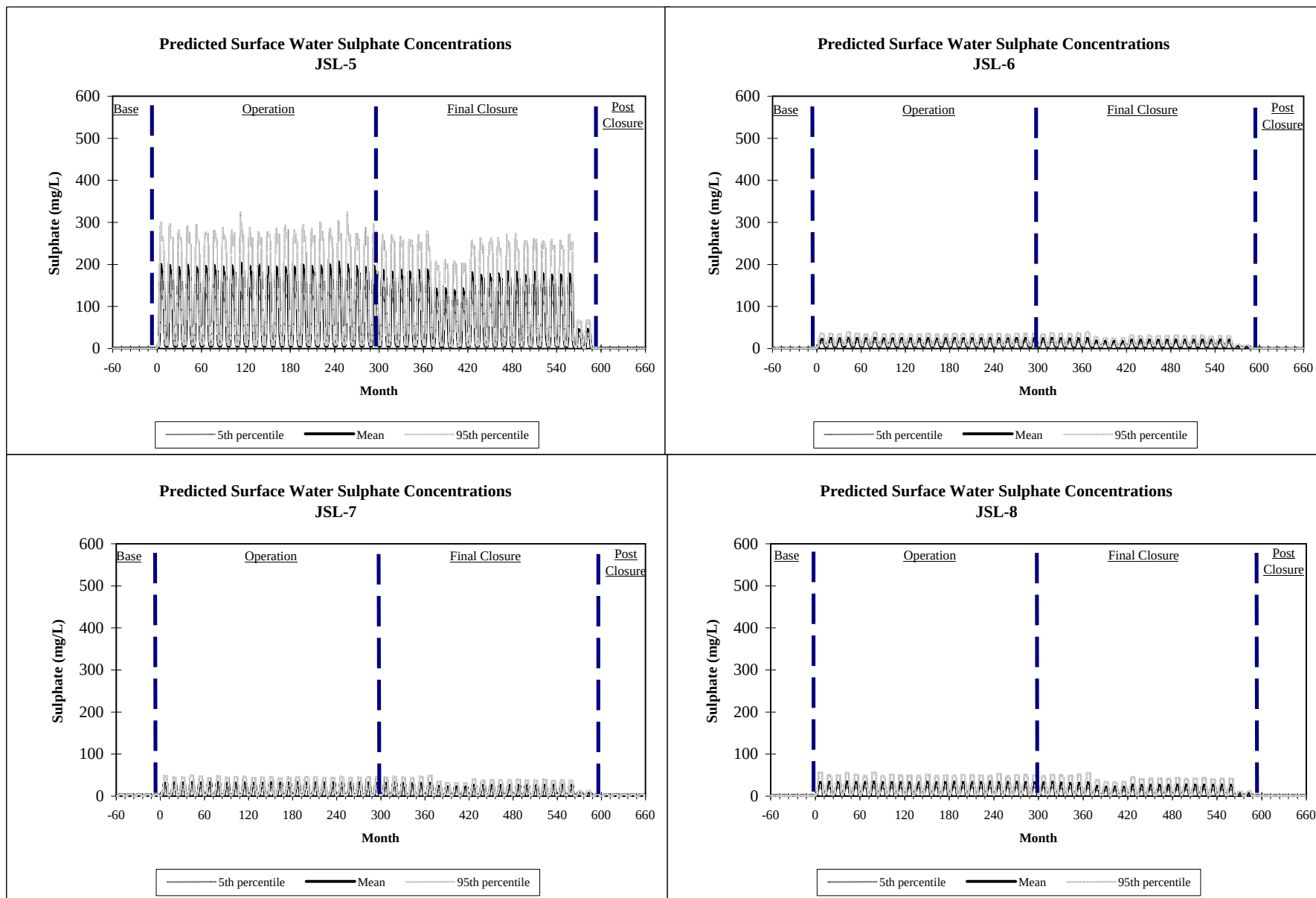


Figure 7.2-1 Water Quality Predictions

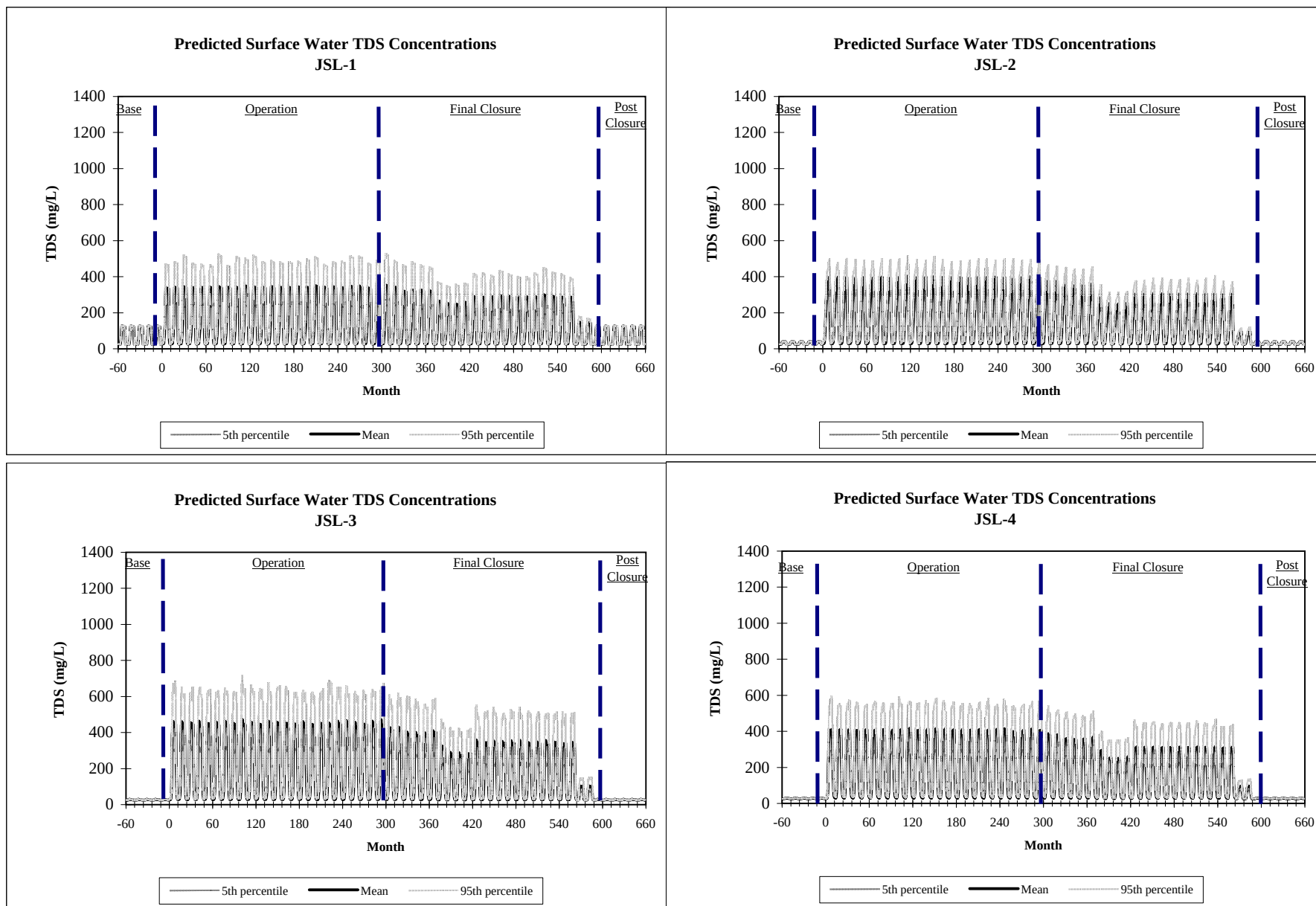


Figure 7.2-1 Water Quality Predictions

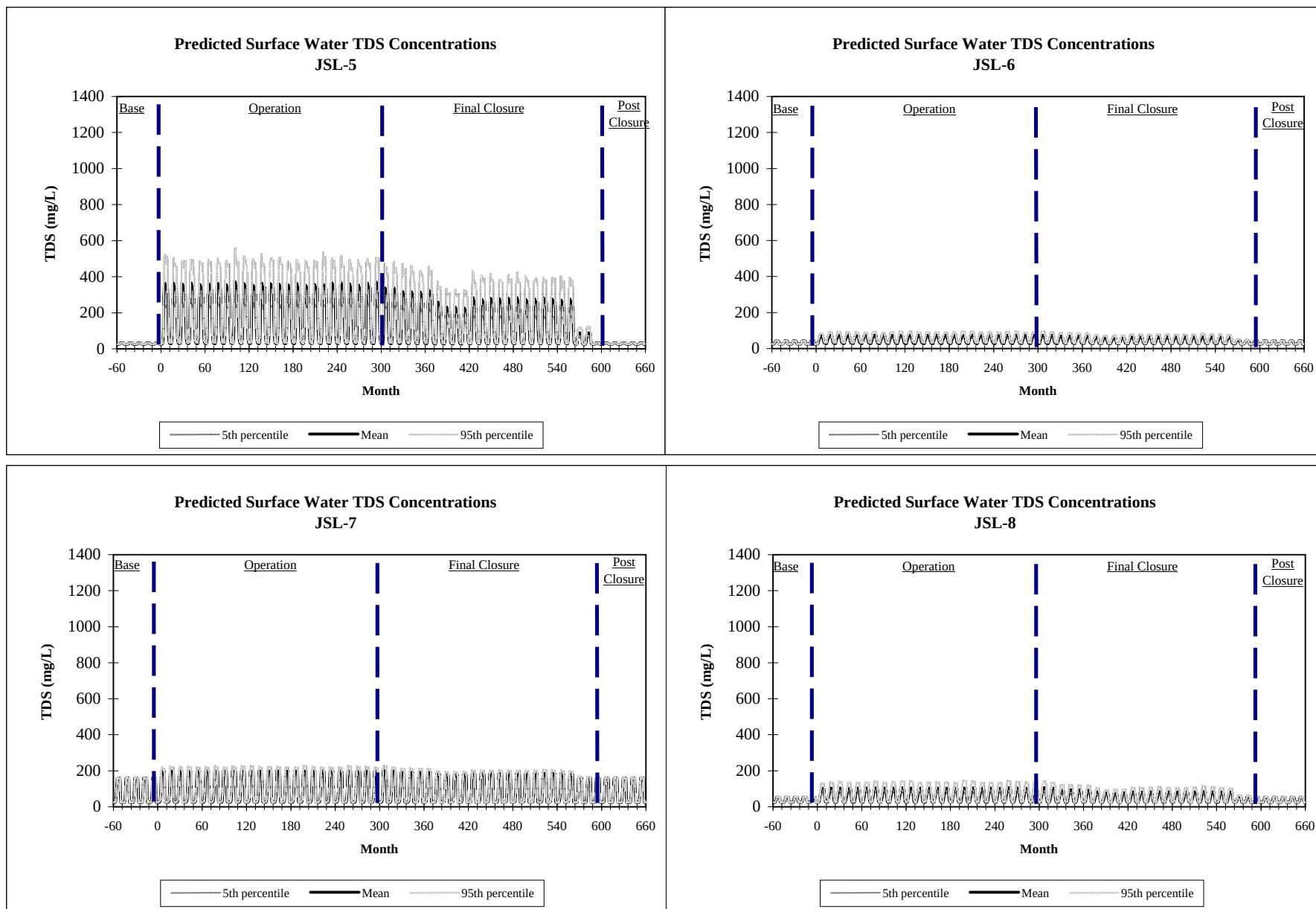


Figure 7.2-1 Water Quality Predictions

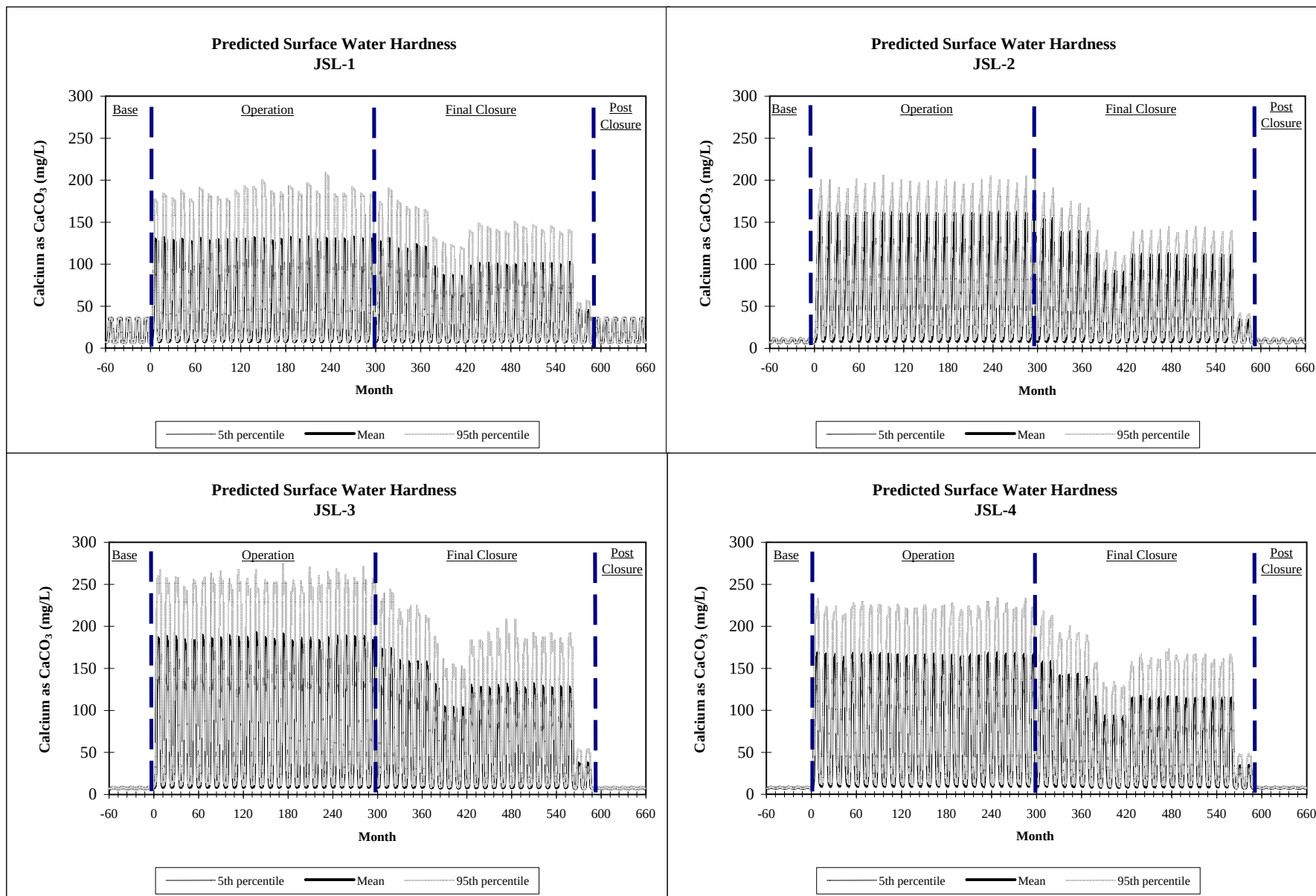


Figure 7.2-1 Water Quality Predictions

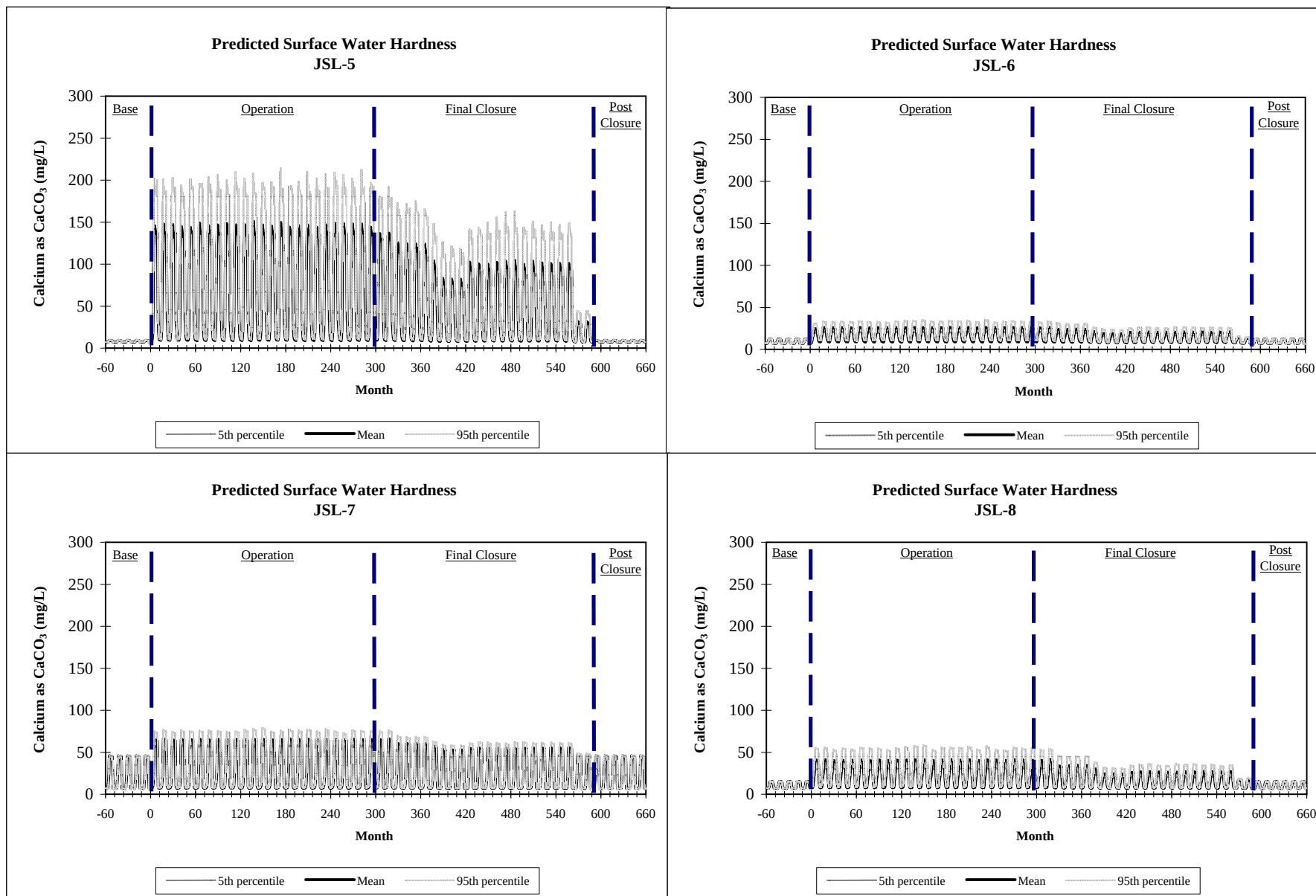


Figure 7.2-1 Water Quality Predictions

concentrations in JSL-1 (for uranium, from 0.1 to 0.5 µg/L) compared with concentrations in JSL-4 (for uranium, from 0.1 to 0.12 µg/L).

The operation phase shows the predicted water quality results under the assumed effluent release for the extended operation of Option 1, which considers discharge of the Kiggavik WTP to JSL-2 and Sissons WTP to JSL-8. The effluent is distributed throughout Judge Sissons Lake by natural flow processes and horizontal dispersion. Figure 7.2-1 illustrates the range of predicted water concentrations in each of the Judge Sissons Lake segments during the operation phase. Comparison of the baseline phase with the operation phase gives an indication of which COPC in the effluent have more of an influence on the water quality in the various Judge Sissons Lake segments. For example, comparison between the baseline and operation phase concentrations of uranium at JSL-1 shows that uranium in the effluent discharge creates a noticeable difference, while concentrations of thorium-230 are essentially the same between the two phases.

The final closure phase represents the predicted water quality under the bounding case decommissioning scenario with 22-years of Main Zone consolidation. As effluent releases are gradually decreased through this phase, Figure 7.2-1 shows that water quality is predicted to approach baseline concentrations as effluent discharge. The system is shown to respond relatively quickly to changes in the effluent release scenario.

Finally, the post-closure phase shows the recovery of predicted water quality for Judge Sissons Lake after effluent releases have stopped. Again, the system responds quickly and returns to baseline/pre-operation conditions, and the water effluent scenario assessed indicates that the Project does not have long-term impacts on the water quality of Judge Sissons Lake.

The associated water quality guidelines are indicated on the graphs. For the COPC with water quality guidelines available, predicted water concentrations of uranium, arsenic, lead, molybdenum, nickel, selenium, zinc, and un-ionized ammonia were below the guidelines in all segments of Judge Sissons Lake. For cadmium, predicted concentrations in water exceed the Canadian Water Quality Guideline (CWQG) of 0.017 µg/L at all points of the assessment, including baseline summer concentrations. Effluent discharge does have an influence on cadmium concentrations in water; however the baseline cadmium concentrations were taken to be at the detection limit of 0.05 µg/L, which is above the CWQG.

The CWQG for cadmium provided by CCME is dated as it is consistent with that presented in previous documents (CCME 1996). A more recent assessment of the aquatic toxicity information was considered in the evaluation of a water quality criterion for cadmium by the US EPA (2001). The US EPA developed a hardness-dependent criteria based on an assessment of the complete database of information (U.S. EPA 2009). As discussed previously, due to the presence of the ice cover in Judge Sissons Lake there is expected to be fluctuation concentrations during the year. This was examined for JSL-1 which is a shallow segment directly adjacent to the Kiggavik WTP discharge location and JSL-4 a larger segment that represents the outflow from the lake. Table 7.2-1 provides the estimated hardness; the

calculated criterion following the EPA approach; and, the estimated cadmium concentration for JSL-1 and JSL-4 separately for the summer and winter periods. This table shows that cadmium levels are within the acceptable level during winter and only marginally above an appropriate comparison level during summer. It should be noted that the concentrations are total (i.e. reflect both baseline and Project effects) and baseline levels could not be reliably established (cadmium was not detected and was assumed to be present at 0.05 µg/L).

Table 7.2-1 Summary of Cadmium Water Concentrations and Appropriate Criteria for the Summer and Winter Periods

	Estimated Hardness (mg/L)	Calculated Cadmium Water Quality Criterion ^(a) (µg/L)	Estimated Cadmium Concentration in Water ^(b) (µg/L)
JSL-1			
Summer	13	0.06	0.070
Winter	115	0.27	0.44
JSL-4			
Summer	20	0.08	0.086
Winter	176	0.36	0.25
Note: a Water quality criterion calculated following the approach adopted by the US EPA b Concentrations include baseline level of <0.1 µg/L (taken to be 0.05 µg/L during the summer)			

Predicted water quality for copper indicates that effluent from the Project has limited influence on the water quality in Judge Sissons Lake segments; however, copper concentrations in JSL-1 and JSL-7 exceed the CWQG. This is a baseline condition.

7.2.1 Predicted Downstream Impacts on Water Quality

An analysis was completed to evaluate the potential impacts on water quality downstream of Judge Sissons Lake. Judge Sissons Lake is part of the Anigaaq River watershed and the Anigaaq River ultimately drains into the western edge of Baker Lake, which in turn drains into Chesterfield Inlet and finally into Hudson Bay.

The outlet of Judge Sissons Lake is JSL-4 and the mean annual discharge from Judge Sissons Lake is 4.289 m³/s (Appendix 5A). Mean daily discharge data from an hydrometric station (Environment Canada station name: 06MA007) located about 1 km downstream of Audra Lake was characterized to evaluate the potential impacts on water quality from natural water flow out of Judge Sissons Lake. Mean daily discharge data collected for 14 years between 1984 and 2010 was characterized by an average daily discharge rate of 14.976 m³/s.

Table 7.2-2 shows the estimated incremental downstream water concentrations as a result of a dilution of the water from the outlet of Judge Sissons Lake (JSL-4). Baseline water quality and Canadian Water Quality Guidelines (CWQG) are also provided, as available. From the table, it can be seen that the predicted incremental downstream water concentrations are well below the available CWQG for all COPC, with the exception of cadmium, which exceeds the CWQG at the baseline concentration and with the predicted incremental downstream concentration. For the radionuclides, cobalt, and TDS, which do not have applicable CWQG, the predicted incremental concentrations are below the baseline levels. For chloride, sulphate, and hardness, predicted incremental concentrations are above baseline concentrations but below concentrations associated with toxicity (Table 6.1-1).

7.3 PREDICTED SEDIMENT QUALITY

Table 7.3-1 presents the maximum mean monthly predicted sediment concentrations in the eight segment of Judge Sissons Lake for each of the four phases of the bounding effluent release scenario (O1Ex22). The four phases of effluent release are: baseline conditions (pre-operation), operation phase, final closure phase, and post-closure phase.

The baseline results provide the sediment quality in each segment under natural conditions.

The operation phase shows the predicted sediment quality results under the assumed effluent release for the extended operation of Option 1, which considers discharge of the Kiggavik WTP to JSL-2 and Sissons WTP to JSL-8. Generally, the sediment is not affected by the effluent contribution to the Judge Sissons water column; however, there are changes in sediment quality predicted for uranium, arsenic, cadmium, molybdenum, and selenium.

Table 7.2-2 Predicted Impact on Downstream Water Quality

Constituent	Units	Baseline WQ	CWQG ^a	WQ at Outlet (JSL-4) ⁱ		ΔC Downstream WQ	
				Max	Mean	Max	Mean
Uranium	µg/L	0.064	15	0.2	0.4	0.06	0.11
Thorium-230	Bq/L	0.006	-	0.006	0.006	0.002	0.002
Lead-210	Bq/L	0.011	-	0.011	0.012	0.003	0.003
Radium-226	Bq/L	0.004	-	0.004	0.004	0.001	0.001
Polonium-210	Bq/L	0.005	-	0.005	0.006	0.001	0.002
Arsenic	µg/L	0.16	5	0.3	0.4	0.08	0.11
Cadmium	µg/L	0.05	0.017 ^b	0.09	0.11	0.025	0.031
Cobalt	µg/L	0.06	-	0.08	0.10	0.02	0.03
Copper	µg/L	0.8	2.0 ^c	0.8	0.8	0.2	0.2
Lead	µg/L	0.14	1.0 ^d	0.11	0.13	0.03	0.04
Molybdenum	µg/L	0.09	73	2.1	3.8	0.6	1.1
Nickel	µg/L	0.6	25.0 ^e	0.6	0.7	0.2	0.2
Selenium	µg/L	0.06	1.0	0.13	0.14	0.04	0.04

Constituent	Units	Baseline WQ	CWQG ^a	WQ at Outlet (JSL-4) ^f		ΔC Downstream WQ	
				Max Mean	Max 95th	Max Mean	Max 95th
Zinc	µg/L	4.0	30	4.0	4.0	1.1	1.1
Ammonia (un-ionized)	mg/L	0.04	0.019	0.001	0.001	<0.001	<0.001
Chloride	mg/L	0.64	-	7.2	10.9	2.1	3.1
Sulphate	mg/L	0.78	-	23	35	7	10
TDS	mg/L	24.6	-	53	71	15	20
Hardness (Ca as CaCO ₃)	mg/L	2.8	-	19	26	6	7

Note:

Calculated based on the assumption of a mean annual flow of 4.289 m³/s out of JSL-4 and a mean annual flow of 14.976 m³/s at the downstream Anigaq River station.

a = Canadian Water Quality Guideline.

b = The guidelines for cadmium are hardness-dependent; at hardnesses ranging from 0 to 48.5 mg/L as CaCO₃, the guideline is 0.000017 mg/L.

c = The guidelines for copper are hardness-dependent; at hardnesses ranging from 0 to 120 mg/L as CaCO₃, the guideline is 0.002 mg/L.

d = The guidelines for lead are hardness-dependent; at hardnesses ranging from 0 to 60 mg/L as CaCO₃, the guideline is 0.001 mg/L.

e = The guidelines for nickel are hardness-dependent; at hardnesses ranging from 0 to 60 mg/L as CaCO₃, the guideline is 0.025 mg/L.

f = Maximum mean and 95th percentile summer concentrations were assumed for the assessment of downstream water quality because outflow from Judge Sissons Lake does not occur in the winter.

µg/L = micrograms per litre; Bq/L = Bequerels per litre; mg/L – milligrams per litre

The final closure phase represents the predicted sediment quality under the bounding case decommissioning scenario with 22-years of Main Zone consolidation. As effluent releases are gradually decreased through this phase, Table 7.3-1 shows that sediment quality is predicted to gradually return to baseline levels. The system is predicted to respond relatively quickly to changes in effluent release.

Finally, the post-closure phase shows the recovery of predicted sediment quality for Judge Sissons Lake after effluent releases have stopped. Again, the system responds quickly and returns to baseline/pre-operation conditions. The water effluent scenario assessed for the Project does not have long-term impacts on the sediment quality of Judge Sissons Lake.

Table 7.3-2 presents a summary of the maximum predicted mean and 95th percentile sediment concentrations over the duration of the assessment (i.e., all four phases of the effluent release scenario). The associated sediment quality guidelines are indicated in Tables 7.3-1 and 7.3-2. For the COPC with sediment quality guidelines available, predicted sediment concentrations of all COPC were below the guidelines in all segments of Judge Sissons Lake, with the exception of nickel. The 95th percentile predicted concentration of nickel in sediment is slightly elevated compared to the Thompson et al. (2005) lowest effects level (LEL) during all phases of the assessment, including baseline. Predicted nickel concentrations in sediment are well below the severe effects level (SEL) of 484 µg/g.

Table 7.3-1 Maximum Predicted Mean Sediment Concentrations in Each Phase of the Assessment

COPC	Units	SQG		JSL-1				JSL-2				JSL-3			
		LEL/ ISQG	SEL/ PEL	Base	Oper.	Final	Post	Base	Oper.	Final	Post	Base	Oper.	Final	Post
U	µg/g	104.4	5874	2.7	2.8	2.8	2.7	2.7	2.8	2.8	2.7	2.7	2.8	2.8	2.7
Th-230	Bq/g	-	-	0.05	0.05	0.05	0.05	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Pb-210	Bq/g	0.9	21	0.12	0.12	0.12	0.12	0.11	0.12	0.12	0.11	0.11	0.11	0.11	0.11
Ra-226	Bq/g	0.6	14.4	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Po-210	Bq/g	0.8	12	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
As	µg/g	9.8	346	8.3	8.5	8.5	8.4	8.3	8.5	8.5	8.4	8.3	8.4	8.4	8.3
Cd	µg/g	0.6	3.5	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.2
Co	µg/g	-	-	8.9	8.9	8.9	8.9	8.9	9.7	9.9	9.8	8.9	9.2	9.3	9.2
Cu	µg/g	22	269	21.3	21.3	21.3	21.3	21.2	21.2	21.2	21.2	21.1	21.1	21.1	21.1
Pb	µg/g	37	412	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.0	10.1	10.1	10.0
Mo	µg/g	13.8	1238	1.3	2.3	2.3	1.4	1.3	2.2	2.3	1.4	1.3	2.1	2.2	1.4
Ni	µg/g	23	484	22.6	22.7	22.7	22.7	22.5	22.6	22.6	22.5	22.4	22.5	22.5	22.4
Se	µg/g	1.9	16.1	0.7	0.7	0.7	0.7	0.6	0.7	0.7	0.6	0.6	0.7	0.7	0.6
Zn	µg/g	123	315	71.8	71.8	71.8	71.8	71.1	71.1	71.1	71.1	70.8	70.8	70.8	70.8

COPC	Units	SQG		JSL-4				JSL-5				JSL-6			
		LEL/ ISQG	SEL/ PEL	Base	Oper.	Final	Post	Base	Oper.	Final	Post	Base	Oper.	Final	Post
U	µg/g	104.4	5874	2.7	2.8	2.8	2.7	2.7	2.8	2.8	2.7	2.7	2.8	2.7	2.7
Th-230	Bq/g	-	-	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Pb-210	Bq/g	0.9	21	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
Ra-226	Bq/g	0.6	14.4	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Po-210	Bq/g	0.8	12	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
As	µg/g	9.8	346	8.3	8.4	8.4	8.3	8.3	8.4	8.4	8.3	8.3	8.3	8.3	8.3
Cd	µg/g	0.6	3.5	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Co	µg/g	-	-	8.9	9.1	9.2	9.1	8.9	9.0	9.1	9.1	8.9	8.8	8.6	8.4
Cu	µg/g	22	269	21.1	21.1	21.1	21.1	21.1	21.1	21.1	21.1	21.2	21.2	21.2	21.2
Pb	µg/g	37	412	10.0	10.1	10.1	10.0	10.0	10.1	10.1	10.0	10.1	10.1	10.1	10.1
Mo	µg/g	13.8	1238	1.3	2.0	2.0	1.4	1.3	1.9	1.9	1.3	1.3	1.6	1.6	1.3
Ni	µg/g	23	484	22.4	22.5	22.5	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4
Se	µg/g	1.9	16.1	0.6	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Zn	µg/g	123	315	70.8	70.8	70.8	70.8	70.8	70.8	70.8	70.8	71.0	71.0	71.0	71.0
COPC	Units	SQG		JSL-7				JSL-8							
		LEL/ ISQG	SEL/ PEL	Base	Oper.	Final	Post	Base	Oper.	Final	Post				
U	µg/g	104.4	5874	2.7	2.8	2.8	2.8	2.7	2.8	2.8	2.7				
Th-230	Bq/g	-	-	0.05	0.05	0.05	0.05	0.04	0.04	0.04	0.04				
Pb-210	Bq/g	0.9	21	0.12	0.12	0.12	0.12	0.11	0.11	0.11	0.11				
Ra-226	Bq/g	0.6	14.4	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05				
Po-210	Bq/g	0.8	12	0.11	0.12	0.12	0.12	0.11	0.11	0.11	0.11				
As	µg/g	9.8	346	8.4	8.4	8.4	8.4	8.3	8.4	8.3	8.3				
Cd	µg/g	0.6	3.5	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2				
Co	µg/g	-	-	8.9	8.8	8.8	8.8	8.9	8.8	8.6	8.5				
Cu	µg/g	22	269	21.3	21.3	21.3	21.3	21.2	21.2	21.2	21.2				
Pb	µg/g	37	412	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1				
Mo	µg/g	13.8	1238	1.3	1.6	1.6	1.3	1.3	1.8	1.8	1.3				
Ni	µg/g	23	484	22.7	22.7	22.7	22.7	22.5	22.5	22.5	22.5				
Se	µg/g	1.9	16.1	0.7	0.7	0.7	0.7	0.6	0.6	0.6	0.6				
Zn	µg/g	123	315	72.0	72.0	72.0	72.0	71.2	71.2	71.2	71.2				

Table 7.3-2 Maximum Predicted Mean and 95th Percentile Sediment Concentrations

COPC	Units	SQG		JSL-1		JSL-2		JSL-3		JSL-4	
		LEL/ ISQG	SEL/ PEL	Mean	95th	Mean	95th	Mean	95th	Mean	95th
U	µg/g	104.4	5874	2.8	2.9	2.8	2.9	2.8	2.9	2.8	2.9
Th-230	Bq/g	-	-	0.05	0.05	0.04	0.05	0.04	0.05	0.04	0.05
Pb-210	Bq/g	0.9	21	0.12	0.13	0.12	0.13	0.11	0.12	0.11	0.12
Ra-226	Bq/g	0.6	14.4	0.05	0.06	0.05	0.06	0.05	0.06	0.05	0.06
Po-210	Bq/g	0.8	12	0.11	0.12	0.11	0.12	0.11	0.12	0.11	0.12
As	µg/g	9.8	346	8.5	9.1	8.5	9.3	8.4	9.0	8.4	8.9
Cd	µg/g	0.6	3.5	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Co	µg/g	-	-	8.9	9.9	9.9	12.5	9.3	10.8	9.2	10.6
Cu	µg/g	22	269	21.3	21.6	21.2	21.5	21.1	21.4	21.1	21.4
Pb	µg/g	37	412	10.1	10.2	10.1	10.2	10.1	10.2	10.1	10.1
Mo	µg/g	13.8	1238	2.3	3.3	2.3	3.3	2.2	2.9	2.0	2.6
Ni	µg/g	23	484	22.7	23.5	22.6	23.3	22.5	23.0	22.5	23.0
Se	µg/g	1.9	16.1	0.7	0.9	0.7	0.9	0.7	0.8	0.7	0.8
Zn	µg/g	123	315	71.8	74.4	71.1	73.3	70.8	72.6	70.8	72.6
COPC	Units	SQG		JSL-5		JSL-6		JSL-7		JSL-8	
		LEL/ ISQG	SEL/ PEL	Mean	95th	Mean	95th	Mean	95th	Mean	95th
U	µg/g	104.4	5874	2.8	2.9	2.8	2.8	2.8	3.0	2.8	3.1
Th-230	Bq/g	-	-	0.04	0.05	0.04	0.05	0.05	0.05	0.04	0.05
Pb-210	Bq/g	0.9	21	0.11	0.12	0.11	0.12	0.12	0.14	0.11	0.12
Ra-226	Bq/g	0.6	14.4	0.05	0.06	0.05	0.05	0.05	0.06	0.05	0.06
Po-210	Bq/g	0.8	12	0.11	0.12	0.11	0.12	0.12	0.13	0.11	0.12
As	µg/g	9.8	346	8.4	8.9	8.3	8.6	8.4	9.0	8.4	8.8
Cd	µg/g	0.6	3.5	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Co	µg/g	-	-	9.1	10.5	8.9	9.9	8.9	9.9	8.9	9.9
Cu	µg/g	22	269	21.1	21.4	21.2	21.4	21.3	21.7	21.2	21.4
Pb	µg/g	37	412	10.1	10.1	10.1	10.1	10.1	10.2	10.1	10.2
Mo	µg/g	13.8	1238	1.9	2.3	1.6	2.0	1.6	1.9	1.8	2.2
Ni	µg/g	23	484	22.4	23.0	22.4	22.9	22.7	23.6	22.5	23.0
Se	µg/g	1.9	16.1	0.6	0.8	0.6	0.7	0.7	0.8	0.6	0.7
Zn	µg/g	123	315	70.8	72.6	71.0	72.8	72.0	74.8	71.2	73.1
Note: BOLD SHADED values exceed the LEL/ISQG sediment guidelines.											

7.4 PREDICTED SOIL QUALITY

Using the soil model described in Section 2.9.1, soil concentrations were predicted for the duration of the assessment at various locations around the Project area. Table 7.4-1 presents a summary of the maximum predicted mean and 95th percentile soil concentrations over the duration of the assessment for the Kiggavik site, LSA, RSA, and Baker Lake areas. The soil quality guidelines (SQG) for agricultural and residential/parkland from CCME (1999) are also provided in Table 7.4-1. All predicted soil concentrations are below the available SQG in all phases of the assessment. Soil baseline concentrations are also provided in Table 7.4-1 to illustrate that there is very little change in soil concentrations predicted as a result of the Project.

Table 7.4-1 Maximum Predicted Mean and 95th Percentile Soil Concentrations

COPC	Units	SQG		Baseline	Predicted Soil Concentrations							
					Kiggavik Camp		LSA		RSA		Baker Lake	
		Ag.	Res/Prk		Mean	95th	Mean	95th	Mean	95th	Mean	95th
U	µg/g	23	23	1.2	1.3	1.4	1.2	1.3	1.2	1.3	1.2	1.3
Th-230	Bq/g	-	-	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Pb-210	Bq/g	-	-	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Ra-226	Bq/g	-	-	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Po-210	Bq/g	-	-	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
As	µg/g	12	12	3.8	3.8	4.2	3.8	4.2	3.8	4.2	3.8	4.2
Cd	µg/g	1.4	10	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Co	µg/g	40	50	4.0	4.0	4.4	4.0	4.4	4.0	4.4	4.0	4.4
Cu	µg/g	63	63	8.9	9.0	9.9	9.0	9.9	9.0	9.9	9.0	9.9
Pb	µg/g	70	140	13.7	13.7	15.1	13.7	15.1	13.7	15.1	13.7	15.1
Mo	µg/g	5	10	1.8	1.8	2.0	1.8	2.0	1.8	2.0	1.8	2.0
Ni	µg/g	50	50	12.4	12.4	13.7	12.4	13.7	12.4	13.7	12.4	13.7
Se	µg/g	1	1	0.8	0.8	0.9	0.8	0.9	0.8	0.9	0.8	0.9
Zn	µg/g	200	200	14.2	14.2	15.7	14.2	15.7	14.2	15.7	14.2	15.7
Note: Soil Quality Guidelines (SQG) for Agricultural and Residential/Parkland from CCME (1999).												

Note: Soil Quality Guidelines (SQG) for Agricultural and Residential/Parkland from CCME (1999).

7.5 PREDICTED TERRESTRIAL VEGETATION QUALITY

7.5.1 Exposure to COPC

Terrestrial vegetation concentrations were predicted for the assessment period using the terrestrial vegetation model described in Section 2.9.3. Tables 7.5-1 through 7.5-4 present the maximum predicted mean and 95th percentile lichen, browse, forage, and berry concentrations for the Kiggavik site, LSA, RSA, and Baker Lake areas over the assessment period. The predicted concentrations of browse and forage are compared to concentrations that are associated with phytotoxicity.

All predicted browse and forage concentrations are below the available phytotoxic benchmarks, with the exception of predicted zinc concentrations in browse and forage and cobalt and copper in browse at the four assessment locations. The values that are above the benchmark are attributable due to baseline levels; the project emissions are having little affect on the concentrations as shown by a comparison of the mean values at different locations provided in the table. This indicates that no change is expected on vegetation as a result of emissions from the Project for these COPC and thus no adverse effects are expected.

There is a lack of available phytotoxicity values for some COPC in browse and forage as well as for lichen and berries. For browse, forage and berries, with the exception of uranium at the Kiggavik camp site, there is expected to be little change between the measured baseline concentrations and the Project increment. This indicates that no change is expected on vegetation as a result of emissions from the Project for these COPC. In addition, all predicted soil concentrations, including uranium, are expected to be below the available Soil Quality Guidelines, which are set to protect vegetation. Thus, no adverse effects on vegetation are expected.

For lichen, there is the potential for a measureable change in concentration of several COPC at the Kiggavik camp (used to represent on-site vegetation). Unfortunately there are no appropriate benchmarks in which to judge the potential for an effect. Lichens exhibit a range of tolerances to metals. Some species of *Cladonia*, *Peltigera*, and *Stereocaulon* can tolerate high levels of metals, and may even be found growing on mining spoils or other metal-enriched substrates (USDA Forest Service 2011). To place the results in context, the estimated lichen concentrations were compared to measurements collected from exposed areas near another uranium mine site (McClean). In general, with the exception of on-site locations the estimated concentration is either close to baseline or within the range experienced at other sites. A formal evaluation of the health of lichen at the McClean site has not been undertaken but there is a relative abundance of reindeer lichen at exposure sites and field staff have not reported any obvious signs of stress. Based on the available information, it is not expected that there would be widespread effects on lichen; however, it is uncertain whether there will be any effects on lichen on the Kiggavik Project site due to metal accumulation. The potential food-chain impacts for animals that consume lichen is addressed in Section 8.

Table 7.5-1 Maximum Predicted Mean and 95th Percentile Lichen Concentrations

COPC	Units	Phytotoxic Concentration ^a		Baseline	Predicted Lichen Concentrations							
		dw	ww		Kiggavik Camp		LSA		RSA		Baker Lake	
					Mean	95th	Mean	95th	Mean	95th	Mean	95th
U	µg/g ww	-	-	0.03	48.6	110	3.9	8.8	0.8	1.8	0.1	0.2
Th-230	Bq/g ww	-	-	0.002	0.11	0.28	0.010	0.03	0.004	0.01	0.002	0.005
Pb-210	Bq/g ww	-	-	0.46	1.1	2.7	0.51	1.3	0.47	1.2	0.46	1.1
Ra-226	Bq/g ww	-	-	0.003	0.25	0.58	0.02	0.05	0.01	0.02	0.003	0.01
Po-210	Bq/g ww	-	-	0.39	3.0	7.1	0.60	1.3	0.43	0.97	0.40	0.87
As	µg/g ww	-	-	0.09	0.2	0.6	0.1	0.3	0.1	0.2	0.1	0.2
Cd	µg/g ww	-	-	0.13	7.4	20.9	1.7	4.7	0.4	1.2	0.1	0.4
Co	µg/g ww	-	-	0.15	4.4	10.2	0.6	1.3	0.2	0.5	0.2	0.4
Cu	µg/g ww	-	-	2.2	2.3	5.5	2.2	5.4	2.2	5.3	2.2	5.3
Pb	µg/g ww	-	-	0.71	1.2	2.7	0.8	1.6	0.7	1.5	0.7	1.5
Mo	µg/g ww	-	-	0.15	0.4	1.0	0.2	0.4	0.2	0.4	0.2	0.4
Ni	µg/g ww	-	-	1.1	8.0	19.8	2.0	4.7	1.3	3.0	1.1	2.5
Se	µg/g ww	-	-	0.27	0.5	1.3	0.3	0.7	0.3	0.7	0.3	0.7
Zn	µg/g ww	-	-	34.5	40	95	35	83	35	82	35	82
Note:												
a = no applicable phytotoxic concentrations available for lichen.												

Table 7.5-2 Maximum Predicted Mean and 95th Percentile Browse Concentrations

COPC	Units	Phytotoxic Concentration		Baseline	Predicted Browse Concentrations							
					Kiggavik Camp		LSA		RSA		Baker Lake	
		dw	ww ^a		Mean	95th	Mean	95th	Mean	95th	Mean	95th
U	µg/g ww	-	-	0.001	0.021	0.047	0.003	0.006	0.002	0.003	0.001	0.003
Th-230	Bq/g ww	-	-	0.0003	0.0006	0.0011	0.0004	0.0007	0.0003	0.0007	0.0003	0.0007
Pb-210	Bq/g ww	-	-	0.04	0.04	0.06	0.04	0.06	0.04	0.06	0.04	0.06
Ra-226	Bq/g ww	-	-	0.001	0.0017	0.003	0.0014	0.003	0.0014	0.003	0.0014	0.003
Po-210	Bq/g ww	-	-	0.04	0.04	0.08	0.04	0.08	0.04	0.08	0.04	0.08
As	µg/g ww	3 ^b	1.4	0.19	0.2	0.8	0.2	0.8	0.2	0.8	0.2	0.8
Cd	µg/g ww	5 ^{b,c}	2.3	0.42	0.4	1.2	0.4	1.2	0.4	1.2	0.4	1.2
Co	µg/g ww	3 ^d	1.4	0.47	0.47	1.8	0.47	1.8	0.47	1.8	0.47	1.8
Cu	µg/g ww	25 ^b	10.5	6.5	6.6	15.3	6.6	15.3	6.6	15.3	6.6	15.3
Pb	µg/g ww	20 ^d	9.3	0.22	0.2	0.6	0.2	0.6	0.2	0.6	0.2	0.6
Mo	µg/g ww	10 ^c	4.7	0.57	0.6	2.2	0.6	2.2	0.6	2.2	0.6	2.2
Ni	µg/g ww	50 ^b	21	1.6	1.6	4.1	1.6	4.1	1.6	4.1	1.6	4.1
Se	µg/g ww	-	-	0.01	0.01	0.04	0.01	0.04	0.01	0.04	0.01	0.04
Zn	µg/g ww	100 ^c	47	157	157	399	157	399	157	399	157	399

Note: **BOLD SHADED** values exceed the phytotoxic levels.

a = dry weight (dw) concentrations converted to wet weight (ww) concentrations using an assumed moisture content of 53%.

b = Phytotoxic conc. In plant foliage. Langmuir, D., P. Chrostowski, B. Vigneault and R. Chaney 2004. Issue Paper on the Environmental Chemistry of Metals. Submitted to U.S. Environmental Protection Agency, Risk Assessment Forum, Washington, DC. ERG, Lexington, MA.

c = Leaf tissue concentration in plants that are neither sensitive or tolerant McBride, M.B. 1994 Environmental Chemistry of Soils. Oxford University Press Inc. New York, NY.

d = Upper Critical Level in leaves and shoots of spring barley associated with reduced yield. Davis, R.D., P.H.T. Beckett and E. Wollan 1978. Critical Levels of Twenty Potentially Toxic Elements in Young Spring Barley. Plant Soil 49: 395-408.

Table 7.5-3 Maximum Predicted Mean and 95th Percentile Forage Concentrations

COPC	Units	Phytotoxic Concentration		Baseline	Predicted Forage Concentrations							
		dw	ww ^a		Kiggavik Camp		LSA		RSA		Baker Lake	
					Mean	95th	Mean	95th	Mean	95th	Mean	95th
U	µg/g ww	-	-	0.07	0.09	0.3	0.08	0.3	0.07	0.3	0.07	0.3
Th-230	Bq/g ww	-	-	0.01	0.01	0.02	0.01	0.02	0.01	0.02	0.01	0.02
Pb-210	Bq/g ww	-	-	0.12	0.12	0.39	0.12	0.39	0.12	0.39	0.12	0.39
Ra-226	Bq/g ww	-	-	0.01	0.01	0.04	0.01	0.04	0.01	0.04	0.01	0.04
Po-210	Bq/g ww	-	-	0.07	0.08	0.22	0.08	0.22	0.08	0.22	0.08	0.22
As	µg/g ww	3 ^b	1.4	0.06	0.06	0.3	0.06	0.3	0.06	0.3	0.06	0.3
Cd	µg/g ww	5 ^{b,c}	2.3	0.08	0.08	0.2	0.08	0.2	0.08	0.2	0.08	0.2
Co	µg/g ww	3 ^d	1.4	0.19	0.19	0.7	0.19	0.7	0.19	0.7	0.19	0.7
Cu	µg/g ww	25 ^b	10.5	2.9	2.9	7.3	2.9	7.3	2.9	7.3	2.9	7.3
Pb	µg/g ww	20 ^d	9.3	0.37	0.37	1.2	0.37	1.2	0.37	1.2	0.37	1.2
Mo	µg/g ww	10 ^c	4.7	0.78	0.78	3.0	0.78	2.9	0.78	2.9	0.78	2.9
Ni	µg/g ww	50 ^b	21	1.2	1.2	3.3	1.2	3.3	1.2	3.3	1.2	3.3
Se	µg/g ww	-	-	0.19	0.19	0.4	0.19	0.4	0.19	0.4	0.19	0.4
Zn	µg/g ww	100 ^c	47	21.3	21.4	54.5	21.4	54.5	21.4	54.5	21.4	54.5

Note: **BOLD SHADED** values exceed the phytotoxic levels.

a = dry weight (dw) concentrations converted to wet weight (ww) concentrations using an assumed moisture content of 53%.

b = Phytotoxic conc. In plant foliage. Langmuir, D., P. Chrostowski, B. Vigneault and R. Chaney 2004. Issue Paper on the Environmental Chemistry of Metals. Submitted to U.S. Environmental Protection Agency, Risk Assessment Forum, Washington, DC. ERG, Lexington, MA.

c = Leaf tissue concentration in plants that are neither sensitive or tolerant McBride, M.B. 1994 Environmental Chemistry of Soils. Oxford University Press Inc. New York, NY.

d = Upper Critical Level in leaves and shoots of spring barley associated with reduced yield. Davis, R.D., P.H.T. Beckett and E. Wollan 1978. Critical Levels of Twenty Potentially Toxic Elements in Young Spring Barley. Plant Soil 49: 395-408.

Table 7.5-4 Maximum Predicted Mean and 95th Percentile Berry Concentrations

COPC	Units	Phytotoxic Concentration ^a		Baseline	Predicted Berry Concentrations							
					Kiggavik Camp		LSA		RSA		Baker Lake	
		dw	ww		Mean	95th	Mean	95th	Mean	95th	Mean	95th
U	µg/g ww	-	-	0.002	0.2	0.4	0.02	0.03	0.004	0.01	0.002	0.005
Th-230	Bq/g ww	-	-	0.002	0.004	0.009	0.002	0.006	0.002	0.006	0.002	0.005
Pb-210	Bq/g ww	-	-	0.002	0.004	0.009	0.002	0.005	0.002	0.004	0.002	0.004
Ra-226	Bq/g ww	-	-	0.0002	0.002	0.005	0.0004	0.0009	0.0003	0.0007	0.0002	0.0007
Po-210	Bq/g ww	-	-	0.001	0.003	0.006	0.001	0.002	0.001	0.002	0.001	0.002
As	µg/g ww	-	-	0.03	0.03	0.07	0.03	0.07	0.03	0.07	0.03	0.07
Cd	µg/g ww	-	-	0.02	0.04	0.08	0.02	0.05	0.02	0.05	0.02	0.05
Co	µg/g ww	-	-	0.04	0.05	0.10	0.04	0.10	0.04	0.10	0.04	0.10
Cu	µg/g ww	-	-	1.5	1.5	4.0	1.5	4.0	1.5	4.0	1.5	4.0
Pb	µg/g ww	-	-	0.06	0.07	0.2	0.06	0.2	0.06	0.2	0.06	0.2
Mo	µg/g ww	-	-	0.07	0.08	0.3	0.07	0.3	0.07	0.3	0.07	0.3
Ni	µg/g ww	-	-	0.65	0.66	2.0	0.65	2.0	0.65	2.0	0.65	2.0
Se	µg/g ww	-	-	0.004	0.004	0.012	0.004	0.012	0.004	0.012	0.004	0.012
Zn	µg/g ww	-	-	18.6	18.6	71.7	18.6	71.7	18.6	71.7	18.6	71.7
Note: a = no applicable phytotoxic concentrations available for berry.												

Table 7.5-5 Comparison of Lichen Concentrations to Other Locations

COPC	Units	Average Estimated Lichen Concentration					Average Measured Lichen Concentration		
		Baseline	Kiggavik Camp	LSA	RSA	Baker Lake	JEB	McClean	Sue
U	µg/g ww	0.03	48.6	3.9	0.8	0.1	1.3	3.2	8.4
Th-230	Bq/g ww	0.002	0.11	0.010	0.004	0.002	0.015	0.04	0.1
Pb-210	Bq/g ww	0.46	1.1	0.51	0.47	0.46	0.19	0.21	0.3
Ra-226	Bq/g ww	0.003	0.25	0.02	0.01	0.003	0.018	0.05	0.2
Po-210	Bq/g ww	0.39	3.0	0.60	0.43	0.40	0.17	0.18	0.3
As	µg/g ww	0.09	0.2	0.1	0.1	0.1	0.3	2.4	4.9
Cd	µg/g ww	0.13	7.4	1.7	0.4	0.1	0.03	0.05	0.06
Co	µg/g ww	0.15	4.4	0.6	0.2	0.2	0.04	0.1	0.2
Cu	µg/g ww	2.2	2.3	2.2	2.2	2.2	0.5	0.9	1.0
Pb	µg/g ww	0.71	1.2	0.8	0.7	0.7	0.2	1.8	3.2
Mo	µg/g ww	0.15	0.4	0.2	0.2	0.2	0.1	0.3	0.7
Ni	µg/g ww	1.1	8.0	2.0	1.3	1.1	0.5	3.1	6.0
Se	µg/g ww	0.27	0.5	0.3	0.3	0.3	0.04	0.05	0.06
Zn	µg/g ww	34.5	40	35	35	35	6.7	7.0	7.7

7.5.2 Exposure to NO_x and SO₂

Appendix 4B Air Quality described the air quality modelling completed for the assessment. The maximum incremental concentrations of NO₂ and SO₂ are presented in Table 7.5-6. Also shown in the table are levels associated with effects on vegetation provided by the World Health Organization (WHO).

Table 7.5-6 Assessment of Potential Effects on Vegetation Due to NO₂ and SO₂

Receptor Name	NO ₂ (µg/m ³)	SO ₂ (µg/m ³)	
	Incremental Annual Maximum	Incremental 24-hr Maximum	Incremental Annual Maximum
Accommodation Complex	10.4	15.4	0.6
Judge Sissons Lake Cabin	0.80	0.8	0.03
Community of Baker Lake	0.04	0.04	0.001
Phytotoxicity Benchmark (µg/m³)	19	100	20 ^a 10
Note: Annual concentrations were obtained from Period 2 which had the highest SO₂ and NO_x emission rates. During this period there is open pit mining of Main Zone West pit at Kiggavik and Andrew Lake at Sissons as well as the milling of ores from East Zone, Centre Zone and Main Zone pits. * The phytotoxicity values for NO_x (annual average of 30 µg/m³) have been converted to a NO₂ concentration (assuming NO₂ represents 63% of NO_x) for comparison to model results. a 20 µg/m³ is selected for forests and natural vegetation; 10 µg/m³ is selected for lichen			

As can be seen in the table, 24-hour and annual maximum concentrations of SO₂ are well within the limits of applicable criteria. Therefore no effects on vegetation are expected as a result of exposure to SO₂ from the Kiggavik Project. Similarly, annual NO₂ concentrations meet applicable criteria at all of the selected locations.

8 RESULTS FOR ECOLOGICAL RISK ASSESSMENT

The risk characterization phase combines the information gathered in the exposure and toxicity assessment phases and characterizes the potential for adverse ecological effects.

8.1 AQUATIC RECEPTORS

The risk characterization phase combines the information gathered in the exposure and toxicity assessment phases and characterizes the potential for adverse ecological effects. This section of the report evaluates the risks to aquatic species via comparison of exposure levels to toxicity reference values.

Potential toxic effects of COPC can be measured at different levels of biological and ecological organization. In this study, the potential ecological impacts of different COPC on receptors in the aquatic environment were characterized by the calculation of screening index (SI) values. SI values provide an integrated description of the potential hazard, the exposure (or dose) response relationship and the exposure evaluation (U.S. EPA 1992, AIHC 1992). A SI is calculated by dividing the predicted concentration by the selected toxicity reference value for each aquatic receptor.

The aquatic receptors chosen for the assessment represent several trophic levels in aquatic ecosystems. The aquatic SI values for all species were estimated for the chosen assessment locations for the predicted mean and 95th percentile COPC concentrations in the receiving waters.

It should be noted that the SI values reported in this section are not estimates of the probability of ecological impact. Rather, the SI values are positively correlated with the potential of an effect, that is, higher index values imply greater potential of an effect. In this study, a SI value of 1.0 was used to examine the potential adverse effects of COPC as the assessment is based on the application of chronic effects concentration (EC₂₀) endpoints for the aquatic species. SI values less than 1.0 indicate that the predicted levels are below the corresponding benchmarks. Values greater than 1.0 suggest that there is a potential of observing adverse effects on some species. The probabilistic framework for the assessment captures uncertainty in the model inputs and the evaluation of potential effects at the mean and 95th percentile levels provides a range of the conditions that may occur.

8.1.1 Exposure to Non-Radioactive Constituents

Aquatic SI values were calculated for each of segment of Judge Sissons Lake and are summarized in Table 8.1-1. The maximum predicted mean and 95th percentile water concentrations over the assessment period in each segment were used for the calculation of the

SI values. Therefore, the SI values presented in Table 8.1-1 represent the predicted worst-case results over the entire Project.

The **bold shading** in Table 8.1-1 indicates SI values that are above 1.0. Aquatic SI values were calculated using the maximum monthly mean and 95th percentile predicted concentrations. All COPC have predicted SI values less than 1.0 for all segments of Judge Sissons Lake, with the exception of cadmium for zooplankton, benthic invertebrates, and predator fish, copper for phytoplankton, zooplankton, predator fish, and forage fish and sulphate for zooplankton.

The exceedances of the selected benchmarks for copper in JSL-1 and JSL-7 are due to baseline copper concentrations in the area. There is no difference between the mean and 95th percentile SI values because the effluent discharge from the Project has little impact on the predicted water concentrations. JSL-1 and JSL-7 are shallow segments and therefore experience the largest variation between summer and winter concentrations (Figure 7.2-1). As discussed, aquatic SI values were calculated using the maximum monthly mean and 95th percentile predicted concentrations. Due to winter ice cover, water concentrations during the winter months are predicted to increase because of a reduced volume of free-flowing water. Therefore, the winter concentrations in JSL-1 and JSL-7 are the highest and a potential issue was identified in only these segments although they still reflect baseline conditions.

The release of treated effluent to Judge Sissons Lake does affect the expected concentration of cadmium. In terms of fish, an SI of 1.2 was identified at the 95th percentile for predator fish in JSL-1. While Judge Sissons Lake is deep enough to support fish through the winter, it is unlikely that fish would be present in the most shallow segments (e.g. JSL-1) through the winter months due to a lack of free water. As the maximum concentration occurs in the winter when fish are not present, there is not expected to be any effects on fish from the cadmium levels in the lake.

A potential issue was also identified for the exposure of benthic invertebrates to cadmium in JSL-1. The SI values identified are only slightly above 1 (1.02 at the mean and 1.44 at the 95th percentile). The predicted sediment concentrations (Table 7.3-2) did not identify an issue with benthic invertebrates. Considering the minor exceedance, the limited spatial extent and the results of the sediment analysis no effects on benthic invertebrates from exposure to cadmium are expected.

As seen in Table 8.1-1 a potential issue for zooplankton exposure to cadmium was identified in all segments of Judge Sissons Lake. An important consideration in the determination of the potential toxicity of cadmium is the hardness. The natural condition of Judge Sissons Lake is very low hardness water. However, as shown in Figure 7.2-1 the release of treated effluent will raise the hardness to 100 to 200 mg/L. Under these conditions the toxicity of cadmium will be ameliorated. At a hardness of 100 mg/L the lowest toxicity value for zooplankton available (USGS 2010) is 0.23 µg/L. The SI values for cadmium exposure to zooplankton based on this TRV is shown in Table 8.1-2. This table shows that there are still some potential issues as SI values above 1 are identified for JSL-1, JSL-2, JSL-3, JSL-4 and JSL-7; however the magnitude

of the potential effect is less and these segments represent less than 40% of the total lake area. In addition, the SI values are based on total concentrations (i.e. baseline plus Project effects). Baseline in the area could not be reliably established as the levels were below detection limit and thus cadmium is assumed to be present at 0.05 µg/L. Based on the results of the assessment, some of the more sensitive zooplankton species will be affected in certain segments of the lake; however considering the moderate SI values and the spatial extent of the impact, the zooplankton population of Judge Sisson Lake may experience only localized changes in community composition.

Table 8.1-2 also identified some potential for effects to zooplankton due to exposure to sulphate in JSL-1, JSL-2, JSL-4, JSL-5 (95th percentile only) as well as JSL-3 (mean and 95th percentile). The largest SI value is 1.7 for the 95th percentile in JSL-3. Hardness may also have an ameliorating effect on sulphate toxicity but a definitive relationship has not been developed. Similar to cadmium, it is possible that in certain segments of the lake some of the more sensitive zooplankton species will be affected; however considering the low SI values and the spatial extent of the potential effects, the zooplankton population of Judge Sissons Lake may have some localized changes to community composition.

The toxicity reference values for selenium are for exposure to water only. Exposures for bioaccumulative COPC such as selenium can occur through pathways other than water alone and may be related primarily to the diet. Because it is recognized that selenium has the ability to bioaccumulate through aquatic food webs, a comparison to a fish tissue concentration of 2 µg/g (ww) (U.S.EPA 2004) was done. Predicted fish concentrations in the segments of Judge Sissons Lake are presented in Table 8.1-3. As seen from Table 8.1-3, all selenium concentrations are below a value of 2 µg/g (ww), indicating that there are no potential effects in fish due to bioaccumulation of selenium. As selenium levels in the discharge are low, there is little change to the concentration of selenium predicted for Judge Sissons Lake and the fish are assumed to be able to regulate the uptake of selenium within this range. Therefore, the concentrations shown in Table 8.1-3 for selenium in fish are the same in all segments of the lake and are based on the minimum fish concentration shown in Table 5.1-3.

Table 8.1-1 Predicted Aquatic Screening Index Values for Non-Radioactive Constituents

	JSL-1		JSL-2		JSL-3		JSL-4		JSL-5		JSL-6		JSL-7		JSL-8	
	Mean	95th	Mean	95th	Mean	95th	Mean	95th	Mean	95th	Mean	95th	Mean	95th	Mean	95th
Uranium																
Aquatic Plants	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Phytoplankton	0.10	0.20	0.07	0.15	0.07	0.18	0.06	0.15	0.06	0.13	0.03	0.06	0.13	0.25	0.08	0.17
Benthic Invertebrates	<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
Zooplankton	0.10	0.20	0.07	0.15	0.07	0.18	0.06	0.15	0.06	0.13	0.03	0.06	0.13	0.25	0.08	0.17
Predator Fish	<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
Forage Fish	<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
Arsenic																
Aquatic Plants	<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
Phytoplankton	0.07	0.10	0.04	0.06	0.03	0.05	0.03	0.04	0.02	0.04	0.02	0.02	0.06	0.08	0.02	0.04
Benthic Invertebrates	<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
Zooplankton	<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
Predator Fish	<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
Forage Fish	<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
Cadmium																
Aquatic Plants	0.03	0.05	0.02	0.03	0.02	0.03	0.02	0.02	0.01	0.02	<0.01	0.01	0.02	0.03	<0.01	0.01
Phytoplankton	0.17	0.24	0.11	0.15	0.09	0.15	0.08	0.12	0.07	0.10	0.04	0.05	0.13	0.15	0.05	0.06
Benthic Invertebrates	1.02	1.44	0.67	0.92	0.55	0.88	0.48	0.71	0.41	0.61	0.25	0.32	0.79	0.90	0.30	0.36
Zooplankton	7.28	10.29	4.80	6.55	3.90	6.31	3.46	5.09	2.95	4.32	1.81	2.29	5.67	6.44	2.12	2.59
Predator Fish	0.85	1.20	0.56	0.76	0.46	0.74	0.40	0.59	0.34	0.50	0.21	0.27	0.66	0.75	0.25	0.30
Forage Fish	0.07	0.10	0.05	0.06	0.04	0.06	0.03	0.05	0.03	0.04	0.02	0.02	0.05	0.06	0.02	0.02
Cobalt																
Aquatic Plants	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Phytoplankton	<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
Benthic Invertebrates	<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
Zooplankton	0.09	0.13	0.04	0.06	0.03	0.04	0.02	0.03	0.02	0.03	0.02	0.03	0.09	0.09	0.03	0.03
Predator Fish	<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
Forage Fish	<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

	JSL-1		JSL-2		JSL-3		JSL-4		JSL-5		JSL-6		JSL-7		JSL-8	
	Mean	95th	Mean	95th	Mean	95th	Mean	95th	Mean	95th	Mean	95th	Mean	95th	Mean	95th
Copper																
Aquatic Plants	0.03	0.03	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	0.03	0.01	0.01
Phytoplankton	1.03	1.03	0.37	0.41	0.26	0.30	0.26	0.28	0.28	0.30	0.35	0.35	1.31	1.31	0.43	0.43
Benthic Invertebrates	0.04	0.04	0.01	0.01	<0.01	0.01	<0.01	0.01	0.01	0.01	0.01	0.01	0.05	0.05	0.02	0.02
Zooplankton	1.00	1.00	0.36	0.40	0.26	0.29	0.25	0.28	0.28	0.30	0.34	0.34	1.27	1.27	0.42	0.42
Predator Fish	1.03	1.03	0.37	0.41	0.26	0.30	0.26	0.28	0.28	0.30	0.35	0.35	1.31	1.31	0.43	0.43
Forage Fish	1.00	1.00	0.36	0.40	0.26	0.29	0.25	0.28	0.28	0.30	0.34	0.34	1.27	1.27	0.42	0.42
Lead																
Aquatic Plants	<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
Phytoplankton	<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
Benthic Invertebrates	0.03	0.05	0.02	0.02	0.01	0.02	0.01	0.02	0.01	0.02	0.01	0.01	0.04	0.04	0.01	0.01
Zooplankton	0.03	0.04	0.01	0.02	0.01	0.02	<0.01	0.01	<0.01	0.01	<0.01	0.01	0.03	0.04	0.01	0.01
Predator Fish	0.02	0.03	<0.01	0.01	<0.01	0.01	<0.01	0.01	<0.01	0.01	<0.01	<0.01	0.02	0.03	<0.01	<0.01
Forage Fish	<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
Molybdenum																
Aquatic Plants	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Phytoplankton	<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
Benthic Invertebrates	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Zooplankton	0.03	0.07	0.03	0.06	0.03	0.07	0.03	0.05	0.02	0.05	<0.01	0.01	0.01	0.02	<0.01	0.02
Predator Fish	0.06	0.13	0.06	0.11	0.06	0.13	0.05	0.10	0.04	0.09	0.01	0.02	0.02	0.04	0.02	0.03
Forage Fish	<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
Nickel																
Aquatic Plants	0.02	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	0.02	<0.01	<0.01
Phytoplankton	0.56	0.66	0.26	0.31	0.18	0.25	0.17	0.22	0.17	0.21	0.18	0.19	0.66	0.68	0.22	0.24
Benthic Invertebrates	<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
Zooplankton	0.06	0.07	0.03	0.03	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.07	0.07	0.02	0.03
Predator Fish	0.04	0.05	0.02	0.02	0.01	0.02	0.01	0.02	0.01	0.02	0.01	0.01	0.05	0.05	0.02	0.02
Forage Fish	<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

	JSL-1		JSL-2		JSL-3		JSL-4		JSL-5		JSL-6		JSL-7		JSL-8	
	Mean	95th	Mean	95th	Mean	95th	Mean	95th	Mean	95th	Mean	95th	Mean	95th	Mean	95th
Selenium																
Aquatic Plants	<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
Phytoplankton	<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
Benthic Invertebrates	<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
Zooplankton	0.02	0.02	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	0.02	<0.01	<0.01
Predator Fish	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
Forage Fish	<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
Zinc																
Aquatic Plants	<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
Phytoplankton	0.51	0.51	0.19	0.20	0.13	0.14	0.13	0.14	0.14	0.15	0.17	0.17	0.65	0.65	0.21	0.21
Benthic Invertebrates	0.04	0.04	0.01	0.01	<0.01	0.01	<0.01	<0.01	<0.01	0.01	0.01	0.01	0.05	0.05	0.02	0.02
Zooplankton	0.51	0.51	0.19	0.20	0.13	0.14	0.13	0.14	0.14	0.15	0.17	0.17	0.65	0.65	0.21	0.21
Predator Fish	0.34	0.34	0.13	0.14	0.09	0.10	0.09	0.09	0.09	0.10	0.12	0.12	0.44	0.44	0.14	0.14
Forage Fish	0.19	0.19	0.07	0.07	0.05	0.05	0.05	0.05	0.05	0.05	0.06	0.06	0.24	0.24	0.08	0.08
Un-ionized Ammonia																
Aquatic Plants	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Phytoplankton	<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
Benthic Invertebrates	0.03	0.05	0.06	0.09	0.08	0.13	0.06	0.09	0.06	0.09	<0.01	0.01	0.01	0.03	0.05	0.06
Zooplankton	0.02	0.04	0.04	0.06	0.06	0.10	0.04	0.07	0.04	0.07	<0.01	0.01	<0.01	0.02	0.04	0.04
Predator Fish	0.04	0.07	0.07	0.11	0.10	0.17	0.07	0.12	0.08	0.13	0.01	0.02	0.02	0.04	0.07	0.07
Forage Fish	0.02	0.04	0.04	0.06	0.05	0.09	0.04	0.06	0.04	0.07	<0.01	0.01	<0.01	0.02	0.04	0.04
Chloride																
Aquatic Plants	0.04	0.06	0.06	0.07	0.07	0.11	0.06	0.09	0.05	0.08	<0.01	0.01	0.02	0.04	0.06	0.06
Phytoplankton	0.08	0.14	0.12	0.15	0.15	0.23	0.13	0.20	0.12	0.18	0.02	0.03	0.04	0.08	0.14	0.12
Benthic Invertebrates	0.33	0.56	0.49	0.64	0.61	0.94	0.53	0.81	0.48	0.73	0.07	0.10	0.17	0.33	0.56	0.49
Zooplankton	0.16	0.28	0.24	0.31	0.30	0.46	0.26	0.40	0.24	0.36	0.03	0.05	0.09	0.16	0.28	0.24
Predator Fish	0.13	0.22	0.19	0.25	0.24	0.37	0.21	0.32	0.19	0.29	0.03	0.04	0.07	0.13	0.22	0.19

	JSL-1		JSL-2		JSL-3		JSL-4		JSL-5		JSL-6		JSL-7		JSL-8	
	Mean	95th	Mean	95th	Mean	95th	Mean	95th	Mean	95th	Mean	95th	Mean	95th	Mean	95th
Forage Fish	0.22	0.36	0.32	0.41	0.40	0.61	0.35	0.53	0.31	0.48	0.04	0.07	0.11	0.22	0.36	0.32
Sulphate																
Aquatic Plants	0.21	0.37	0.27	0.35	0.32	0.51	0.28	0.41	0.25	0.39	0.03	0.05	0.04	0.06	0.04	0.07
Phytoplankton	0.15	0.27	0.20	0.26	0.24	0.38	0.21	0.31	0.18	0.29	0.02	0.04	0.03	0.04	0.03	0.05
Benthic Invertebrates	0.16	0.29	0.21	0.28	0.25	0.40	0.22	0.32	0.19	0.31	0.02	0.04	0.03	0.05	0.03	0.05
Zooplankton	0.70	1.24	0.91	1.18	1.09	1.70	0.94	1.39	0.84	1.31	0.10	0.16	0.13	0.20	0.14	0.23
Predator Fish	0.18	0.33	0.24	0.31	0.29	0.45	0.25	0.37	0.22	0.35	0.03	0.04	0.03	0.05	0.04	0.06
Forage Fish	0.34	0.61	0.45	0.58	0.54	0.84	0.46	0.68	0.41	0.64	0.05	0.08	0.06	0.10	0.07	0.11
Note: BOLD SHADING indicates an exceedance of 1.0																

Table 8.1-2 SI Values for Cadmium Exposure to Zooplankton, Hardness Adjusted

Segment	Mean	95 th Percentile
JSL-1	2.21	3.13
JSL-2	1.46	1.99
JSL-3	1.19	1.92
JSL-4	1.05	1.55
JSL-5	0.90	1.32
JSL-6	0.55	0.70
JSL-7	1.72	1.96
JSL-8	0.65	0.79
Note: BOLD SHADING indicates an exceedance of 1.0 SI values calculated using a TRV of 0.23 µg/L which is based on a hardness of 100 mg/L		

Table 8.1-3 Predicted Selenium Concentrations in Fish Tissue

Result	Predicted Selenium Concentrations in Fish Tissue (µg/g ww) – Judge Sissons Lake							
	JSL-1	JSL-2	JSL-3	JSL-4	JSL-5	JSL-6	JSL-7	JSL-8
Mean	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46
95 th Percentile	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80

8.1.2 Radiological Dose

To assess the potential adverse effects of radionuclides to the aquatic environment, the predicted mean and 95th percentile water and sediment concentrations were used to estimate the radiological dose to aquatic receptors in Judge Sissons Lake. The results for dose equivalents calculated with RBE values of 10 and 40 are presented for comparison in Table 8.1-3. Attachment H provides the details of the dose calculation. Estimated doses were compared to the dose rate guidelines as previously discussed in Section 6.3.2. A value greater than 1 indicates that the dose rate guideline for an aquatic receptor is exceeded.

From Table 8.1-3, it can be seen that all calculated doses for aquatic receptors are well below the dose rate guidelines. The largest screening index value (0.091) was calculated for rooted plants in JSL-7 at the 95th percentile, RBE 40.

Table 8.1-3 Results of Radiological Assessment for Aquatic Receptors

	Predicted Screening Index Values			
	RBE=10		RBE=40	
	Average	95th Percentile	Average	95th Percentile
Baseline				
Pelagic Fish	0.003	0.003	0.011	0.011
Forage Fish	0.005	0.005	0.013	0.013
Macrophytes	0.003	0.003	0.013	0.013
Rooted Plants	0.004	0.004	0.013	0.013
Benthic Invertebrates	0.005	0.005	0.017	0.017
JSL-1				
Pelagic Fish	0.015	0.016	0.059	0.066
Forage Fish	0.017	0.019	0.061	0.068
Macrophytes	0.016	0.018	0.062	0.071
Rooted Plants	0.017	0.019	0.063	0.073
Benthic Invertebrates	0.013	0.017	0.052	0.066
JSL-2				
Pelagic Fish	0.007	0.008	0.007	0.030
Forage Fish	0.009	0.010	0.009	0.033
Macrophytes	0.007	0.009	0.007	0.035

	Predicted Screening Index Values			
	RBE=10		RBE=40	
	Average	95th Percentile	Average	95th Percentile
Rooted Plants	0.008	0.010	0.008	0.036
Benthic Invertebrates	0.007	0.009	0.007	0.036
JSL-3				
Pelagic Fish	0.005	0.007	0.019	0.027
Forage Fish	0.007	0.009	0.021	0.029
Macrophytes	0.005	0.008	0.022	0.033
Rooted Plants	0.006	0.009	0.023	0.034
Benthic Invertebrates	0.005	0.009	0.007	0.035
JSL-4				
Pelagic Fish	0.005	0.007	0.019	0.027
Forage Fish	0.007	0.009	0.021	0.029
Macrophytes	0.005	0.008	0.022	0.033
Rooted Plants	0.006	0.009	0.023	0.034
Benthic Invertebrates	0.005	0.009	0.007	0.035
JSL-5				
Pelagic Fish	0.005	0.006	0.019	0.023
Forage Fish	0.007	0.009	0.021	0.026
Macrophytes	0.005	0.007	0.021	0.027
Rooted Plants	0.006	0.008	0.022	0.028
Benthic Invertebrates	0.005	0.008	0.006	0.029
JSL-6				
Pelagic Fish	0.005	0.005	0.020	0.021
Forage Fish	0.007	0.008	0.023	0.024
Macrophytes	0.005	0.006	0.022	0.023
Rooted Plants	0.006	0.007	0.023	0.024
Benthic Invertebrates	0.005	0.006	0.003	0.021
JSL-7				
Pelagic Fish	0.019	0.077	0.019	0.083
Forage Fish	0.022	0.080	0.022	0.086
Macrophytes	0.021	0.082	0.021	0.090
Rooted Plants	0.022	0.083	0.022	0.091
Benthic Invertebrates	0.017	0.013	0.017	0.083
JSL-8				
Pelagic Fish	0.007	0.008	0.027	0.034
Forage Fish	0.009	0.011	0.029	0.036
Macrophytes	0.007	0.009	0.029	0.038
Rooted Plants	0.008	0.011	0.030	0.039
Benthic Invertebrates	0.007	0.010	0.008	0.040

8.2 TERRESTRIAL RECEPTORS

This section presents the results of the risk characterization for terrestrial receptors assessed in the study area. In the assessment of risks to the terrestrial receptors, both aquatic and terrestrial exposure pathways for the COPC were taken into account. Hence, for all terrestrial receptors, the total intakes account for all major pathways. The fraction of time in the area is accounted for in the assessment with the remainder of the time the receptor is assumed to be exposed to baseline conditions. The inhalation pathway is not considered for terrestrial receptors, as this is generally an insignificant pathway for ecological receptors. The indirect pathways resulting from dust (e.g. dust settling on vegetation that is consumed by biota) are included in the assessment.

8.2.1 Exposure to Non-Radioactive Constituents

Potential effects can be measured at different levels of biological and ecological organization. Screening index values provide an integrated description of the potential hazard, the exposure (or dose)-response relationship, and the exposure evaluation (U.S. EPA 1992, AIHC 1992). In this study, adverse effects from exposure to COPC were characterized by the value of a simple screening index. This index was calculated by dividing the predicted exposure by the toxicity reference value for each ecological receptor, as shown in equation (8.2- 1).

$$\text{Screening Index} = \frac{\text{Dose}}{\text{Toxicity Benchmark}} \quad (8.2-1)$$

The screening index values reported in this section are not estimates of the probability of ecological effect. Rather, the index values are positively correlated with the potential of an effect, i.e. higher index values imply a greater potential of an effect. Different magnitudes of the screening index have been used in other studies to screen for potential ecological effects. A screening index value of 1.0 has been used in some instances (e.g. Suter 1991) and is used in this study. The potential ecological effects of COPC were evaluated for the mean and 95th percentile results from the probabilistic risk assessment. The probabilistic framework for the assessment captures uncertainty in the model inputs and the evaluation of potential effects at the mean and 95th percentile levels provides a range of the conditions that may occur.

Herbivore Mammals

Table 8.2-1 presents the results for caribou in the LSA (average of 2% of the time) and the RSA (average of 4% of the time). The atmospheric pathway is an important pathway of exposure for caribou since their diet is composed mainly of lichen. Constituent concentrations in lichen are linked directly to constituents in air through direct deposition and nutrient uptake from air. While there are some increases in screening index values during the operation phase of the assessment, all predicted screening index values for caribou are below 1.0 in both the LSA and RSA.

Table 8.2-1 Screening Index Values for Non-Radionuclide Intakes by Caribou

LSA	Toxicity Benchmarks		Base				Kiggavik Project				Kiggavik Project				Kiggavik Project				Kiggavik Project			
							Year 10 of Operation				Year 5 of Final Closure				Year 15 of Final Closure				Year 5 of Post Closure			
	(mg/(kg d))		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs	
	LOAELs	NOAELs	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th
Arsenic	14.40	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-
Cadmium	1.00	0.77	0.008	0.015	0.010	0.020	0.009	0.018	0.011	0.023	0.008	0.015	0.010	0.020	0.008	0.015	0.010	0.020	0.008	0.015	0.010	0.020
Cobalt	20.20	-	<0.001	0.001	-	-	<0.001	0.001	-	-	<0.001	0.001	-	-	<0.001	0.001	-	-	<0.001	0.001	-	-
Copper	1.50	-	0.088	0.167	-	-	0.088	0.167	-	-	0.088	0.167	-	-	0.088	0.167	-	-	0.088	0.167	-	-
Lead	15.00	-	0.002	0.004	-	-	0.002	0.004	-	-	0.002	0.004	-	-	0.002	0.004	-	-	0.002	0.004	-	-
Molybdenum	4.10	-	0.003	0.007	-	-	0.003	0.007	-	-	0.003	0.007	-	-	0.003	0.007	-	-	0.003	0.007	-	-
Nickel	9.80	3.40	0.006	0.012	0.017	0.036	0.006	0.012	0.017	0.036	0.006	0.012	0.017	0.036	0.006	0.012	0.017	0.036	0.006	0.012	0.017	0.036
Selenium	0.33	0.17	0.033	0.076	0.064	0.148	0.033	0.077	0.065	0.149	0.033	0.076	0.064	0.148	0.033	0.076	0.064	0.148	0.033	0.076	0.064	0.148
Uranium	6.13	3.07	<0.001	<0.001	<0.001	0.001	<0.001	0.002	0.002	0.003	<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	75.90	37.90	0.029	0.055	0.058	0.110	0.029	0.055	0.058	0.110	0.029	0.055	0.058	0.110	0.029	0.055	0.058	0.110	0.029	0.055	0.058	0.110

Fraction of time in area: 0.02

RSA	Toxicity Benchmarks		Base				Kiggavik Project				Kiggavik Project				Kiggavik Project				Kiggavik Project			
							Year 10 of Operation				Year 5 of Final Closure				Year 15 of Final Closure				Year 5 of Post Closure			
	(mg/(kg d))		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs	
	LOAELs	NOAELs	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th
Arsenic	14.40	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-
Cadmium	1.00	0.77	0.008	0.015	0.010	0.020	0.008	0.017	0.011	0.022	0.008	0.015	0.010	0.020	0.008	0.015	0.010	0.020	0.008	0.015	0.010	0.020
Cobalt	20.20	-	<0.001	0.001	-	-	<0.001	0.001	-	-	<0.001	0.001	-	-	<0.001	0.001	-	-	<0.001	0.001	-	-
Copper	1.50	-	0.088	0.167	-	-	0.088	0.167	-	-	0.088	0.167	-	-	0.088	0.167	-	-	0.088	0.167	-	-
Lead	15.00	-	0.002	0.004	-	-	0.002	0.004	-	-	0.002	0.004	-	-	0.002	0.004	-	-	0.002	0.004	-	-
Molybdenum	4.10	-	0.003	0.007	-	-	0.003	0.007	-	-	0.003	0.007	-	-	0.003	0.007	-	-	0.003	0.007	-	-
Nickel	9.80	3.40	0.006	0.012	0.017	0.036	0.006	0.012	0.017	0.036	0.006	0.012	0.017	0.036	0.006	0.012	0.017	0.036	0.006	0.012	0.017	0.036
Selenium	0.33	0.17	0.033	0.076	0.064	0.148	0.033	0.077	0.065	0.149	0.033	0.076	0.064	0.148	0.033	0.076	0.064	0.148	0.033	0.076	0.064	0.148
Uranium	6.13	3.07	<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	<0.001	0.001
Zinc	75.90	37.90	0.029	0.055	0.058	0.110	0.029	0.055	0.058	0.110	0.029	0.055	0.058	0.110	0.029	0.055	0.058	0.110	0.029	0.055	0.058	0.110

Fraction of time in area: 0.04

Brown lemmings consume herbaceous vegetation, berries, and lichen. The lemming acts as a surrogate species for other small herbivore mammals, such as the vole. Table 8.2-2 presents the results for lemming living in the Rock Lake Watershed, Judge Sissons Lake in the vicinity of the Kiggavik WTP discharge (i.e., JSL-2), the Kiggavik Camp, and Judge Sissons Lake in the vicinity of the Sissons WTP discharge (i.e., JSL-8). The results show that all predicted screening index values are below 1.0 for the lemmings in the Rock Lake Watershed, Judge Sissons Lake in the vicinity of the Kiggavik WTP discharge, and Judge Sissons Lake in the vicinity of the Sissons WTP discharge. For the lemming at the Kiggavik Camp, screening index values above 1.0 are predicted at the 95th percentile level and NOAEL for cadmium and uranium in Year 10 of Operation. The screening index values for both cadmium and uranium are only slightly above 1.0 and the screening index values for the LOAEL are below 1.0. Considering that these exceedances are at the 95th percentile level and for the NOAEL, it is not expected that there would be population effects on lemmings living in the Kiggavik Camp. Further, in Year 5 of Closure, 95th percentile screening index values for the lemming are below 1.0 again, and therefore, any potential effects would not be long-term.

Muskoxen were selected for the assessment because they have been an integral part of the Inuit lifestyle for centuries as one animal can provide a great amount of meat, a warm versatile hide, and soft insulating fur. Table 8.2-3 presents the results for muskoxen living 10% of the time at Judge Sissons Lake in the vicinity of the Kiggavik WTP discharge (i.e., JSL-2) and Judge Sissons Lake in the vicinity of the Sissons WTP discharge (i.e., JSL-8). All screening index values are less than 1.0 and show limited potential for effects from the Project on muskoxen in these areas.

Arctic ground squirrels consume browse and herbaceous vegetation. They have a significant role in food chain effects, since they are part of the diet of larger predatory species. The Arctic hare is also a common species for the area and was identified as a possible human food source; however, the hare has essentially the same diet as the Arctic ground squirrel. Therefore, exposures to the Arctic hare are captured with the inclusion of the Arctic ground squirrel in the assessment. The Arctic ground squirrel also serves as a surrogate for Arctic hare in the human diet. Table 8.2-4 presents the results for the squirrel living in the Rock Lake Watershed, Judge Sissons Lake in the vicinity of the Kiggavik WTP discharge (i.e., JSL-2), the Kiggavik Camp, and Judge Sissons Lake in the vicinity of the Sissons WTP discharge (i.e., JSL-8). The results show that all predicted screening index values are below 1.0.

Omnivore Mammals

The bear is an important indicator of potential effects of atmospheric deposition on the terrestrial environment (and transfer to terrestrial vegetation, berries and soil) as well as emissions to the aquatic environment (and uptake by fish). Table 8.2-5 presents the results for a grizzly bear spending 50% of its time in the LSA. All predicted screening index values are below 1.0 which indicates that there are no potential effects on grizzly bear from the Project.

Table 8.2-2 Screening Index Values for Non-Radionuclide Intakes by Lemming

Rock Lake Watershed	Toxicity Benchmarks		Base				Kiggavik Project				Kiggavik Project				Kiggavik Project				Kiggavik Project			
							Year 10 of Operation				Year 5 of Final Closure				Year 15 of Final Closure				Year 5 of Post Closure			
	(mg/(kg d))		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs	
	LOAELs	NOAELs	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th
Arsenic	14.20	8.10	0.002	0.006	0.003	0.010	0.002	0.006	0.003	0.010	0.002	0.006	0.003	0.010	0.002	0.006	0.003	0.010	0.002	0.006	0.003	0.010
Cadmium	1.00	0.77	0.030	0.069	0.040	0.089	0.063	0.146	0.081	0.189	0.030	0.069	0.040	0.089	0.030	0.069	0.040	0.089	0.030	0.069	0.040	0.089
Cobalt	13.39	5.22	0.005	0.014	0.013	0.037	0.006	0.015	0.014	0.038	0.005	0.014	0.013	0.037	0.005	0.014	0.013	0.037	0.005	0.014	0.013	0.037
Copper	194.00	100.00	0.005	0.011	0.009	0.021	0.005	0.011	0.009	0.021	0.005	0.011	0.009	0.021	0.005	0.011	0.009	0.021	0.005	0.011	0.009	0.021
Lead	188.00	25.50	<0.001	0.002	0.006	0.014	<0.001	0.002	0.006	0.014	<0.001	0.002	0.006	0.014	<0.001	0.002	0.006	0.014	<0.001	0.002	0.006	0.014
Molybdenum	1.90	-	0.119	0.431	-	-	0.119	0.432	-	-	0.119	0.432	-	-	0.119	0.432	-	-	0.119	0.432	-	-
Nickel	11.60	6.20	0.036	0.090	0.067	0.168	0.037	0.090	0.070	0.169	0.036	0.090	0.067	0.168	0.036	0.090	0.067	0.168	0.036	0.090	0.067	0.168
Selenium	0.63	0.33	0.107	0.189	0.204	0.360	0.108	0.189	0.206	0.360	0.107	0.189	0.204	0.360	0.107	0.189	0.204	0.360	0.107	0.189	0.204	0.360
Uranium	6.13	3.07	0.004	0.013	0.008	0.025	0.018	0.044	0.036	0.088	0.004	0.013	0.008	0.025	0.004	0.013	0.008	0.025	0.004	0.013	0.008	0.025
Zinc	249.00	215.00	0.033	0.072	0.038	0.083	0.033	0.072	0.038	0.083	0.033	0.072	0.038	0.083	0.033	0.072	0.038	0.083	0.033	0.072	0.038	0.083

Fraction of time in area: 1.0

JSL @ Kiggavik	Toxicity Benchmarks		Base				Kiggavik Project				Kiggavik Project				Kiggavik Project				Kiggavik Project			
							Year 10 of Operation				Year 5 of Final Closure				Year 15 of Final Closure				Year 5 of Post Closure			
	(mg/(kg d))		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs	
	LOAELs	NOAELs	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th
Arsenic	14.20	8.10	0.002	0.006	0.003	0.010	0.002	0.006	0.003	0.010	0.002	0.006	0.003	0.010	0.002	0.006	0.003	0.010	0.002	0.006	0.003	0.010
Cadmium	1.00	0.77	0.030	0.069	0.040	0.089	0.058	0.130	0.075	0.169	0.030	0.069	0.040	0.089	0.030	0.069	0.040	0.089	0.030	0.069	0.040	0.089
Cobalt	13.39	5.22	0.005	0.014	0.013	0.037	0.005	0.015	0.014	0.038	0.005	0.014	0.013	0.037	0.005	0.014	0.013	0.037	0.005	0.014	0.013	0.037
Copper	194.00	100.00	0.005	0.011	0.009	0.021	0.005	0.011	0.009	0.021	0.005	0.011	0.009	0.021	0.005	0.011	0.009	0.021	0.005	0.011	0.009	0.021
Lead	188.00	25.50	<0.001	0.002	0.006	0.014	<0.001	0.002	0.006	0.014	<0.001	0.002	0.006	0.014	<0.001	0.002	0.006	0.014	<0.001	0.002	0.006	0.014
Molybdenum	1.90	-	0.119	0.431	-	-	0.119	0.432	-	-	0.119	0.432	-	-	0.119	0.432	-	-	0.119	0.432	-	-
Nickel	11.60	6.20	0.036	0.090	0.067	0.168	0.037	0.090	0.070	0.169	0.036	0.090	0.067	0.168	0.036	0.090	0.067	0.168	0.036	0.090	0.067	0.168
Selenium	0.63	0.33	0.107	0.189	0.204	0.360	0.108	0.189	0.205	0.360	0.107	0.189	0.204	0.360	0.107	0.189	0.204	0.360	0.107	0.189	0.204	0.360
Uranium	6.13	3.07	0.004	0.013	0.008	0.025	0.016	0.038	0.031	0.076	0.004	0.013	0.008	0.025	0.004	0.013	0.008	0.025	0.004	0.013	0.008	0.025
Zinc	249.00	215.00	0.033	0.072	0.038	0.083	0.033	0.072	0.038	0.083	0.033	0.072	0.038	0.083	0.033	0.072	0.038	0.083	0.033	0.072	0.038	0.083

Fraction of time in area: 1.0

Table 8.2-2 (cont'd) Screening Index Values for Non-Radionuclide Intakes by Lemming

Kiggavik Camp Watershed	Toxicity Benchmarks (mg/(kg d))		Base				Kiggavik Project				Kiggavik Project				Kiggavik Project				Kiggavik Project			
							Year 10 of Operation				Year 5 of Final Closure				Year 15 of Final Closure				Year 5 of Post Closure			
	LOAELs	NOAELs	SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs	
			Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th
Arsenic	14.20	8.10	0.002	0.006	0.003	0.010	0.002	0.006	0.004	0.011	0.002	0.006	0.003	0.010	0.002	0.006	0.003	0.010	0.002	0.006	0.003	0.010
Cadmium	1.00	0.77	0.030	0.069	0.040	0.089	0.290	0.820	0.376	1.065	0.030	0.069	0.040	0.089	0.030	0.069	0.040	0.089	0.030	0.069	0.040	0.089
Cobalt	13.39	5.22	0.005	0.014	0.013	0.037	0.007	0.017	0.018	0.043	0.005	0.014	0.013	0.037	0.005	0.014	0.013	0.037	0.005	0.014	0.013	0.037
Copper	194.00	100.00	0.005	0.011	0.009	0.021	0.005	0.011	0.009	0.021	0.005	0.011	0.009	0.021	0.005	0.011	0.009	0.021	0.005	0.011	0.009	0.021
Lead	188.00	25.50	<0.001	0.002	0.006	0.014	<0.001	0.002	0.007	0.014	<0.001	0.002	0.006	0.014	<0.001	0.002	0.006	0.014	<0.001	0.002	0.006	0.014
Molybdenum	1.90	-	0.119	0.431	-	-	0.120	0.433	-	-	0.119	0.432	-	-	0.119	0.432	-	-	0.119	0.432	-	-
Nickel	11.60	6.20	0.036	0.090	0.067	0.168	0.042	0.094	0.079	0.177	0.036	0.090	0.067	0.168	0.036	0.090	0.067	0.168	0.036	0.090	0.067	0.168
Selenium	0.63	0.33	0.107	0.188	0.204	0.360	0.110	0.192	0.210	0.366	0.107	0.189	0.204	0.360	0.107	0.189	0.204	0.360	0.107	0.189	0.204	0.360
Uranium	6.13	3.07	0.004	0.013	0.008	0.025	0.265	0.643	0.528	1.284	0.004	0.013	0.009	0.026	0.004	0.013	0.008	0.026	0.004	0.013	0.008	0.026
Zinc	249.00	215.00	0.033	0.072	0.038	0.083	0.033	0.072	0.038	0.083	0.033	0.072	0.038	0.083	0.033	0.072	0.038	0.083	0.033	0.072	0.038	0.083

Fraction of time in area: 1.0

JSL @ Sissons	Toxicity Benchmarks (mg/(kg d))		Base				Kiggavik Project				Kiggavik Project				Kiggavik Project				Kiggavik Project			
							Year 10 of Operation				Year 5 of Final Closure				Year 15 of Final Closure				Year 5 of Post Closure			
	LOAELs	NOAELs	SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs	
			Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th
Arsenic	14.20	8.10	0.002	0.006	0.003	0.010	0.002	0.006	0.003	0.010	0.002	0.006	0.003	0.010	0.002	0.006	0.003	0.010	0.002	0.006	0.003	0.010
Cadmium	1.00	0.77	0.030	0.069	0.040	0.089	0.103	0.270	0.133	0.351	0.030	0.069	0.040	0.089	0.030	0.069	0.040	0.089	0.030	0.069	0.040	0.089
Cobalt	13.39	5.22	0.005	0.014	0.013	0.037	0.006	0.015	0.015	0.039	0.005	0.014	0.013	0.037	0.005	0.014	0.013	0.037	0.005	0.014	0.013	0.037
Copper	194.00	100.00	0.005	0.011	0.009	0.021	0.005	0.011	0.009	0.021	0.005	0.011	0.009	0.021	0.005	0.011	0.009	0.021	0.005	0.011	0.009	0.021
Lead	188.00	25.50	<0.001	0.002	0.006	0.014	<0.001	0.002	0.006	0.014	<0.001	0.002	0.006	0.014	<0.001	0.002	0.006	0.014	<0.001	0.002	0.006	0.014
Molybdenum	1.90	-	0.119	0.431	-	-	0.119	0.432	-	-	0.119	0.432	-	-	0.119	0.432	-	-	0.119	0.432	-	-
Nickel	11.60	6.20	0.036	0.090	0.067	0.168	0.039	0.092	0.073	0.172	0.036	0.090	0.067	0.168	0.036	0.090	0.067	0.168	0.036	0.090	0.067	0.168
Selenium	0.63	0.33	0.107	0.189	0.204	0.360	0.109	0.189	0.208	0.361	0.107	0.189	0.204	0.360	0.107	0.189	0.204	0.360	0.107	0.189	0.204	0.360
Uranium	6.13	3.07	0.004	0.013	0.008	0.025	0.032	0.077	0.063	0.154	0.004	0.013	0.008	0.025	0.004	0.013	0.008	0.025	0.004	0.013	0.008	0.025
Zinc	249.00	215.00	0.033	0.072	0.038	0.083	0.033	0.072	0.038	0.083	0.033	0.072	0.038	0.083	0.033	0.072	0.038	0.083	0.033	0.072	0.038	0.083

Fraction of time in area: 1.0

Note: **BOLD SHADING** indicates a screening index exceedance of 1.0

Table 8.2-3 Screening Index Values for Non-Radionuclide Intakes by Muskoxen

JSL @ Kiggavik	Toxicity Benchmarks		Base				Kiggavik Project				Kiggavik Project				Kiggavik Project				Kiggavik Project			
							Year 10 of Operation				Year 5 of Final Closure				Year 15 of Final Closure				Year 5 of Post Closure			
	(mg/(kg d))		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs	
	LOAELs	NOAELs	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th
Arsenic	14.40	-	0.001	0.004	-	-	0.001	0.004	-	-	0.001	0.004	-	-	0.001	0.004	-	-	0.001	0.004	-	-
Cadmium	1.00	0.77	0.032	0.089	0.041	0.115	0.032	0.089	0.041	0.115	0.032	0.089	0.041	0.115	0.032	0.089	0.041	0.115	0.032	0.089	0.041	0.115
Cobalt	20.20	-	0.002	0.007	-	-	0.002	0.007	-	-	0.002	0.007	-	-	0.002	0.007	-	-	0.002	0.007	-	-
Copper	1.50	-	0.334	0.768	-	-	0.334	0.769	-	-	0.334	0.770	-	-	0.335	0.770	-	-	0.335	0.770	-	-
Lead	15.00	-	0.002	0.003	-	-	0.002	0.003	-	-	0.002	0.003	-	-	0.002	0.003	-	-	0.002	0.003	-	-
Molybdenum	4.10	-	0.012	0.041	-	-	0.012	0.041	-	-	0.012	0.041	-	-	0.012	0.041	-	-	0.012	0.041	-	-
Nickel	9.80	3.40	0.013	0.031	0.037	0.089	0.013	0.031	0.037	0.089	0.013	0.031	0.037	0.089	0.013	0.031	0.037	0.089	0.013	0.031	0.037	0.089
Selenium	0.33	0.17	0.008	0.015	0.015	0.029	0.008	0.015	0.015	0.029	0.008	0.015	0.015	0.029	0.008	0.015	0.015	0.029	0.008	0.015	0.015	0.029
Uranium	6.13	3.07	<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	75.90	37.90	0.155	0.382	0.310	0.765	0.155	0.382	0.310	0.765	0.155	0.382	0.310	0.765	0.155	0.382	0.310	0.765	0.155	0.382	0.310	0.765

Fraction of time in area: 0.1

JSL @ Sissons	Toxicity Benchmarks		Base				Kiggavik Project				Kiggavik Project				Kiggavik Project				Kiggavik Project			
							Year 10 of Operation				Year 5 of Final Closure				Year 15 of Final Closure				Year 5 of Post Closure			
	(mg/(kg d))		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs	
	LOAELs	NOAELs	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th
Arsenic	14.40	-	0.001	0.004	-	-	0.001	0.004	-	-	0.001	0.004	-	-	0.001	0.004	-	-	0.001	0.004	-	-
Cadmium	1.00	0.77	0.032	0.089	0.041	0.115	0.032	0.089	0.041	0.115	0.032	0.089	0.041	0.115	0.032	0.089	0.041	0.115	0.032	0.089	0.041	0.115
Cobalt	20.20	-	0.002	0.007	-	-	0.002	0.007	-	-	0.002	0.007	-	-	0.002	0.007	-	-	0.002	0.007	-	-
Copper	1.50	-	0.334	0.768	-	-	0.334	0.769	-	-	0.334	0.770	-	-	0.335	0.770	-	-	0.335	0.770	-	-
Lead	15.00	-	0.002	0.003	-	-	0.002	0.003	-	-	0.002	0.003	-	-	0.002	0.003	-	-	0.002	0.003	-	-
Molybdenum	4.10	-	0.012	0.041	-	-	0.012	0.041	-	-	0.012	0.041	-	-	0.012	0.041	-	-	0.012	0.041	-	-
Nickel	9.80	3.40	0.013	0.031	0.037	0.089	0.013	0.031	0.037	0.089	0.013	0.031	0.037	0.089	0.013	0.031	0.037	0.089	0.013	0.031	0.037	0.089
Selenium	0.33	0.17	0.008	0.015	0.015	0.029	0.008	0.015	0.015	0.029	0.008	0.015	0.015	0.029	0.008	0.015	0.015	0.029	0.008	0.015	0.015	0.029
Uranium	6.13	3.07	<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	75.90	37.90	0.155	0.382	0.310	0.765	0.155	0.382	0.310	0.765	0.155	0.382	0.310	0.765	0.155	0.382	0.310	0.765	0.155	0.382	0.310	0.765

Fraction of time in area: 0.1

Table 8.2-4 Screening Index Values for Non-Radionuclide Intakes by Squirrel

Rock Lake Watershed	Toxicity Benchmarks		Base				Kiggavik Project				Kiggavik Project				Kiggavik Project				Kiggavik Project			
							Year 10 of Operation				Year 5 of Final Closure				Year 15 of Final Closure				Year 5 of Post Closure			
	(mg/(kg d))		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs	
	LOAELs	NOAELs	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th
Arsenic	14.20	8.10	<0.001	0.003	0.002	0.005	<0.001	0.003	0.002	0.005	<0.001	0.003	0.002	0.005	<0.001	0.003	0.002	0.005	<0.001	0.003	0.002	0.005
Cadmium	1.00	0.77	0.013	0.031	0.017	0.040	0.013	0.031	0.017	0.040	0.013	0.031	0.017	0.040	0.013	0.031	0.017	0.040	0.013	0.031	0.017	0.040
Cobalt	13.39	5.22	0.002	0.006	0.006	0.016	0.002	0.006	0.006	0.016	0.002	0.006	0.006	0.016	0.002	0.006	0.006	0.016	0.002	0.006	0.006	0.016
Copper	194.00	100.00	0.003	0.006	0.005	0.012	0.003	0.006	0.005	0.012	0.003	0.006	0.005	0.012	0.003	0.006	0.005	0.012	0.003	0.006	0.005	0.012
Lead	188.00	25.50	<0.001	<0.001	0.002	0.006	<0.001	<0.001	0.002	0.006	<0.001	<0.001	0.002	0.006	<0.001	<0.001	0.002	0.006	<0.001	<0.001	0.002	0.006
Molybdenum	1.90	-	0.053	0.171	-	-	0.053	0.171	-	-	0.053	0.171	-	-	0.053	0.171	-	-	0.053	0.171	-	-
Nickel	11.60	6.20	0.019	0.046	0.036	0.086	0.019	0.046	0.036	0.086	0.019	0.046	0.036	0.086	0.019	0.046	0.036	0.086	0.019	0.046	0.036	0.086
Selenium	0.63	0.33	0.038	0.071	0.072	0.135	0.038	0.071	0.072	0.135	0.038	0.071	0.072	0.135	0.038	0.071	0.072	0.135	0.038	0.071	0.072	0.135
Uranium	6.13	3.07	0.002	0.005	0.004	0.011	0.002	0.005	0.004	0.011	0.002	0.005	0.004	0.011	0.002	0.005	0.004	0.011	0.002	0.005	0.004	0.011
Zinc	249.00	215.00	0.019	0.048	0.022	0.056	0.019	0.048	0.022	0.056	0.019	0.048	0.022	0.056	0.019	0.048	0.022	0.056	0.019	0.048	0.022	0.056

Fraction of time in area: 1.0

JSL @ Kiggavik	Toxicity Benchmarks		Base				Kiggavik Project				Kiggavik Project				Kiggavik Project				Kiggavik Project			
							Year 10 of Operation				Year 5 of Final Closure				Year 15 of Final Closure				Year 5 of Post Closure			
	(mg/(kg d))		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs	
	LOAELs	NOAELs	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th
Arsenic	3.60	-	<0.001	0.003	0.002	0.005	<0.001	0.003	0.002	0.005	<0.001	0.003	0.002	0.005	<0.001	0.003	0.002	0.005	<0.001	0.003	0.002	0.005
Cadmium	2.37	1.47	0.013	0.031	0.017	0.040	0.013	0.031	0.017	0.040	0.013	0.031	0.017	0.040	0.013	0.031	0.017	0.040	0.013	0.031	0.017	0.040
Cobalt	14.13	4.10	0.002	0.006	0.006	0.016	0.002	0.006	0.006	0.016	0.002	0.006	0.006	0.016	0.002	0.006	0.006	0.016	0.002	0.006	0.006	0.016
Copper	75.20	15.30	0.003	0.006	0.005	0.012	0.003	0.006	0.005	0.012	0.003	0.006	0.005	0.012	0.003	0.006	0.005	0.012	0.003	0.006	0.005	0.012
Lead	11.80	6.51	<0.001	<0.001	0.002	0.006	<0.001	<0.001	0.002	0.006	<0.001	<0.001	0.002	0.006	<0.001	<0.001	0.002	0.006	<0.001	<0.001	0.002	0.006
Molybdenum	20.83	-	0.053	0.171	-	-	0.054	0.171	-	-	0.054	0.171	-	-	0.054	0.171	-	-	0.053	0.171	-	-
Nickel	10.70	14.60	0.019	0.046	0.036	0.086	0.019	0.046	0.036	0.086	0.019	0.046	0.036	0.086	0.019	0.046	0.036	0.086	0.019	0.046	0.036	0.086
Selenium	0.68	0.36	0.038	0.071	0.072	0.135	0.038	0.071	0.072	0.135	0.038	0.071	0.072	0.135	0.038	0.071	0.072	0.135	0.038	0.071	0.072	0.135
Uranium	-	16.00	0.002	0.005	0.004	0.011	0.002	0.005	0.004	0.011	0.002	0.005	0.004	0.011	0.002	0.005	0.004	0.011	0.002	0.005	0.004	0.011
Zinc	62.70	-	0.019	0.048	0.022	0.056	0.019	0.048	0.022	0.056	0.019	0.048	0.022	0.056	0.019	0.048	0.022	0.056	0.019	0.048	0.022	0.056

Fraction of time in area: 1.0

Table 8.2-4(Cont'd) Screening Index Values for Non-Radionuclide Intakes by Squirrel

Kiggavik Camp Watershed	Toxicity Benchmarks (mg/(kg d))		Base				Kiggavik Project				Kiggavik Project				Kiggavik Project				Kiggavik Project			
							Year 10 of Operation				Year 5 of Final Closure				Year 15 of Final Closure				Year 5 of Post Closure			
	LOAELs	NOAELs	SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs	
			Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th
Arsenic	3.60	-	<0.001	0.003	0.002	0.005	<0.001	0.003	0.002	0.005	<0.001	0.003	0.002	0.005	<0.001	0.003	0.002	0.005	<0.001	0.003	0.002	0.005
Cadmium	2.37	1.47	0.013	0.031	0.017	0.040	0.014	0.032	0.018	0.041	0.013	0.031	0.017	0.040	0.013	0.031	0.017	0.040	0.013	0.031	0.017	0.040
Cobalt	14.13	4.10	0.002	0.006	0.006	0.016	0.002	0.006	0.006	0.016	0.002	0.006	0.006	0.016	0.002	0.006	0.006	0.016	0.002	0.006	0.006	0.016
Copper	75.20	15.30	0.003	0.006	0.005	0.012	0.003	0.006	0.005	0.012	0.003	0.006	0.005	0.012	0.003	0.006	0.005	0.012	0.003	0.006	0.005	0.012
Lead	11.80	6.51	<0.001	<0.001	0.002	0.006	<0.001	<0.001	0.002	0.006	<0.001	<0.001	0.002	0.006	<0.001	<0.001	0.002	0.006	<0.001	<0.001	0.002	0.006
Molybdenum	20.83	-	0.053	0.171	-	-	0.053	0.171	-	-	0.053	0.171	-	-	0.053	0.171	-	-	0.053	0.171	-	-
Nickel	10.70	14.60	0.019	0.046	0.036	0.086	0.019	0.046	0.036	0.086	0.019	0.046	0.036	0.086	0.019	0.046	0.036	0.086	0.019	0.046	0.036	0.086
Selenium	0.68	0.36	0.038	0.071	0.072	0.135	0.038	0.071	0.072	0.135	0.038	0.071	0.072	0.135	0.038	0.071	0.072	0.135	0.038	0.071	0.072	0.135
Uranium	-	16.00	0.002	0.005	0.004	0.011	0.004	0.009	0.007	0.017	0.002	0.006	0.004	0.011	0.002	0.006	0.004	0.011	0.002	0.006	0.004	0.011
Zinc	62.70	-	0.019	0.048	0.022	0.056	0.019	0.048	0.022	0.056	0.019	0.048	0.022	0.056	0.019	0.048	0.022	0.056	0.019	0.048	0.022	0.056

Fraction of time in area: 1.0

JSL @ Sissons	Toxicity Benchmarks (mg/(kg d))		Base				Kiggavik Project				Kiggavik Project				Kiggavik Project				Kiggavik Project			
							Year 10 of Operation				Year 5 of Final Closure				Year 15 of Final Closure				Year 5 of Post Closure			
	LOAELs	NOAELs	SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs	
			Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th
Arsenic	3.60	-	<0.001	0.003	0.002	0.005	<0.001	0.003	0.002	0.005	<0.001	0.003	0.002	0.005	<0.001	0.003	0.002	0.005	<0.001	0.003	0.002	0.005
Cadmium	2.37	1.47	0.013	0.031	0.017	0.040	0.013	0.031	0.017	0.040	0.013	0.031	0.017	0.040	0.013	0.031	0.017	0.040	0.013	0.031	0.017	0.040
Cobalt	14.13	4.10	0.002	0.006	0.006	0.016	0.002	0.006	0.006	0.016	0.002	0.006	0.006	0.016	0.002	0.006	0.006	0.016	0.002	0.006	0.006	0.016
Copper	75.20	15.30	0.003	0.006	0.005	0.012	0.003	0.006	0.005	0.012	0.003	0.006	0.005	0.012	0.003	0.006	0.005	0.012	0.003	0.006	0.005	0.012
Lead	11.80	6.51	<0.001	<0.001	0.002	0.006	<0.001	<0.001	0.002	0.006	<0.001	<0.001	0.002	0.006	<0.001	<0.001	0.002	0.006	<0.001	<0.001	0.002	0.006
Molybdenum	20.83	-	0.053	0.171	-	-	0.053	0.171	-	-	0.053	0.171	-	-	0.053	0.171	-	-	0.053	0.171	-	-
Nickel	10.70	14.60	0.019	0.046	0.036	0.086	0.019	0.046	0.036	0.086	0.019	0.046	0.036	0.086	0.019	0.046	0.036	0.086	0.019	0.046	0.036	0.086
Selenium	0.68	0.36	0.038	0.071	0.072	0.135	0.038	0.071	0.072	0.135	0.038	0.071	0.072	0.135	0.038	0.071	0.072	0.135	0.038	0.071	0.072	0.135
Uranium	-	16.00	0.002	0.005	0.004	0.011	0.002	0.006	0.004	0.011	0.002	0.005	0.004	0.011	0.002	0.005	0.004	0.011	0.002	0.005	0.004	0.011
Zinc	62.70	-	0.019	0.048	0.022	0.056	0.019	0.048	0.022	0.056	0.019	0.048	0.022	0.056	0.019	0.048	0.022	0.056	0.019	0.048	0.022	0.056

Fraction of time in area: 1.0

Table 8.2-5 Screening Index Values for Non-Radionuclide Intakes by Grizzly Bear

LSA	Toxicity Benchmarks		Base				Kiggavik Project				Kiggavik Project				Kiggavik Project				Kiggavik Project			
							Year 10 of Operation				Year 5 of Final Closure				Year 15 of Final Closure				Year 5 of Post Closure			
	(mg/(kg d))		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs	
	LOAELs	NOAELs	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th
Arsenic	3.10	1.50	0.002	0.006	0.004	0.012	0.002	0.006	0.004	0.012	0.002	0.006	0.004	0.012	0.002	0.006	0.004	0.012	0.002	0.006	0.004	0.012
Cadmium	1.00	0.77	0.009	0.024	0.012	0.031	0.009	0.024	0.012	0.031	0.009	0.024	0.012	0.031	0.009	0.024	0.012	0.031	0.009	0.024	0.012	0.031
Cobalt	13.39	5.22	<0.001	0.002	0.002	0.006	<0.001	0.002	0.002	0.006	<0.001	0.002	0.002	0.006	<0.001	0.002	0.002	0.006	<0.001	0.002	0.002	0.006
Copper	11.50	5.90	0.016	0.033	0.030	0.065	0.016	0.033	0.030	0.065	0.016	0.033	0.030	0.065	0.016	0.033	0.030	0.065	0.016	0.033	0.031	0.065
Lead	50.00	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-
Molybdenum	1.90	-	0.007	0.019	-	-	0.007	0.019	-	-	0.007	0.019	-	-	0.007	0.019	-	-	0.007	0.019	-	-
Nickel	112.00	45.00	<0.001	<0.001	0.001	0.002	<0.001	<0.001	0.001	0.002	<0.001	<0.001	0.001	0.002	<0.001	<0.001	0.001	0.002	<0.001	<0.001	0.001	0.002
Selenium	0.21	-	0.038	0.066	-	-	0.040	0.066	-	-	0.040	0.066	-	-	0.039	0.066	-	-	0.038	0.066	-	-
Uranium	6.13	3.07	<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	34.90	-	0.106	0.228	-	-	0.106	0.228	-	-	0.106	0.228	-	-	0.106	0.228	-	-	0.106	0.228	-	-

Fraction of time in area: 0.5

Insectivore Mammals

The masked shrew relies heavily on insects for food, with a small portion of the diet from lichen. Table 8.2-6 presents the results for the shrew living in the Rock Lake Watershed, Judge Sissons Lake in the vicinity of the Kiggavik WTP discharge (i.e., JSL-2), the Kiggavik Camp, and Judge Sissons Lake in the vicinity of the Sissons WTP discharge (i.e., JSL-8). The results show that all predicted screening index values are below 1.0 for the shrew in the Rock Lake Watershed, Judge Sissons Lake in the vicinity of the Kiggavik WTP discharge, and Judge Sissons Lake in the vicinity of the Sissons WTP discharge. For the shrew at the Kiggavik Camp, screening index values above 1.0 are predicted at the 95th percentile level and NOAEL for cadmium and uranium in Year 10 of Operation. The screening index values for cadmium and uranium are only slightly above 1.0 and the screening index values for the LOAEL are below 1.0. Considering that these exceedances are at the 95th percentile level and for the NOAEL, it is not expected that there would be adverse effects on shrews living in the Kiggavik Camp. Further, in Year 5 of Closure, screening index values for the shrew are below 1.0 again.

Carnivore Mammals

Arctic fox were selected since they consume small terrestrial animals and birds and are an important species for trappers in the area. Predicted exposures to the fox represent exposure to other scavenger mammals. Table 8.2-7 presents the results for a fox 100% of its time in the LSA. All predicted screening index values are below 1.0 which indicates that there are no potential effects on fox from the Project.

Gray wolf was selected since the diet contains caribou and muskoxen. Wolves and wolf dens have been observed within the project area. Table 8.2-8 presents the results for wolf living 50% of the time in the LSA and 100% in the RSA. The results show that all screening index values are below 1.0 in both areas, with the exception of zinc. In both the LSA and RSA, zinc intakes by the wolf exceed the LOAEL (there is NOAEL benchmark available) at the 95th percentile value at baseline levels and the SI values do not change over the duration of the assessment. This indicates that the elevated SI is due to baseline levels of zinc measured in the environment and is not being affected by the Project. The exceedance of the LOAEL at a baseline level indicates that the benchmark maybe be overly conservative. Zinc is a physiologically essential element and these types of elements tend to be well regulated in organisms.

Wolverines were identified as an important species for the area and are carnivorous scavengers. The wolverine is a member of the weasel family and has the largest home range of carnivores of its size. The diet of the wolverine consists of small mammals and birds and carrion (caribou and muskoxen). Table 8.2-9 presents the results for wolverine living 50% of the time in the LSA and 100% in the RSA. The results show that all screening index values are below 1.0 in both areas.

Table 8.2-6 Screening Index Values for Non-Radionuclide Intakes by Shrew

Rock Lake Watershed	Toxicity Benchmarks		Base				Kiggavik Project				Kiggavik Project				Kiggavik Project				Kiggavik Project			
							Year 10 of Operation				Year 5 of Final Closure				Year 15 of Final Closure				Year 5 of Post Closure			
	(mg/(kg d))		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs	
	LOAELs	NOAELs	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th
Arsenic	14.20	8.10	0.008	0.021	0.014	0.037	0.008	0.021	0.014	0.038	0.008	0.021	0.014	0.037	0.008	0.021	0.014	0.037	0.008	0.021	0.014	0.037
Cadmium	1.00	0.77	0.053	0.125	0.069	0.162	0.086	0.187	0.111	0.243	0.053	0.125	0.069	0.162	0.053	0.125	0.069	0.162	0.053	0.125	0.069	0.162
Cobalt	13.39	5.22	0.003	0.006	0.008	0.016	0.003	0.007	0.009	0.017	0.003	0.006	0.008	0.016	0.003	0.006	0.008	0.016	0.003	0.006	0.008	0.016
Copper	194.00	100.00	0.012	0.020	0.023	0.039	0.012	0.020	0.023	0.039	0.012	0.020	0.023	0.039	0.012	0.020	0.023	0.039	0.012	0.020	0.023	0.039
Lead	188.00	25.50	<0.001	<0.001	0.003	0.005	<0.001	<0.001	0.003	0.005	<0.001	<0.001	0.003	0.005	<0.001	<0.001	0.003	0.005	<0.001	<0.001	0.003	0.005
Molybdenum	1.90	-	0.007	0.014	-	-	0.007	0.014	-	-	0.007	0.014	-	-	0.007	0.014	-	-	0.007	0.014	-	-
Nickel	11.60	6.20	0.020	0.053	0.038	0.099	0.022	0.054	0.041	0.101	0.020	0.053	0.038	0.099	0.020	0.053	0.038	0.099	0.020	0.053	0.038	0.099
Selenium	0.63	0.33	0.105	0.263	0.201	0.502	0.107	0.264	0.203	0.504	0.105	0.264	0.201	0.503	0.105	0.264	0.201	0.503	0.105	0.264	0.201	0.503
Uranium	6.13	3.07	0.007	0.011	0.014	0.023	0.021	0.040	0.042	0.080	0.007	0.011	0.014	0.023	0.007	0.011	0.014	0.023	0.007	0.011	0.014	0.023
Zinc	249.00	215.00	0.075	0.238	0.087	0.276	0.075	0.238	0.087	0.276	0.075	0.238	0.087	0.276	0.075	0.238	0.087	0.276	0.075	0.238	0.087	0.276

Fraction of time in area: 1.0

JSL @ Kiggavik	Toxicity Benchmarks		Base				Kiggavik Project				Kiggavik Project				Kiggavik Project				Kiggavik Project			
							Year 10 of Operation				Year 5 of Final Closure				Year 15 of Final Closure				Year 5 of Post Closure			
	(mg/(kg d))		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs	
	LOAELs	NOAELs	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th
Arsenic	3.60	-	0.009	0.023	0.016	0.040	0.012	0.034	0.021	0.060	0.012	0.034	0.021	0.059	0.011	0.029	0.019	0.051	0.009	0.023	0.016	0.040
Cadmium	2.37	1.47	0.058	0.140	0.075	0.181	0.113	0.268	0.147	0.348	0.086	0.216	0.111	0.280	0.080	0.206	0.104	0.268	0.058	0.140	0.075	0.181
Cobalt	14.13	4.10	0.003	0.007	0.008	0.018	0.004	0.009	0.011	0.023	0.004	0.009	0.010	0.023	0.004	0.008	0.009	0.020	0.003	0.007	0.008	0.018
Copper	75.20	15.30	0.013	0.023	0.026	0.044	0.013	0.023	0.026	0.044	0.013	0.023	0.026	0.044	0.013	0.023	0.026	0.044	0.013	0.023	0.026	0.044
Lead	11.80	6.51	<0.001	<0.001	0.003	0.005	<0.001	<0.001	0.003	0.005	<0.001	<0.001	0.003	0.005	<0.001	<0.001	0.003	0.005	<0.001	<0.001	0.003	0.005
Molybdenum	20.83	-	0.007	0.014	-	-	0.043	0.115	-	-	0.045	0.113	-	-	0.037	0.098	-	-	0.007	0.014	-	-
Nickel	10.70	14.60	0.022	0.057	0.041	0.106	0.024	0.061	0.045	0.113	0.023	0.061	0.042	0.115	0.022	0.057	0.042	0.107	0.022	0.057	0.041	0.106
Selenium	0.68	0.36	0.113	0.286	0.215	0.546	0.132	0.336	0.253	0.641	0.135	0.353	0.258	0.673	0.126	0.312	0.240	0.596	0.113	0.286	0.215	0.546
Uranium	-	16.00	0.008	0.013	0.015	0.025	0.024	0.043	0.047	0.086	0.010	0.019	0.020	0.038	0.008	0.013	0.016	0.026	0.008	0.013	0.015	0.025
Zinc	62.70	-	0.084	0.270	0.097	0.312	0.084	0.270	0.097	0.312	0.084	0.270	0.097	0.312	0.084	0.270	0.097	0.312	0.084	0.270	0.097	0.312

Fraction of time in area: 1.0

Table 8.2-6(Cont'd) Screening Index Values for Non-Radionuclide Intakes by Shrew

Kiggavik Camp Watershed	Toxicity Benchmarks		Base				Kiggavik Project				Kiggavik Project				Kiggavik Project				Kiggavik Project			
							Year 10 of Operation				Year 5 of Final Closure				Year 15 of Final Closure				Year 5 of Post Closure			
	(mg/(kg d))		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs	
	LOAELs	NOAELs	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th
Arsenic	3.60	-	0.008	0.020	0.013	0.035	0.008	0.020	0.014	0.035	0.008	0.020	0.013	0.035	0.008	0.020	0.013	0.035	0.008	0.020	0.013	0.035
Cadmium	2.37	1.47	0.051	0.119	0.066	0.155	0.315	0.807	0.409	1.048	0.051	0.119	0.066	0.155	0.051	0.119	0.066	0.155	0.051	0.119	0.066	0.155
Cobalt	14.13	4.10	0.003	0.006	0.007	0.015	0.005	0.010	0.012	0.026	0.003	0.006	0.007	0.015	0.003	0.006	0.007	0.015	0.003	0.006	0.007	0.015
Copper	75.20	15.30	0.011	0.020	0.022	0.038	0.011	0.020	0.022	0.038	0.011	0.020	0.022	0.038	0.011	0.020	0.022	0.038	0.011	0.020	0.022	0.038
Lead	11.80	6.51	<0.001	<0.001	0.003	0.005	<0.001	<0.001	0.003	0.006	<0.001	<0.001	0.003	0.005	<0.001	<0.001	0.003	0.005	<0.001	<0.001	0.003	0.005
Molybdenum	20.83	-	0.007	0.013	-	-	0.008	0.015	-	-	0.007	0.013	-	-	0.007	0.013	-	-	0.007	0.013	-	-
Nickel	10.70	14.60	0.019	0.049	0.036	0.092	0.026	0.059	0.049	0.110	0.019	0.049	0.036	0.092	0.019	0.049	0.036	0.092	0.019	0.049	0.036	0.092
Selenium	0.68	0.36	0.099	0.246	0.190	0.470	0.103	0.249	0.197	0.475	0.099	0.246	0.190	0.470	0.099	0.246	0.190	0.470	0.099	0.246	0.190	0.470
Uranium	-	16.00	<0.001	0.001	0.002	0.002	0.264	0.610	0.527	1.218	<0.001	0.001	0.002	0.002	<0.001	0.001	0.002	0.002	<0.001	0.001	0.002	0.002
Zinc	62.70	-	0.072	0.231	0.084	0.268	0.073	0.231	0.084	0.268	0.072	0.231	0.084	0.268	0.072	0.231	0.084	0.268	0.072	0.231	0.084	0.268

Fraction of time in area: 1.0

JSL @ Sissons	Toxicity Benchmarks		Base				Kiggavik Project				Kiggavik Project				Kiggavik Project				Kiggavik Project			
							Year 10 of Operation				Year 5 of Final Closure				Year 15 of Final Closure				Year 5 of Post Closure			
	(mg/(kg d))		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs	
	LOAELs	NOAELs	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th
Arsenic	3.60	-	0.008	0.021	0.014	0.037	0.010	0.030	0.018	0.052	0.009	0.025	0.016	0.043	0.009	0.023	0.015	0.040	0.008	0.021	0.014	0.037
Cadmium	2.37	1.47	0.054	0.128	0.070	0.167	0.135	0.292	0.175	0.379	0.062	0.144	0.080	0.187	0.060	0.141	0.078	0.183	0.054	0.128	0.070	0.167
Cobalt	14.13	4.10	0.003	0.006	0.008	0.016	0.004	0.008	0.010	0.020	0.003	0.007	0.008	0.017	0.003	0.006	0.008	0.016	0.003	0.006	0.008	0.016
Copper	75.20	15.30	0.012	0.021	0.024	0.041	0.012	0.021	0.024	0.041	0.012	0.021	0.024	0.041	0.012	0.021	0.024	0.041	0.012	0.021	0.024	0.041
Lead	11.80	6.51	<0.001	<0.001	0.003	0.005	<0.001	<0.001	0.003	0.005	<0.001	<0.001	0.003	0.005	<0.001	<0.001	0.003	0.005	<0.001	<0.001	0.003	0.005
Molybdenum	20.83	-	0.007	0.014	-	-	0.027	0.067	-	-	0.023	0.047	-	-	0.015	0.036	-	-	0.007	0.014	-	-
Nickel	10.70	14.60	0.020	0.052	0.038	0.098	0.024	0.055	0.045	0.102	0.021	0.053	0.039	0.099	0.021	0.052	0.038	0.098	0.020	0.052	0.038	0.098
Selenium	0.68	0.36	0.105	0.264	0.201	0.503	0.113	0.277	0.215	0.529	0.109	0.274	0.209	0.524	0.108	0.268	0.205	0.512	0.105	0.264	0.201	0.503
Uranium	-	16.00	0.007	0.012	0.014	0.023	0.047	0.089	0.095	0.178	0.014	0.027	0.027	0.054	0.007	0.012	0.014	0.024	0.007	0.012	0.014	0.023
Zinc	62.70	-	0.077	0.249	0.090	0.288	0.078	0.249	0.090	0.288	0.077	0.249	0.090	0.288	0.077	0.249	0.090	0.288	0.077	0.249	0.090	0.288

Fraction of time in area: 1.0

Note: **BOLD SHADING** indicates a screening index exceedance of 1.0

Table 8.2-7 Screening Index Values for Non-Radionuclide Intakes by Fox

LSA	Toxicity Benchmarks		Base				Kiggavik Project				Kiggavik Project				Kiggavik Project				Kiggavik Project			
							Year 10 of Operation				Year 5 of Final Closure				Year 15 of Final Closure				Year 5 of Post Closure			
	(mg/(kg d))		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs	
	LOAELs	NOAELs	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th
Arsenic	3.10	1.50	0.002	0.004	0.003	0.009	0.002	0.005	0.004	0.010	0.002	0.005	0.004	0.011	0.002	0.005	0.003	0.011	0.002	0.004	0.003	0.009
Cadmium	1.00	0.77	0.005	0.014	0.007	0.018	0.012	0.030	0.015	0.040	0.006	0.014	0.008	0.019	0.006	0.014	0.007	0.019	0.005	0.014	0.007	0.018
Cobalt	13.39	5.22	<0.001	0.002	0.002	0.005	<0.001	0.002	0.002	0.005	<0.001	0.002	0.002	0.005	<0.001	0.002	0.002	0.005	<0.001	0.002	0.002	0.005
Copper	11.50	5.90	0.032	0.080	0.063	0.156	0.033	0.080	0.063	0.156	0.033	0.080	0.064	0.157	0.033	0.080	0.064	0.157	0.033	0.080	0.064	0.157
Lead	50.00	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-
Molybdenum	1.90	-	0.007	0.023	-	-	0.008	0.025	-	-	0.008	0.024	-	-	0.008	0.025	-	-	0.007	0.023	-	-
Nickel	112.00	45.00	<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
Selenium	0.21	-	0.187	0.540	-	-	0.191	0.543	-	-	0.192	0.544	-	-	0.190	0.543	-	-	0.187	0.540	-	-
Uranium	6.13	3.07	<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	<0.001	<0.001
Zinc	34.90	-	0.137	0.397	-	-	0.138	0.399	-	-	0.138	0.397	-	-	0.138	0.397	-	-	0.138	0.397	-	-

Fraction of time in area: 1.0

Table 8.2-8 Screening Index Values for Non-Radionuclide Intakes by Wolf

LSA	Toxicity Benchmarks		Base				Kiggavik Project				Kiggavik Project				Kiggavik Project				Kiggavik Project			
							Year 10 of Operation				Year 5 of Final Closure				Year 15 of Final Closure				Year 5 of Post Closure			
	(mg/(kg d))		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs	
	LOAELs	NOAELs	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th
Arsenic	3.10	1.50	0.002	0.008	0.005	0.017	0.002	0.008	0.005	0.017	0.002	0.008	0.005	0.017	0.002	0.008	0.005	0.017	0.002	0.008	0.005	0.017
Cadmium	1.00	0.77	0.003	0.008	0.003	0.010	0.003	0.008	0.003	0.010	0.003	0.008	0.003	0.010	0.003	0.008	0.003	0.010	0.003	0.008	0.003	0.010
Cobalt	13.39	5.22	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	0.002
Copper	11.50	5.90	0.074	0.274	0.145	0.534	0.074	0.274	0.145	0.534	0.074	0.274	0.145	0.534	0.074	0.274	0.145	0.534	0.074	0.274	0.145	0.534
Lead	50.00	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-
Molybdenum	1.90	-	0.005	0.018	-	-	0.005	0.018	-	-	0.005	0.018	-	-	0.005	0.018	-	-	0.005	0.018	-	-
Nickel	112.00	45.00	<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
Selenium	0.21	-	0.067	0.210	-	-	0.067	0.210	-	-	0.067	0.210	-	-	0.067	0.210	-	-	0.067	0.210	-	-
Uranium	6.13	3.07	<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	34.90	-	0.554	1.628	-	-	0.554	1.628	-	-	0.554	1.628	-	-	0.554	1.628	-	-	0.554	1.628	-	-

Fraction of time in area: 0.33

RSA	Toxicity Benchmarks		Base				Kiggavik Project				Kiggavik Project				Kiggavik Project				Kiggavik Project			
							Year 10 of Operation				Year 5 of Final Closure				Year 15 of Final Closure				Year 5 of Post Closure			
	(mg/(kg d))		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs	
	LOAELs	NOAELs	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th
Arsenic	3.10	1.50	0.002	0.008	0.005	0.017	0.002	0.008	0.005	0.017	0.002	0.008	0.005	0.017	0.002	0.008	0.005	0.017	0.002	0.008	0.005	0.017
Cadmium	1.00	0.77	0.003	0.008	0.003	0.010	0.003	0.008	0.003	0.010	0.003	0.008	0.003	0.010	0.003	0.008	0.003	0.010	0.003	0.008	0.003	0.010
Cobalt	13.39	5.22	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	0.002
Copper	11.50	5.90	0.074	0.274	0.145	0.534	0.074	0.274	0.145	0.534	0.074	0.274	0.145	0.534	0.074	0.274	0.145	0.534	0.074	0.274	0.145	0.534
Lead	50.00	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-
Molybdenum	1.90	-	0.005	0.018	-	-	0.005	0.018	-	-	0.005	0.018	-	-	0.005	0.018	-	-	0.005	0.018	-	-
Nickel	112.00	45.00	<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
Selenium	0.21	-	0.067	0.210	-	-	0.067	0.210	-	-	0.067	0.210	-	-	0.067	0.210	-	-	0.067	0.210	-	-
Uranium	6.13	3.07	<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	34.90	-	0.554	1.628	-	-	0.554	1.628	-	-	0.554	1.628	-	-	0.554	1.628	-	-	0.554	1.628	-	-

Fraction of time in area: 0.33

Note: **BOLD SHADING** indicates a screening index exceedance of 1.0

Table 8.2-9 Screening Index Values for Non-Radionuclide Intakes by Wolverine

LSA	Toxicity Benchmarks		Base				Kiggavik Project				Kiggavik Project				Kiggavik Project				Kiggavik Project			
							Year 10 of Operation				Year 5 of Final Closure				Year 15 of Final Closure				Year 5 of Post Closure			
	(mg/(kg d))		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs	
	LOAELs	NOAELs	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th
Arsenic	3.10	1.50	0.001	0.003	0.003	0.006	0.001	0.003	0.003	0.006	0.001	0.003	0.003	0.006	0.001	0.003	0.003	0.006	0.001	0.003	0.003	0.006
Cadmium	1.00	0.77	0.004	0.011	0.005	0.014	0.006	0.019	0.008	0.024	0.004	0.011	0.005	0.014	0.004	0.011	0.005	0.014	0.004	0.011	0.005	0.014
Cobalt	13.39	5.22	<0.001	0.002	0.002	0.005	<0.001	0.002	0.002	0.005	<0.001	0.002	0.002	0.005	<0.001	0.002	0.002	0.005	<0.001	0.002	0.002	0.005
Copper	11.50	5.90	0.031	0.075	0.061	0.145	0.031	0.075	0.061	0.146	0.031	0.075	0.061	0.147	0.032	0.075	0.061	0.147	0.032	0.076	0.061	0.147
Lead	50.00	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-
Molybdenum	1.90	-	0.007	0.022	-	-	0.007	0.022	-	-	0.007	0.022	-	-	0.007	0.022	-	-	0.007	0.022	-	-
Nickel	112.00	45.00	<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
Selenium	0.21	-	0.031	0.083	-	-	0.031	0.083	-	-	0.031	0.083	-	-	0.031	0.083	-	-	0.031	0.083	-	-
Uranium	6.13	3.07	<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	34.90	-	0.168	0.463	-	-	0.168	0.463	-	-	0.168	0.463	-	-	0.168	0.463	-	-	0.168	0.463	-	-

Fraction of time in area: 0.33

RSA	Toxicity Benchmarks		Base				Kiggavik Project				Kiggavik Project				Kiggavik Project				Kiggavik Project			
							Year 10 of Operation				Year 5 of Final Closure				Year 15 of Final Closure				Year 5 of Post Closure			
	(mg/(kg d))		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs	
	LOAELs	NOAELs	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th
Arsenic	3.10	1.50	0.001	0.003	0.003	0.006	0.001	0.003	0.003	0.006	0.001	0.003	0.003	0.006	0.001	0.003	0.003	0.006	0.001	0.003	0.003	0.006
Cadmium	1.00	0.77	0.004	0.011	0.005	0.014	0.005	0.015	0.007	0.019	0.004	0.011	0.005	0.014	0.004	0.011	0.005	0.014	0.004	0.011	0.005	0.014
Cobalt	13.39	5.22	<0.001	0.002	0.002	0.005	<0.001	0.002	0.002	0.005	<0.001	0.002	0.002	0.005	<0.001	0.002	0.002	0.005	<0.001	0.002	0.002	0.005
Copper	11.50	5.90	0.031	0.075	0.061	0.146	0.032	0.075	0.061	0.147	0.032	0.076	0.062	0.148	0.032	0.076	0.062	0.149	0.032	0.076	0.062	0.149
Lead	50.00	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-
Molybdenum	1.90	-	0.007	0.022	-	-	0.007	0.022	-	-	0.007	0.022	-	-	0.007	0.022	-	-	0.007	0.022	-	-
Nickel	112.00	45.00	<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
Selenium	0.21	-	0.031	0.083	-	-	0.031	0.083	-	-	0.031	0.083	-	-	0.031	0.083	-	-	0.031	0.083	-	-
Uranium	6.13	3.07	<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	34.90	-	0.168	0.463	-	-	0.168	0.463	-	-	0.168	0.463	-	-	0.168	0.463	-	-	0.168	0.463	-	-

Fraction of time in area: 0.33

Aquatic Birds

Table 8.2-10 presents the results for long-tailed duck living 33% of the time in Judge Sissons Lake in the vicinity of the Kiggavik WTP discharge (i.e., JSL-2), and Judge Sissons Lake in the vicinity of the Sissons WTP discharge (i.e., JSL-8). The results show that all predicted screening index values are less than 1.0, which suggests a negligible potential for effects on ducks associated with discharge from the Project.

Table 8.2-11 presents the results for merganser living 33% of the time in Judge Sissons Lake in the vicinity of the Kiggavik WTP discharge (i.e., JSL-2), and Judge Sissons Lake in the vicinity of the Sissons WTP discharge (i.e., JSL-8). The results show that all predicted screening index values are less than 1.0, which suggests a negligible potential for effects on ducks associated with discharge from the Project.

Table 8.2-12 presents the results for northern pintail living 33% of the time in Judge Sissons Lake in the vicinity of the Kiggavik WTP discharge (i.e., JSL-2), and Judge Sissons Lake in the vicinity of the Sissons WTP discharge (i.e., JSL-8). The results show that all predicted screening index values are less than 1.0, which suggests a negligible potential for effects on ducks associated with discharge from the Project.

Terrestrial Birds

Peregrine falcon is relatively common and nests within the Kiggavik RSA (Appendix 6C). Exposures to the falcon represent potential exposures to other similar species, such as the short-eared owl. The short-eared owl is also a species of special concern identified within the Sissons Lease area, but it is not specifically considered in the assessment. Table 8.2-13 presents the results for falcon in the LSA and RSA (33% of the time). All predicted screening index values are below 1.0 which indicates that there are no potential effects on falcon from the Project. The results of the assessment for falcon indicate that adverse effects on the short-eared owl would not be expected from the Project.

Lapland longspurs consume seeds and insects and represent other small songbirds that might be present in the area. Table 8.2-14 presents the results for Lapland longspur living 33% of the time in each of the Rock Lake Watershed, Judge Sissons Lake in the vicinity of the Kiggavik WTP discharge (i.e., JSL-2), the Kiggavik Camp, and Judge Sissons Lake in the vicinity of the Sissons WTP discharge (i.e., JSL-8). The results show that all screening index values are below 1.0 in all areas, with the exception of zinc. In each of the four assessment locations, zinc intakes by the longspur exceed the LOAEL (there is NOAEL benchmark available) at the 95th percentile value over the duration of the assessment, including baseline. Further, the exceedance of the LOAEL at a baseline level indicates that the benchmark maybe be overly conservative. Therefore, the elevated SI values are due to baseline levels of zinc measured in the environment and the Project is not expected to have any impact on the Lapland longspur. There is a slight increase in the screening index value over the assessment period, but it is not significant and would not be discernable from the natural variability in the baseline.

Table 8.2-10 Screening Index Values for Non-Radionuclide Intakes by Long-Tailed Duck

JSL @ Kiggavik	Toxicity Benchmarks		Base				Kiggavik Project				Kiggavik Project				Kiggavik Project				Kiggavik Project			
							Year 10 of Operation				Year 5 of Final Closure				Year 15 of Final Closure				Year 5 of Post Closure			
	(mg/(kg d))		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs	
	LOAELs	NOAELs	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th
Arsenic	3.60	-	0.016	0.043	-	-	0.019	0.050	-	-	0.019	0.048	-	-	0.018	0.046	-	-	0.016	0.043	-	-
Cadmium	2.37	1.47	0.010	0.024	0.015	0.039	0.012	0.029	0.019	0.047	0.012	0.032	0.020	0.052	0.012	0.032	0.019	0.052	0.010	0.024	0.015	0.039
Cobalt	148.00	14.80	<0.001	<0.001	0.001	0.003	<0.001	<0.001	0.001	0.003	<0.001	<0.001	0.001	0.003	<0.001	<0.001	0.001	0.003	<0.001	<0.001	0.001	0.003
Copper	27.00	24.10	0.039	0.064	0.044	0.072	0.039	0.064	0.044	0.072	0.039	0.064	0.044	0.072	0.039	0.064	0.044	0.072	0.039	0.064	0.044	0.072
Lead	11.80	6.51	0.001	0.002	0.002	0.004	0.001	0.002	0.002	0.004	0.001	0.002	0.002	0.004	0.001	0.002	0.002	0.004	0.001	0.002	0.002	0.004
Molybdenum	20.83	-	<0.001	<0.001	-	-	<0.001	0.002	-	-	<0.001	0.002	-	-	<0.001	0.002	-	-	<0.001	<0.001	-	-
Nickel	10.70	14.60	0.008	0.025	0.006	0.019	0.008	0.026	0.006	0.019	0.008	0.026	0.006	0.019	0.008	0.026	0.006	0.019	0.008	0.025	0.006	0.019
Selenium	1.37	1.18	0.041	0.080	0.048	0.093	0.044	0.085	0.051	0.099	0.044	0.087	0.051	0.101	0.043	0.085	0.050	0.098	0.041	0.080	0.048	0.093
Uranium	-	16.00	-	-	<0.001	<0.001	-	-	<0.001	0.002	-	-	<0.001	0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001
Zinc	62.70	-	0.136	0.471	-	-	0.136	0.471	-	-	0.136	0.471	-	-	0.136	0.471	-	-	0.136	0.471	-	-

Fraction of time in area: 0.33

JSL @ Sissons	Toxicity Benchmarks		Base				Kiggavik Project				Kiggavik Project				Kiggavik Project				Kiggavik Project			
							Year 10 of Operation				Year 5 of Final Closure				Year 15 of Final Closure				Year 5 of Post Closure			
	(mg/(kg d))		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs	
	LOAELs	NOAELs	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th
Arsenic	3.60	-	0.016	0.043	-	-	0.018	0.045	-	-	0.017	0.044	-	-	0.017	0.043	-	-	0.016	0.043	-	-
Cadmium	2.37	1.47	0.010	0.024	0.016	0.039	0.010	0.025	0.016	0.041	0.010	0.025	0.016	0.041	0.010	0.025	0.016	0.041	0.010	0.024	0.016	0.039
Cobalt	148.00	14.80	<0.001	<0.001	0.001	0.003	<0.001	<0.001	0.001	0.003	<0.001	<0.001	0.001	0.003	<0.001	<0.001	0.001	0.003	<0.001	<0.001	0.001	0.003
Copper	27.00	24.10	0.039	0.064	0.044	0.072	0.039	0.064	0.044	0.072	0.039	0.064	0.044	0.072	0.039	0.064	0.044	0.072	0.039	0.064	0.044	0.072
Lead	11.80	6.51	0.001	0.002	0.002	0.004	0.001	0.002	0.002	0.004	0.001	0.002	0.002	0.004	0.001	0.002	0.002	0.004	0.001	0.002	0.002	0.004
Molybdenum	20.83	-	<0.001	<0.001	-	-	<0.001	0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-
Nickel	10.70	14.60	0.008	0.025	0.006	0.019	0.008	0.026	0.006	0.019	0.008	0.026	0.006	0.019	0.008	0.026	0.006	0.019	0.008	0.025	0.006	0.019
Selenium	1.37	1.18	0.041	0.081	0.048	0.094	0.042	0.082	0.049	0.096	0.042	0.082	0.049	0.095	0.042	0.081	0.048	0.094	0.041	0.081	0.048	0.094
Uranium	-	16.00	-	-	<0.001	<0.001	-	-	0.001	0.002	-	-	<0.001	0.002	-	-	<0.001	<0.001	-	-	<0.001	<0.001
Zinc	62.70	-	0.138	0.476	-	-	0.138	0.476	-	-	0.138	0.476	-	-	0.138	0.476	-	-	0.138	0.476	-	-

Fraction of time in area: 0.33

Table 8.2-11 Screening Index Values for Non-Radionuclide Intakes by Merganser

JSL @ Kiggavik	Toxicity Benchmarks		Base				Kiggavik Project				Kiggavik Project				Kiggavik Project				Kiggavik Project			
							Year 10 of Operation				Year 5 of Final Closure				Year 15 of Final Closure				Year 5 of Post Closure			
	(mg/(kg d))		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs	
	LOAELs	NOAELs	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th
Arsenic	3.60	-	0.006	0.015	-	-	0.006	0.015	-	-	0.006	0.015	-	-	0.006	0.015	-	-	0.006	0.015	-	-
Cadmium	2.37	1.47	0.002	0.009	0.004	0.014	0.003	0.009	0.004	0.014	0.003	0.009	0.004	0.014	0.003	0.009	0.004	0.014	0.002	0.009	0.004	0.014
Cobalt	148.00	14.80	<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
Copper	27.00	24.10	0.003	0.005	0.003	0.005	0.003	0.005	0.003	0.005	0.003	0.005	0.003	0.005	0.003	0.005	0.003	0.005	0.003	0.005	0.003	0.005
Lead	11.80	6.51	<0.001	0.003	0.002	0.006	<0.001	0.003	0.002	0.006	<0.001	0.003	0.002	0.006	<0.001	0.003	0.002	0.006	<0.001	0.003	0.002	0.006
Molybdenum	20.83	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-
Nickel	10.70	14.60	<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
Selenium	1.37	1.18	0.079	0.142	0.092	0.164	0.081	0.142	0.094	0.164	0.081	0.142	0.094	0.164	0.080	0.142	0.093	0.164	0.079	0.142	0.092	0.164
Uranium	-	16.00	-	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001
Zinc	62.70	-	0.024	0.043	-	-	0.024	0.043	-	-	0.024	0.043	-	-	0.024	0.043	-	-	0.024	0.043	-	-

Fraction of time in area: 0.33

JSL @ Sissons	Toxicity Benchmarks		Base				Kiggavik Project				Kiggavik Project				Kiggavik Project				Kiggavik Project			
							Year 10 of Operation				Year 5 of Final Closure				Year 15 of Final Closure				Year 5 of Post Closure			
	(mg/(kg d))		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs	
	LOAELs	NOAELs	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th
Arsenic	3.60	-	0.006	0.015	-	-	0.006	0.015	-	-	0.006	0.015	-	-	0.006	0.015	-	-	0.006	0.015	-	-
Cadmium	2.37	1.47	0.002	0.009	0.004	0.014	0.002	0.009	0.004	0.014	0.002	0.009	0.004	0.014	0.002	0.009	0.004	0.014	0.002	0.009	0.004	0.014
Cobalt	148.00	14.80	<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
Copper	27.00	24.10	0.003	0.005	0.003	0.005	0.003	0.005	0.003	0.005	0.003	0.005	0.003	0.005	0.003	0.005	0.003	0.005	0.003	0.005	0.003	0.005
Lead	11.80	6.51	<0.001	0.003	0.002	0.006	<0.001	0.003	0.002	0.006	<0.001	0.003	0.002	0.006	<0.001	0.003	0.002	0.006	<0.001	0.003	0.002	0.006
Molybdenum	20.83	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-
Nickel	10.70	14.60	<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
Selenium	1.37	1.18	0.079	0.142	0.092	0.164	0.079	0.142	0.092	0.164	0.079	0.142	0.092	0.164	0.079	0.142	0.092	0.164	0.079	0.142	0.092	0.164
Uranium	-	16.00	-	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001
Zinc	62.70	-	0.025	0.043	-	-	0.025	0.043	-	-	0.025	0.043	-	-	0.025	0.043	-	-	0.025	0.043	-	-

Fraction of time in area: 0.33

Table 8.2-12 Screening Index Values for Non-Radionuclide Intakes by Northern Pintail

JSL @ Kiggavik	Toxicity Benchmarks		Base				Kiggavik Project				Kiggavik Project				Kiggavik Project				Kiggavik Project			
							Year 10 of Operation				Year 5 of Final Closure				Year 15 of Final Closure				Year 5 of Post Closure			
	(mg/(kg d))		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs	
	LOAELs	NOAELs	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th
Arsenic	3.60	-	0.128	0.440	-	-	0.152	0.533	-	-	0.149	0.518	-	-	0.143	0.502	-	-	0.128	0.440	-	-
Cadmium	2.37	1.47	0.005	0.012	0.007	0.020	0.006	0.016	0.009	0.025	0.006	0.015	0.009	0.025	0.006	0.015	0.009	0.024	0.005	0.012	0.007	0.020
Cobalt	148.00	14.80	<0.001	0.001	0.003	0.013	<0.001	0.001	0.003	0.015	<0.001	0.001	0.003	0.015	<0.001	0.001	0.003	0.014	<0.001	0.001	0.003	0.013
Copper	27.00	24.10	0.022	0.049	0.024	0.055	0.022	0.049	0.024	0.055	0.022	0.049	0.024	0.055	0.022	0.049	0.024	0.055	0.022	0.049	0.024	0.055
Lead	11.80	6.51	0.004	0.016	0.007	0.029	0.004	0.017	0.007	0.031	0.004	0.016	0.007	0.029	0.004	0.016	0.007	0.029	0.004	0.016	0.007	0.029
Molybdenum	20.83	-	0.002	0.006	-	-	0.021	0.058	-	-	0.022	0.063	-	-	0.017	0.055	-	-	0.002	0.006	-	-
Nickel	10.70	14.60	0.014	0.042	0.010	0.031	0.015	0.044	0.011	0.032	0.015	0.042	0.011	0.031	0.015	0.042	0.011	0.031	0.014	0.042	0.010	0.031
Selenium	1.37	1.18	0.006	0.013	0.007	0.015	0.006	0.015	0.007	0.017	0.006	0.015	0.007	0.017	0.006	0.014	0.007	0.016	0.006	0.013	0.007	0.015
Uranium	-	16.00	-	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001
Zinc	62.70	-	0.043	0.113	-	-	0.043	0.113	-	-	0.043	0.113	-	-	0.043	0.113	-	-	0.043	0.113	-	-

Fraction of time in area: 0.33

JSL @ Sissons	Toxicity Benchmarks		Base				Kiggavik Project				Kiggavik Project				Kiggavik Project				Kiggavik Project			
							Year 10 of Operation				Year 5 of Final Closure				Year 15 of Final Closure				Year 5 of Post Closure			
	(mg/(kg d))		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs	
	LOAELs	NOAELs	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th
Arsenic	3.60	-	0.129	0.443	-	-	0.139	0.493	-	-	0.134	0.478	-	-	0.132	0.457	-	-	0.129	0.443	-	-
Cadmium	2.37	1.47	0.005	0.012	0.007	0.020	0.005	0.013	0.008	0.021	0.005	0.013	0.008	0.021	0.005	0.013	0.008	0.021	0.005	0.012	0.007	0.020
Cobalt	148.00	14.80	<0.001	0.001	0.003	0.013	<0.001	0.001	0.003	0.013	<0.001	0.001	0.003	0.013	<0.001	0.001	0.003	0.013	<0.001	0.001	0.003	0.013
Copper	27.00	24.10	0.022	0.050	0.025	0.056	0.022	0.050	0.025	0.056	0.022	0.050	0.025	0.056	0.022	0.050	0.025	0.056	0.022	0.050	0.025	0.056
Lead	11.80	6.51	0.004	0.016	0.007	0.029	0.004	0.016	0.007	0.029	0.004	0.016	0.007	0.029	0.004	0.016	0.007	0.029	0.004	0.016	0.007	0.029
Molybdenum	20.83	-	0.002	0.006	-	-	0.010	0.027	-	-	0.008	0.024	-	-	0.005	0.018	-	-	0.002	0.006	-	-
Nickel	10.70	14.60	0.014	0.042	0.011	0.031	0.014	0.042	0.011	0.031	0.014	0.042	0.011	0.031	0.014	0.042	0.011	0.031	0.014	0.042	0.011	0.031
Selenium	1.37	1.18	0.006	0.013	0.007	0.015	0.006	0.014	0.007	0.016	0.006	0.014	0.007	0.016	0.006	0.013	0.007	0.016	0.006	0.013	0.007	0.015
Uranium	-	16.00	-	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001
Zinc	62.70	-	0.043	0.114	-	-	0.043	0.114	-	-	0.043	0.114	-	-	0.043	0.114	-	-	0.043	0.114	-	-

Fraction of time in area: 0.33

Table 8.2-13 Screening Index Values for Non-Radionuclide Intakes by Falcon

LSA	Toxicity Benchmarks		Base				Kiggavik Project				Kiggavik Project				Kiggavik Project				Kiggavik Project			
							Year 10 of Operation				Year 5 of Final Closure				Year 15 of Final Closure				Year 5 of Post Closure			
	(mg/(kg d))		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs	
	LOAELs	NOAELs	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th
Arsenic	3.60	-	0.001	0.002	-	-	0.001	0.002	-	-	0.001	0.002	-	-	0.001	0.002	-	-	0.001	0.002	-	-
Cadmium	2.37	1.47	0.001	0.003	0.002	0.005	0.002	0.004	0.003	0.007	0.001	0.003	0.002	0.005	0.001	0.003	0.002	0.005	0.001	0.003	0.002	0.005
Cobalt	14.13	4.10	<0.001	<0.001	0.002	0.003	<0.001	0.001	0.002	0.004	<0.001	0.001	0.002	0.003	<0.001	0.001	0.002	0.003	<0.001	0.001	0.002	0.003
Copper	75.20	15.30	0.003	0.009	0.016	0.042	0.003	0.009	0.016	0.042	0.003	0.009	0.016	0.042	0.003	0.009	0.016	0.042	0.003	0.009	0.016	0.042
Lead	11.80	6.51	0.001	0.002	0.002	0.003	0.001	0.002	0.002	0.003	0.001	0.002	0.002	0.003	0.001	0.002	0.002	0.003	0.001	0.002	0.002	0.003
Molybdenum	20.83	-	<0.001	<0.001	-	-	<0.001	0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-
Nickel	10.70	14.60	0.001	0.002	<0.001	0.002	0.001	0.002	<0.001	0.002	0.001	0.002	<0.001	0.002	0.001	0.002	<0.001	0.002	0.001	0.002	<0.001	0.002
Selenium	0.68	0.36	0.170	0.477	0.320	0.901	0.172	0.478	0.324	0.902	0.172	0.478	0.325	0.903	0.171	0.478	0.323	0.902	0.170	0.477	0.320	0.902
Uranium	-	16.00	-	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001
Zinc	62.70	-	0.043	0.114	-	-	0.043	0.114	-	-	0.043	0.114	-	-	0.043	0.114	-	-	0.043	0.114	-	-

Fraction of time in area: 0.33

RSA	Toxicity Benchmarks		Base				Kiggavik Project				Kiggavik Project				Kiggavik Project				Kiggavik Project			
							Year 10 of Operation				Year 5 of Final Closure				Year 15 of Final Closure				Year 5 of Post Closure			
	(mg/(kg d))		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs	
	LOAELs	NOAELs	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th
Arsenic	3.60	-	0.001	0.002	-	-	0.001	0.002	-	-	0.001	0.002	-	-	0.001	0.002	-	-	0.001	0.002	-	-
Cadmium	2.37	1.47	0.001	0.003	0.002	0.005	0.001	0.004	0.002	0.006	0.001	0.003	0.002	0.005	0.001	0.003	0.002	0.005	0.001	0.003	0.002	0.005
Cobalt	14.13	4.10	<0.001	<0.001	0.002	0.003	<0.001	0.001	0.002	0.003	<0.001	0.001	0.002	0.003	<0.001	0.001	0.002	0.003	<0.001	0.001	0.002	0.003
Copper	75.20	15.30	0.003	0.009	0.016	0.042	0.003	0.009	0.016	0.042	0.003	0.009	0.016	0.042	0.003	0.009	0.016	0.042	0.003	0.009	0.016	0.042
Lead	11.80	6.51	0.001	0.002	0.002	0.003	0.001	0.002	0.002	0.003	0.001	0.002	0.002	0.003	0.001	0.002	0.002	0.003	0.001	0.002	0.002	0.003
Molybdenum	20.83	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-
Nickel	10.70	14.60	0.001	0.002	<0.001	0.002	0.001	0.002	<0.001	0.002	0.001	0.002	<0.001	0.002	0.001	0.002	<0.001	0.002	0.001	0.002	<0.001	0.002
Selenium	0.68	0.36	0.170	0.477	0.320	0.901	0.171	0.478	0.324	0.902	0.172	0.478	0.325	0.903	0.171	0.478	0.323	0.902	0.170	0.477	0.320	0.902
Uranium	-	16.00	-	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001
Zinc	62.70	-	0.043	0.114	-	-	0.043	0.114	-	-	0.043	0.114	-	-	0.043	0.114	-	-	0.043	0.114	-	-

Fraction of time in area: 0.33

Table 8.2-14 Screening Index Values for Non-Radionuclide Intakes by Lapland Longspur

Rock Lake Watershed	Toxicity Benchmarks		Base				Kiggavik Project				Kiggavik Project				Kiggavik Project				Kiggavik Project			
							Year 10 of Operation				Year 5 of Final Closure				Year 15 of Final Closure				Year 5 of Post Closure			
	(mg/(kg d))		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs	
	LOAELs	NOAELs	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th
Arsenic	3.60	-	0.031	0.080	-	-	0.031	0.080	-	-	0.031	0.080	-	-	0.031	0.080	-	-	0.031	0.080	-	-
Cadmium	2.37	1.47	0.026	0.053	0.042	0.086	0.026	0.054	0.043	0.087	0.026	0.053	0.042	0.086	0.026	0.053	0.042	0.086	0.026	0.053	0.042	0.086
Cobalt	14.13	4.10	0.006	0.012	0.021	0.042	0.006	0.012	0.021	0.042	0.006	0.012	0.021	0.042	0.006	0.012	0.021	0.042	0.006	0.012	0.021	0.042
Copper	75.20	15.30	0.051	0.106	0.250	0.523	0.051	0.107	0.250	0.524	0.051	0.107	0.250	0.525	0.051	0.107	0.251	0.525	0.051	0.107	0.251	0.526
Lead	11.80	6.51	0.009	0.023	0.017	0.041	0.009	0.023	0.017	0.041	0.009	0.023	0.017	0.041	0.009	0.023	0.017	0.041	0.009	0.023	0.017	0.041
Molybdenum	20.83	-	0.006	0.023	-	-	0.006	0.023	-	-	0.006	0.023	-	-	0.006	0.023	-	-	0.006	0.023	-	-
Nickel	10.70	14.60	0.109	0.304	0.080	0.223	0.109	0.304	0.080	0.223	0.109	0.304	0.080	0.223	0.109	0.304	0.080	0.223	0.109	0.304	0.080	0.223
Selenium	0.68	0.36	0.058	0.148	0.109	0.280	0.058	0.149	0.109	0.281	0.058	0.149	0.109	0.281	0.058	0.149	0.109	0.281	0.058	0.149	0.109	0.281
Uranium	-	16.00	-	-	<0.001	0.001	-	-	<0.001	0.002	-	-	<0.001	0.001	-	-	<0.001	0.001	-	-	<0.001	0.001
Zinc	62.70	-	0.661	2.047	-	-	0.661	2.048	-	-	0.661	2.049	-	-	0.661	2.049	-	-	0.661	2.049	-	-

Fraction of time in area: 0.33

JSL @ Kiggavik	Toxicity Benchmarks		Base				Kiggavik Project				Kiggavik Project				Kiggavik Project				Kiggavik Project			
							Year 10 of Operation				Year 5 of Final Closure				Year 15 of Final Closure				Year 5 of Post Closure			
	(mg/(kg d))		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs	
	LOAELs	NOAELs	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th
Arsenic	3.60	-	0.032	0.081	-	-	0.035	0.092	-	-	0.035	0.089	-	-	0.034	0.085	-	-	0.032	0.081	-	-
Cadmium	2.37	1.47	0.027	0.054	0.043	0.088	0.029	0.064	0.047	0.104	0.029	0.064	0.047	0.103	0.029	0.060	0.046	0.097	0.027	0.054	0.043	0.088
Cobalt	14.13	4.10	0.006	0.012	0.022	0.042	0.006	0.013	0.022	0.045	0.006	0.013	0.022	0.044	0.006	0.013	0.022	0.043	0.006	0.012	0.022	0.042
Copper	75.20	15.30	0.052	0.107	0.254	0.528	0.052	0.108	0.254	0.529	0.052	0.108	0.255	0.530	0.052	0.108	0.255	0.530	0.052	0.108	0.255	0.531
Lead	11.80	6.51	0.009	0.023	0.017	0.041	0.009	0.023	0.017	0.041	0.009	0.023	0.017	0.041	0.009	0.023	0.017	0.041	0.009	0.023	0.017	0.041
Molybdenum	20.83	-	0.006	0.023	-	-	0.007	0.023	-	-	0.007	0.023	-	-	0.006	0.023	-	-	0.006	0.023	-	-
Nickel	10.70	14.60	0.109	0.305	0.080	0.224	0.109	0.306	0.080	0.224	0.109	0.305	0.080	0.224	0.109	0.305	0.080	0.224	0.109	0.305	0.080	0.224
Selenium	0.68	0.36	0.059	0.153	0.112	0.289	0.063	0.164	0.119	0.311	0.064	0.170	0.120	0.320	0.062	0.164	0.117	0.310	0.059	0.153	0.112	0.289
Uranium	-	16.00	-	-	<0.001	0.001	-	-	0.001	0.002	-	-	0.001	0.002	-	-	<0.001	0.001	-	-	<0.001	0.001
Zinc	62.70	-	0.669	2.048	-	-	0.669	2.049	-	-	0.669	2.050	-	-	0.669	2.051	-	-	0.669	2.051	-	-

Fraction of time in area: 0.33

Table 8.2-14 (cont'd) Screening Index Values for Non-Radionuclide Intakes by Lapland Longspur

Kiggavik Camp Watershed	Toxicity Benchmarks		Base				Kiggavik Project				Kiggavik Project				Kiggavik Project				Kiggavik Project			
							Year 10 of Operation				Year 5 of Final Closure				Year 15 of Final Closure				Year 5 of Post Closure			
	(mg/(kg d))		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs	
	LOAELs	NOAELs	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th
Arsenic	3.60	-	0.031	0.078	-	-	0.031	0.078	-	-	0.031	0.078	-	-	0.031	0.078	-	-	0.031	0.078	-	-
Cadmium	2.37	1.47	0.026	0.053	0.042	0.085	0.028	0.056	0.045	0.090	0.026	0.053	0.042	0.085	0.026	0.053	0.042	0.085	0.026	0.053	0.042	0.085
Cobalt	14.13	4.10	0.006	0.012	0.021	0.042	0.006	0.012	0.021	0.042	0.006	0.012	0.021	0.042	0.006	0.012	0.021	0.042	0.006	0.012	0.021	0.042
Copper	75.20	15.30	0.051	0.106	0.249	0.520	0.051	0.106	0.249	0.521	0.051	0.106	0.249	0.523	0.051	0.106	0.249	0.523	0.051	0.107	0.249	0.524
Lead	11.80	6.51	0.009	0.023	0.017	0.041	0.010	0.023	0.017	0.042	0.009	0.023	0.017	0.041	0.009	0.023	0.017	0.041	0.009	0.023	0.017	0.041
Molybdenum	20.83	-	0.006	0.023	-	-	0.006	0.023	-	-	0.006	0.023	-	-	0.006	0.023	-	-	0.006	0.023	-	-
Nickel	10.70	14.60	0.108	0.304	0.079	0.223	0.109	0.304	0.080	0.223	0.108	0.304	0.079	0.223	0.108	0.304	0.079	0.223	0.108	0.304	0.079	0.223
Selenium	0.68	0.36	0.056	0.145	0.107	0.274	0.056	0.145	0.107	0.274	0.056	0.145	0.107	0.274	0.056	0.145	0.107	0.274	0.056	0.145	0.107	0.274
Uranium	-	16.00	-	-	<0.001	<0.001	-	-	0.003	0.007	-	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001
Zinc	62.70	-	0.658	2.046	-	-	0.659	2.047	-	-	0.659	2.048	-	-	0.659	2.048	-	-	0.659	2.049	-	-

Fraction of time in area: 0.33

JSL @ Sissons	Toxicity Benchmarks		Base				Kiggavik Project				Kiggavik Project				Kiggavik Project				Kiggavik Project			
							Year 10 of Operation				Year 5 of Final Closure				Year 15 of Final Closure				Year 5 of Post Closure			
	(mg/(kg d))		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs	
	LOAELs	NOAELs	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th
Arsenic	3.60	-	0.031	0.080	-	-	0.033	0.088	-	-	0.032	0.082	-	-	0.032	0.081	-	-	0.031	0.080	-	-
Cadmium	2.37	1.47	0.026	0.054	0.042	0.086	0.027	0.055	0.044	0.089	0.027	0.055	0.043	0.088	0.027	0.055	0.043	0.088	0.026	0.054	0.042	0.086
Cobalt	14.13	4.10	0.006	0.012	0.021	0.042	0.006	0.012	0.021	0.042	0.006	0.012	0.021	0.042	0.006	0.012	0.021	0.042	0.006	0.012	0.021	0.042
Copper	75.20	15.30	0.051	0.107	0.251	0.524	0.051	0.107	0.251	0.525	0.051	0.107	0.252	0.526	0.051	0.107	0.252	0.526	0.051	0.107	0.252	0.527
Lead	11.80	6.51	0.009	0.023	0.017	0.041	0.009	0.023	0.017	0.041	0.009	0.023	0.017	0.041	0.009	0.023	0.017	0.041	0.009	0.023	0.017	0.041
Molybdenum	20.83	-	0.006	0.023	-	-	0.006	0.023	-	-	0.006	0.023	-	-	0.006	0.023	-	-	0.006	0.023	-	-
Nickel	10.70	14.60	0.109	0.304	0.080	0.223	0.109	0.304	0.080	0.223	0.109	0.304	0.080	0.223	0.109	0.304	0.080	0.223	0.109	0.304	0.080	0.223
Selenium	0.68	0.36	0.058	0.148	0.109	0.280	0.059	0.151	0.111	0.286	0.058	0.152	0.110	0.288	0.058	0.150	0.110	0.284	0.058	0.148	0.109	0.280
Uranium	-	16.00	-	-	<0.001	0.001	-	-	0.002	0.004	-	-	0.001	0.002	-	-	<0.001	0.001	-	-	<0.001	0.001
Zinc	62.70	-	0.663	2.047	-	-	0.663	2.048	-	-	0.663	2.049	-	-	0.663	2.049	-	-	0.663	2.050	-	-

Fraction of time in area: 0.33

Note: **BOLD SHADING** indicates a screening index exceedance of 1.0

Rock ptarmigans were selected because they are consumed by humans. The ptarmigan is also a surrogate in the assessment for other terrestrial birds with similar diets, such as goose and grouse. Table 8.2-15 presents the results for ptarmigan living in the Rock Lake Watershed, Judge Sissons Lake in the vicinity of the Kiggavik WTP discharge (i.e., JSL-2), the Kiggavik Camp, and Judge Sissons Lake in the vicinity of the Sissons WTP discharge (i.e., JSL-8). The results show that all screening index values are below 1.0 in all areas, with the exception of zinc. Similar to the longspur, the zinc intakes by the ptarmigan exceed the LOAEL (there is no NOAEL benchmark available) at the 95th percentile value over the duration of the assessment at four assessment locations as well as baseline. This indicates that these are not Project effects, but rather due to baseline levels of zinc measured in the environment. Further, the exceedance of the LOAEL at a baseline level indicates that the benchmark may be overly conservative.

Table 8.2-16 presents the results for semipalmated sandpiper living 33% of the time in Judge Sissons Lake in the vicinity of the Kiggavik WTP discharge (i.e., JSL-2), and Judge Sissons Lake in the vicinity of the Sissons WTP discharge (i.e., JSL-8). The results show that all predicted screening index values are less than 1.0, with the exception of zinc at the 95th percentile concentration. Further, the screening index values for zinc at the 95th percentile concentration are constant through the assessment period, which indicates that there are not Project effects on the zinc concentrations and these are exceedances are due to baseline levels of zinc measured in the environment. The exceedance of the zinc benchmark at a baseline level indicates that the benchmark may be overly conservative.

Table 8.2-15 Screening Index Values for Non-Radionuclide Intakes by Ptarmigan

Rock Lake Watershed	Toxicity Benchmarks		Base				Kiggavik Project				Kiggavik Project				Kiggavik Project				Kiggavik Project			
							Year 10 of Operation				Year 5 of Final Closure				Year 15 of Final Closure				Year 5 of Post Closure			
	(mg/(kg d))		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs	
	LOAELs	NOAELs	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th
Arsenic	3.60	-	0.013	0.047	-	-	0.013	0.047	-	-	0.013	0.047	-	-	0.013	0.047	-	-	0.013	0.047	-	-
Cadmium	2.37	1.47	0.037	0.099	0.059	0.160	0.037	0.099	0.059	0.160	0.037	0.099	0.059	0.160	0.037	0.099	0.059	0.160	0.037	0.099	0.059	0.160
Cobalt	14.13	4.10	0.008	0.027	0.026	0.092	0.008	0.027	0.026	0.092	0.008	0.027	0.026	0.092	0.008	0.027	0.026	0.092	0.008	0.027	0.026	0.092
Copper	75.20	15.30	0.019	0.044	0.092	0.215	0.019	0.044	0.092	0.216	0.019	0.044	0.093	0.217	0.019	0.044	0.093	0.217	0.019	0.044	0.093	0.217
Lead	11.80	6.51	0.006	0.012	0.011	0.022	0.006	0.012	0.011	0.022	0.006	0.012	0.011	0.022	0.006	0.012	0.011	0.022	0.006	0.012	0.011	0.022
Molybdenum	20.83	-	0.006	0.020	-	-	0.006	0.020	-	-	0.006	0.020	-	-	0.006	0.020	-	-	0.006	0.020	-	-
Nickel	10.70	14.60	0.032	0.077	0.023	0.057	0.032	0.077	0.023	0.057	0.032	0.077	0.023	0.057	0.032	0.077	0.023	0.057	0.032	0.077	0.023	0.057
Selenium	0.68	0.36	0.008	0.020	0.016	0.038	0.008	0.020	0.016	0.038	0.008	0.020	0.016	0.038	0.008	0.020	0.016	0.038	0.008	0.020	0.016	0.038
Uranium	-	16.00	-	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001
Zinc	62.70	-	0.517	1.344	-	-	0.518	1.344	-	-	0.518	1.344	-	-	0.518	1.344	-	-	0.518	1.344	-	-

Fraction of time in area: 1.0

JSL @ Kiggavik	Toxicity Benchmarks		Base				Kiggavik Project				Kiggavik Project				Kiggavik Project				Kiggavik Project			
							Year 10 of Operation				Year 5 of Final Closure				Year 15 of Final Closure				Year 5 of Post Closure			
	(mg/(kg d))		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs	
	LOAELs	NOAELs	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th
Arsenic	3.60	-	0.013	0.047	-	-	0.014	0.048	-	-	0.014	0.047	-	-	0.013	0.047	-	-	0.013	0.047	-	-
Cadmium	2.37	1.47	0.037	0.099	0.059	0.160	0.037	0.099	0.060	0.160	0.037	0.099	0.060	0.160	0.037	0.099	0.060	0.160	0.037	0.099	0.059	0.160
Cobalt	14.13	4.10	0.008	0.027	0.026	0.092	0.008	0.027	0.026	0.093	0.008	0.027	0.026	0.092	0.008	0.027	0.026	0.093	0.008	0.027	0.026	0.092
Copper	75.20	15.30	0.019	0.044	0.092	0.215	0.019	0.044	0.093	0.216	0.019	0.044	0.093	0.217	0.019	0.044	0.093	0.217	0.019	0.044	0.093	0.218
Lead	11.80	6.51	0.006	0.012	0.011	0.022	0.006	0.012	0.011	0.022	0.006	0.012	0.011	0.022	0.006	0.012	0.011	0.022	0.006	0.012	0.011	0.022
Molybdenum	20.83	-	0.006	0.020	-	-	0.006	0.020	-	-	0.006	0.020	-	-	0.006	0.020	-	-	0.006	0.020	-	-
Nickel	10.70	14.60	0.032	0.077	0.024	0.057	0.032	0.077	0.024	0.057	0.032	0.077	0.024	0.057	0.032	0.077	0.024	0.057	0.032	0.077	0.024	0.057
Selenium	0.68	0.36	0.008	0.020	0.016	0.038	0.009	0.021	0.017	0.039	0.009	0.022	0.017	0.041	0.009	0.021	0.017	0.039	0.008	0.020	0.016	0.038
Uranium	-	16.00	-	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001
Zinc	62.70	-	0.519	1.346	-	-	0.519	1.346	-	-	0.519	1.346	-	-	0.519	1.346	-	-	0.519	1.346	-	-

Fraction of time in area: 1.0

Table 8.2-15(Cont'd) Screening Index Values for Non-Radionuclide Intakes by Ptarmigan

Kiggavik Camp Watershed	Toxicity Benchmarks (mg/(kg d))		Base				Kiggavik Project				Kiggavik Project				Kiggavik Project				Kiggavik Project			
							Year 10 of Operation				Year 5 of Final Closure				Year 15 of Final Closure				Year 5 of Post Closure			
			SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs	
	LOAELs	NOAELs	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th
Arsenic	3.60	-	0.013	0.047	-	-	0.013	0.047	-	-	0.013	0.047	-	-	0.013	0.047	-	-	0.013	0.047	-	-
Cadmium	2.37	1.47	0.037	0.099	0.059	0.160	0.037	0.099	0.060	0.160	0.037	0.099	0.059	0.160	0.037	0.099	0.059	0.160	0.037	0.099	0.059	0.160
Cobalt	14.13	4.10	0.008	0.027	0.026	0.092	0.008	0.027	0.026	0.092	0.008	0.027	0.026	0.092	0.008	0.027	0.026	0.092	0.008	0.027	0.026	0.092
Copper	75.20	15.30	0.019	0.044	0.092	0.214	0.019	0.044	0.092	0.216	0.019	0.044	0.092	0.217	0.019	0.044	0.092	0.217	0.019	0.044	0.093	0.217
Lead	11.80	6.51	0.006	0.012	0.011	0.022	0.006	0.012	0.011	0.022	0.006	0.012	0.011	0.022	0.006	0.012	0.011	0.022	0.006	0.012	0.011	0.022
Molybdenum	20.83	-	0.006	0.020	-	-	0.006	0.020	-	-	0.006	0.020	-	-	0.006	0.020	-	-	0.006	0.020	-	-
Nickel	10.70	14.60	0.032	0.077	0.023	0.056	0.032	0.077	0.023	0.056	0.032	0.077	0.023	0.056	0.032	0.077	0.023	0.056	0.032	0.077	0.023	0.056
Selenium	0.68	0.36	0.008	0.020	0.015	0.037	0.008	0.020	0.015	0.037	0.008	0.020	0.015	0.037	0.008	0.020	0.015	0.037	0.008	0.020	0.015	0.037
Uranium	-	16.00	-	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001
Zinc	62.70	-	0.517	1.342	-	-	0.517	1.342	-	-	0.518	1.342	-	-	0.518	1.342	-	-	0.518	1.342	-	-

Fraction of time in area: 1.0

JSL @ Sissons	Toxicity Benchmarks (mg/(kg d))		Base				Kiggavik Project				Kiggavik Project				Kiggavik Project				Kiggavik Project			
							Year 10 of Operation				Year 5 of Final Closure				Year 15 of Final Closure				Year 5 of Post Closure			
			SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs	
	LOAELs	NOAELs	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th
Arsenic	3.60	-	0.013	0.047	-	-	0.013	0.047	-	-	0.013	0.047	-	-	0.013	0.047	-	-	0.013	0.047	-	-
Cadmium	2.37	1.47	0.037	0.099	0.059	0.160	0.037	0.099	0.060	0.160	0.037	0.099	0.060	0.160	0.037	0.099	0.060	0.160	0.037	0.099	0.059	0.160
Cobalt	14.13	4.10	0.008	0.027	0.026	0.092	0.008	0.027	0.026	0.092	0.008	0.027	0.026	0.092	0.008	0.027	0.026	0.092	0.008	0.027	0.026	0.092
Copper	75.20	15.30	0.019	0.044	0.092	0.215	0.019	0.044	0.092	0.216	0.019	0.044	0.093	0.217	0.019	0.044	0.093	0.217	0.019	0.044	0.093	0.217
Lead	11.80	6.51	0.006	0.012	0.011	0.022	0.006	0.012	0.011	0.022	0.006	0.012	0.011	0.022	0.006	0.012	0.011	0.022	0.006	0.012	0.011	0.022
Molybdenum	20.83	-	0.006	0.020	-	-	0.006	0.020	-	-	0.006	0.020	-	-	0.006	0.020	-	-	0.006	0.020	-	-
Nickel	10.70	14.60	0.032	0.077	0.023	0.057	0.032	0.077	0.023	0.057	0.032	0.077	0.023	0.057	0.032	0.077	0.023	0.057	0.032	0.077	0.023	0.057
Selenium	0.68	0.36	0.008	0.020	0.016	0.038	0.008	0.020	0.016	0.038	0.008	0.020	0.016	0.038	0.008	0.020	0.016	0.038	0.008	0.020	0.016	0.038
Uranium	-	16.00	-	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001	-	-	<0.001	<0.001
Zinc	62.70	-	0.518	1.344	-	-	0.518	1.344	-	-	0.518	1.344	-	-	0.518	1.344	-	-	0.518	1.344	-	-

Fraction of time in area: 1.0

Note: **BOLD SHADING** indicates a screening index exceedance of 1.0

Table 8.2-16 Screening Index Values for Non-Radionuclide Intakes by Sandpiper

JSL @ Kiggavik	Toxicity Benchmarks		Base				Kiggavik Project				Kiggavik Project				Kiggavik Project				Kiggavik Project			
							Year 10 of Operation				Year 5 of Final Closure				Year 15 of Final Closure				Year 5 of Post Closure			
	(mg/(kg d))		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs	
	LOAELs	NOAELs	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th
Arsenic	3.60	-	0.074	0.166	-	-	0.085	0.198	-	-	0.084	0.182	-	-	0.082	0.193	-	-	0.074	0.166	-	-
Cadmium	2.37	1.47	0.038	0.102	0.061	0.164	0.048	0.127	0.077	0.205	0.048	0.127	0.078	0.205	0.046	0.121	0.074	0.195	0.038	0.102	0.061	0.164
Cobalt	148.00	14.80	0.011	0.017	0.036	0.058	0.011	0.018	0.038	0.063	0.011	0.019	0.039	0.065	0.011	0.018	0.038	0.063	0.011	0.017	0.037	0.060
Copper	27.00	24.10	0.057	0.093	0.282	0.456	0.058	0.093	0.283	0.457	0.058	0.093	0.283	0.457	0.057	0.093	0.283	0.456	0.057	0.093	0.282	0.456
Lead	11.80	6.51	0.010	0.014	0.018	0.025	0.010	0.014	0.018	0.025	0.010	0.014	0.018	0.025	0.010	0.014	0.018	0.025	0.010	0.014	0.018	0.025
Molybdenum	20.83	-	<0.001	0.001	-	-	0.004	0.009	-	-	0.004	0.009	-	-	0.003	0.008	-	-	<0.001	0.001	-	-
Nickel	10.70	14.60	0.042	0.113	0.031	0.083	0.043	0.115	0.031	0.084	0.043	0.117	0.031	0.086	0.042	0.114	0.031	0.084	0.042	0.113	0.031	0.083
Selenium	1.37	1.18	0.144	0.453	0.271	0.857	0.159	0.499	0.300	0.943	0.161	0.521	0.304	0.983	0.155	0.486	0.292	0.918	0.144	0.454	0.271	0.857
Uranium	-	16.00	-	-	0.003	0.004	-	-	0.004	0.007	-	-	0.003	0.006	-	-	0.003	0.004	-	-	0.003	0.004
Zinc	62.70	-	0.540	1.642	-	-	0.540	1.642	-	-	0.540	1.642	-	-	0.540	1.642	-	-	0.540	1.642	-	-

Fraction of time in area: 0.33

JSL @ Sissons	Toxicity Benchmarks		Base				Kiggavik Project				Kiggavik Project				Kiggavik Project				Kiggavik Project			
							Year 10 of Operation				Year 5 of Final Closure				Year 15 of Final Closure				Year 5 of Post Closure			
	(mg/(kg d))		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs		SIs - LOAELs		SIs - NOAELs	
	LOAELs	NOAELs	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th	Average	95th
Arsenic	3.60	-	0.075	0.167	-	-	0.080	0.175	-	-	0.077	0.169	-	-	0.076	0.171	-	-	0.075	0.167	-	-
Cadmium	2.37	1.47	0.038	0.103	0.062	0.165	0.040	0.108	0.065	0.173	0.040	0.108	0.065	0.173	0.040	0.105	0.064	0.169	0.038	0.103	0.062	0.165
Cobalt	148.00	14.80	0.011	0.017	0.036	0.058	0.011	0.017	0.036	0.058	0.011	0.017	0.036	0.058	0.011	0.017	0.036	0.058	0.010	0.017	0.036	0.058
Copper	27.00	24.10	0.058	0.094	0.285	0.460	0.058	0.094	0.285	0.460	0.058	0.094	0.285	0.460	0.058	0.094	0.285	0.460	0.058	0.094	0.285	0.460
Lead	11.80	6.51	0.010	0.014	0.018	0.025	0.010	0.014	0.018	0.025	0.010	0.014	0.018	0.025	0.010	0.014	0.018	0.025	0.010	0.014	0.018	0.025
Molybdenum	20.83	-	<0.001	0.001	-	-	0.002	0.005	-	-	0.002	0.004	-	-	0.001	0.003	-	-	<0.001	0.001	-	-
Nickel	10.70	14.60	0.042	0.114	0.031	0.083	0.042	0.114	0.031	0.083	0.042	0.114	0.031	0.084	0.042	0.114	0.031	0.083	0.042	0.114	0.031	0.083
Selenium	1.37	1.18	0.144	0.456	0.273	0.861	0.148	0.463	0.279	0.875	0.147	0.464	0.278	0.877	0.146	0.459	0.276	0.868	0.144	0.456	0.273	0.861
Uranium	-	16.00	-	-	0.003	0.004	-	-	0.006	0.011	-	-	0.004	0.007	-	-	0.003	0.004	-	-	0.003	0.004
Zinc	62.70	-	0.544	1.658	-	-	0.544	1.658	-	-	0.544	1.658	-	-	0.544	1.658	-	-	0.544	1.658	-	-

Fraction of time in area: 0.33

Note: **BOLD SHADING** indicates a screening index exceedance of 1.0

8.2.2 Radiological Dose

The potential adverse effects of radionuclides on terrestrial ecological receptors were evaluated by comparing the predicted mean and 95th percentile dose estimates, which were derived using a representative range of RBE values (i.e. 10 and 40), to selected benchmarks (1 mGy/d and 3 mGy/d). Attachment H provides details of the dose calculation. The exposure calculations consider their total exposure and thus include baseline plus Project impacts as well as background exposures to receptors while they are outside of the study area. Therefore, calculated screening index values are compared to a benchmark of 1.0.

A baseline gamma level of 40 nGy/h (or 0.04 µGy/h) was used to calculate external dose to ecological receptors. This value represents a typical value based on airborne gamma ray spectrometry for the Thelon River area, as presented by Carson et al. (2001).

The screening index values for the equivalent dose for the most conservative evaluation (i.e., a RBE value of 40 and a benchmark of 1 mGy/d) are provided in Table 8.2-17, while the results for the remaining evaluations are included in Attachment H. All calculated screening index values are well below a benchmark value of 1.0, which indicates that there are no predicted negative impacts to terrestrial receptors. The largest screening index values (< 0.5 at the 95th percentile level) were calculated for the ptarmigan and sandpiper. The SI values provided in the table show that the Project is expected to have a trivial contribution to the exposure of radioactivity to terrestrial biota.

Table 8.2-17 Results of Radiological Assessment for Terrestrial Receptors

Screening Index - Equivalent Dose	Baseline		Year 10 of Operation		Year 5 of Final Closure		Year 15 of Final Closure		Year 5 of Post Closure	
	Mean	95th	Mean	95th	Mean	95th	Mean	95th	Mean	95th
Bear - LSA	<0.01	0.02	<0.01	0.02	<0.01	0.02	<0.01	0.02	<0.01	0.02
Caribou - LSA	0.07	0.23	0.07	0.23	0.07	0.23	0.07	0.23	0.07	0.23
Caribou - RSA	0.07	0.23	0.07	0.23	0.07	0.23	0.07	0.23	0.07	0.23
Falcon - LSA	0.05	0.16	0.05	0.16	0.05	0.16	0.05	0.16	0.05	0.16
Falcon - RSA	0.05	0.16	0.05	0.16	0.05	0.16	0.05	0.16	0.05	0.16
Fox - LSA	<0.01	0.01	<0.01	0.01	<0.01	0.01	<0.01	0.01	<0.01	0.01
Lemming - Rock Lake Watershed	0.04	0.11	0.04	0.13	0.04	0.11	0.04	0.11	0.04	0.11
Lemming - JSL @ Kiggavik Discharge	0.04	0.11	0.04	0.13	0.04	0.11	0.04	0.11	0.04	0.11
Lemming - Kiggavik Camp	0.04	0.11	0.13	0.46	0.04	0.11	0.04	0.11	0.04	0.11
Lemming - JSL @ Sissons Discharge	0.04	0.11	0.05	0.15	0.04	0.11	0.04	0.11	0.04	0.11
Lapland Longspur - Rock Lake Watershed	0.05	0.15	0.05	0.15	0.05	0.15	0.05	0.15	0.05	0.15
Lapland Longspur - JSL @ Kiggavik Discharge	0.05	0.16	0.05	0.16	0.05	0.16	0.05	0.16	0.05	0.16
Lapland Longspur - Kiggavik Camp	0.05	0.15	0.06	0.17	0.05	0.15	0.05	0.15	0.05	0.15

Screening Index - Equivalent Dose	Baseline		Year 10 of Operation		Year 5 of Final Closure		Year 15 of Final Closure		Year 5 of Post Closure	
	Mean	95th	Mean	95th	Mean	95th	Mean	95th	Mean	95th
Lapland Longspur - JSL @ Sissons Discharge	0.05	0.15	0.05	0.16	0.05	0.15	0.05	0.15	0.05	0.15
Long-Tailed Duck - JSL @ Kiggavik Discharge	0.06	0.22	0.06	0.23	0.06	0.22	0.06	0.22	0.06	0.22
Long-Tailed Duck - JSL @ Sissons Discharge	0.06	0.23	0.06	0.23	0.06	0.23	0.06	0.23	0.06	0.23
Merganser - JSL @ Kiggavik Discharge	<0.01	0.02	<0.01	0.02	<0.01	0.02	<0.01	0.02	<0.01	0.02
Merganser - JSL @ Sissons Discharge	<0.01	0.02	<0.01	0.02	<0.01	0.02	<0.01	0.02	<0.01	0.02
Muskox - JSL @ Kiggavik Discharge	0.02	0.06	0.02	0.06	0.02	0.06	0.02	0.06	0.02	0.06
Muskox - JSL @ Sissons Discharge	0.05	0.15	0.05	0.16	0.05	0.15	0.05	0.15	0.05	0.15
Northern Pintail - JSL @ Kiggavik Discharge	0.06	0.20	0.06	0.20	0.06	0.20	0.06	0.20	0.06	0.20
Northern Pintail - JSL @ Sissons Discharge	0.06	0.20	0.06	0.20	0.06	0.20	0.06	0.20	0.06	0.20
Ptarmigan - Rock Lake Watershed	0.15	0.44	0.15	0.44	0.15	0.44	0.15	0.44	0.15	0.44
Ptarmigan - JSL @ Kiggavik Discharge	0.15	0.44	0.15	0.44	0.15	0.44	0.15	0.44	0.15	0.44
Ptarmigan - Kiggavik Camp	0.15	0.44	0.15	0.45	0.15	0.44	0.15	0.44	0.15	0.45
Ptarmigan - JSL @ Sissons Discharge	0.15	0.44	0.15	0.44	0.15	0.44	0.15	0.44	0.15	0.44
Sandpiper - JSL @ Kiggavik Discharge	0.13	0.44	0.13	0.45	0.13	0.44	0.13	0.44	0.13	0.44
Sandpiper - JSL @ Sissons Discharge	0.13	0.44	0.13	0.46	0.13	0.44	0.13	0.44	0.13	0.44
Shrew - Rock Lake Watershed	0.02	0.05	0.02	0.05	0.02	0.05	0.02	0.05	0.02	0.05
Shrew - JSL @ Kiggavik Discharge	0.02	0.05	0.02	0.06	0.02	0.05	0.02	0.05	0.02	0.05
Shrew - Kiggavik Camp	0.02	0.04	0.07	0.23	0.02	0.04	0.02	0.04	0.02	0.04
Shrew - JSL @ Sissons Discharge	0.02	0.05	0.02	0.06	0.02	0.05	0.02	0.05	0.02	0.05
Squirrel - Rock Lake Watershed	0.02	0.08	0.02	0.08	0.02	0.08	0.02	0.08	0.02	0.08
Squirrel - JSL @ Kiggavik Discharge	0.02	0.08	0.02	0.08	0.02	0.08	0.02	0.08	0.02	0.08
Squirrel - Kiggavik Camp	0.02	0.08	0.02	0.08	0.02	0.08	0.02	0.08	0.02	0.08
Squirrel - JSL @ Sissons Discharge	0.02	0.08	0.02	0.08	0.02	0.08	0.02	0.08	0.02	0.08
Wolf - LSA	<0.01	0.02	<0.01	0.02	<0.01	0.02	<0.01	0.02	<0.01	0.02
Wolf - RSA	<0.01	0.02	<0.01	0.02	<0.01	0.02	<0.01	0.02	<0.01	0.02
Wolverine - LSA	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Wolverine - RSA	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Note: Results presented for a RBE of 40 and a benchmark value of 1 mGy/d. Other evaluations are provided in Attachment H.

9 RESULTS FOR HUMAN HEALTH RISK ASSESSMENT

This section presents the predicted risk of adverse health effects to individuals (other than those classified as nuclear energy workers) who could conceivably be exposed to COPC released to the environment from the Kiggavik Project. An assessment of the exposure to COPC to workers is presented in Volume 8 of the EIS.

Atmospheric and aquatic emissions from the Kiggavik Project were used to predict doses and intakes to human receptors in the study area. As outlined in previous sections, the aquatic environment was explicitly modeled; water and sediment quality predictions were made for Judge Sissons Lake. Similarly, atmospheric emissions from dust re-suspension and radon releases from the site were included in the assessment as discussed in Section 3.

The water quality and pathways models are coupled and were run probabilistically to permit uncertainty in the input parameters to be explicitly accounted for in the model predictions. Results from air quality modelling (discussed separately in Appendix 4B Air Quality) were input to the pathways model. The magnitude of the uncertainties in the model parameters is reflected in the values assigned to the input parameter distributions discussed in prior sections and in the attachments. The pathways modeling results presented below are based on 200 trials.

9.1 EXPOSURE TO NO_x, SO₂ AND DUST

In Appendix 4B predicted air concentrations were compared to air quality standards. The standards used are from NWT which in turn adopted the Canadian National Ambient Air Quality Objectives (Government of Northwest Territories, 2011). The NAAQO's are developed through scientific assessment, derivation of reference levels, assessment of monitoring technologies, economic benefits and public/stakeholder consultations. Therefore, the ambient air quality objectives are not necessarily protective of health. In addition, there has been a substantial amount of study into the health effects to criteria air pollutants in recent times, before the NAAQOs were established. Therefore, in order to examine the effects of the predicted NO₂ air concentrations on human health it is necessary to compare to health-based criteria such as those provided by the World Health Organization (WHO). The maximum incremental concentrations of NO₂ and SO₂ are presented in Table 9.1-1 for the maximum bounding scenario. It should be noted that these maximum concentrations do not occur simultaneously as outlined in Appendix 4B. Also shown in the table are health-based criteria provided by the World Health Organization (WHO).

Table 9.1-1 Incremental Maximum Concentrations of NO₂ and SO₂ at Discrete Receptor Locations

Receptor Name	NO ₂ (µg/m ³)			SO ₂ (µg/m ³)	
	Incremental 1-hr Maximum	Frequency of Exceedances 1-hr Max (hours per year)	Incremental Annual Maximum	Incremental 1-hr Maximum	Incremental 24-hr Maximum
Accommodation Complex	380.7	117	13.6	41	1.03
Community of Baker Lake	3.8	n/a	0.04	0.16	
Judge Sissons Lake Cabin	36.5	n/a	0.80	2.7	
Health-Based Criteria (µg/m³)	200	-	40	500	20

The use of the health-based 1-hr maximum incremental criteria for NO₂ of 200 µg/m³ is protective of sensitive individuals (i.e., people with asthma) and therefore needs no built in safety factors. The annual guideline of 40 µg/m³ is set to protect the public from gaseous effects of NO₂ (WHO 2005). In addition, there is epidemiological evidence in children with asthma indicating that bronchitic symptoms increase with increasing NO₂ concentrations. Annual NO₂ concentrations meet applicable criteria at the discrete receptors locations, including at the residential community of Baker Lake. There are 1-hour NO₂ concentrations above the criterion of 200 µg/m³ over the area surrounding both the Kiggavik and Sissons mine sites. Exceedances can be attributed to emissions of NO_x from open pit mining activities, including diesel-powered mining equipment and blasting. At the Camp location, approximately 1% of the hours (117 hours out of 8760 hours over the year) exceed the health-based limit of 200 µg/m³. As mentioned above, the health-based limit is set to be protective of sensitive individuals such as asthmatics. It should be noted that the WHO indicates that concentrations in the range of 1880 µg/m³ did not result in any adverse respiratory effects in healthy adults. Therefore, it is unlikely that adults working at the Camp would experience any health issue related to short-term NO₂ exposure..

As can be seen in Table 9.1-1, 1- and 24-hour maximum concentrations of SO₂ are well within the limits of applicable health-based criteria.

The predicted incremental concentrations of dust (PM₁₀ and PM_{2.5}) are presented in Table 9.1-2 for the maximum bounding scenario. Also shown in the table are health-based criteria for particulate. It is important to note that the maximum concentrations at each receptor typically occur during different meteorological conditions (i.e., different days) and do not occur simultaneously.

Table 9.1-2 Incremental Maximum 24-hr Concentrations of PM₁₀ and PM_{2.5} at Discrete Receptor Locations

Discrete Receptor Name	PM ₁₀ (µg/m ³)		PM _{2.5} (µg/m ³)	
	Incremental 24-hr Maximum	Frequency of Exceedances 24-hr Max (days per year)	24-hr 98 th Percentile	Frequency of Exceedances 24-hr Max (days per year)
Accommodation Complex	115.2	35	22.5	34
Community of Baker Lake	0.6	n/a	0.2	n/a
Judge Sissons Lake Cabin	11.1	n/a	2.0	n/a
Health-Based Criteria (µg/m³)	25	-	7	-

As can be seen in the table, the modelling suggests the potential for particulate matter at the Accommodation Complex to exceed the health-based guidelines. No exceedances are expected at other receptor locations. Exceedances can be attributed to emissions of dust from open pit mining activities, including unpaved road dust generated on the in-pit ramps.

This current assessment does not attempt to predict PM_{2.5}-induced changes in mortality or morbidity rates at the camp because the concentration-response relationships are based on epidemiological studies on large cities with large populations (several hundred thousand people) and the robustness of these studies and applicability to the small number of people in the camp becomes increasingly less certain as the number of people decrease. Furthermore, there are a number of uncertainties inherent in the PM_{2.5} concentration-response relationships developed from these epidemiological studies (U.S.EPA 2010).

The epidemiological literature suggests the following relationships between fine particulate matter and potential health effects:

- Older adults have a greater susceptibility for cardiovascular morbidity with PM exposure.
- Children are at an increased risk of PM-related respiratory effects relative to adults.
- Individuals with underlying cardiovascular and respiratory diseases are more susceptible to adverse effects from PM-exposure.
- Good nutritional status is reported to have protective effects against PM exposure.

Given the above discussion and the fact that the workers present at the camp would be healthy individuals with good nutritional status, the probability of adverse effects related to PM exposure is likely to be low.

9.2 NON-CARCINOGENIC EFFECTS

For many non-carcinogenic effects, protective biological mechanisms must be overcome before an adverse effect is manifested from exposure to the contaminant. This is known as a "threshold" concept. The potential for an effect is evaluated through a comparison to toxicity reference values (TRVs). However, 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.

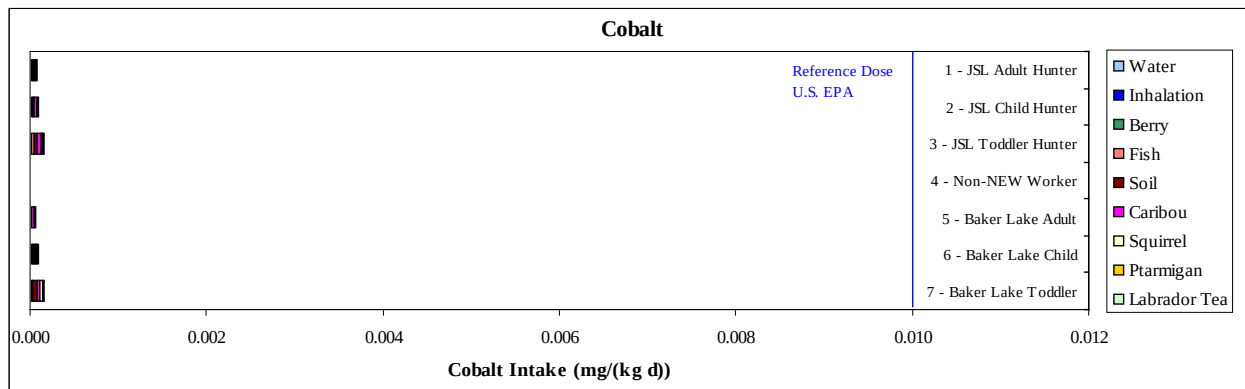
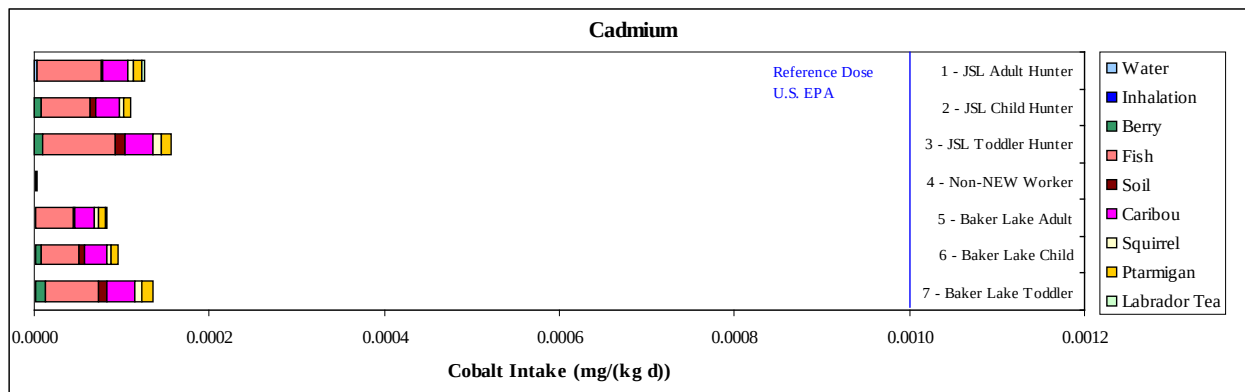
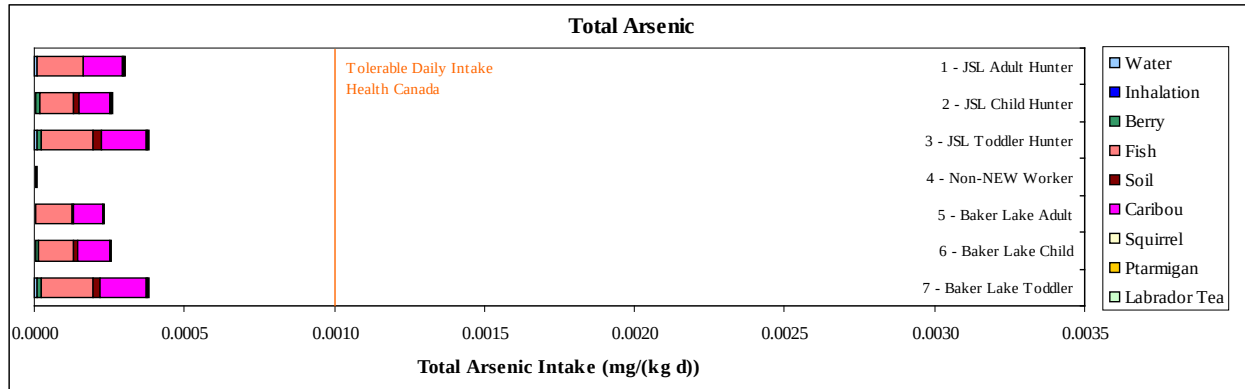
Doses occurring as a result of the Kiggavik Project are referred to as "incremental" (above background) exposures and include all of the exposure pathways assessed in the model. Exposures occurring as a result of other activities are referred to as "baseline" exposures. Both incremental and baseline exposure are required to estimate total intake, which is subsequently compared to toxicity benchmarks in the case of non-radionuclides.

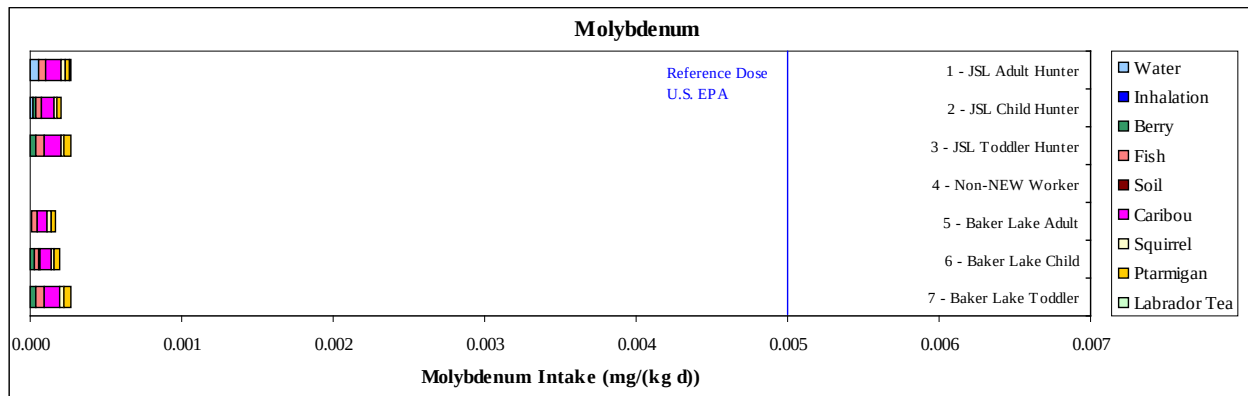
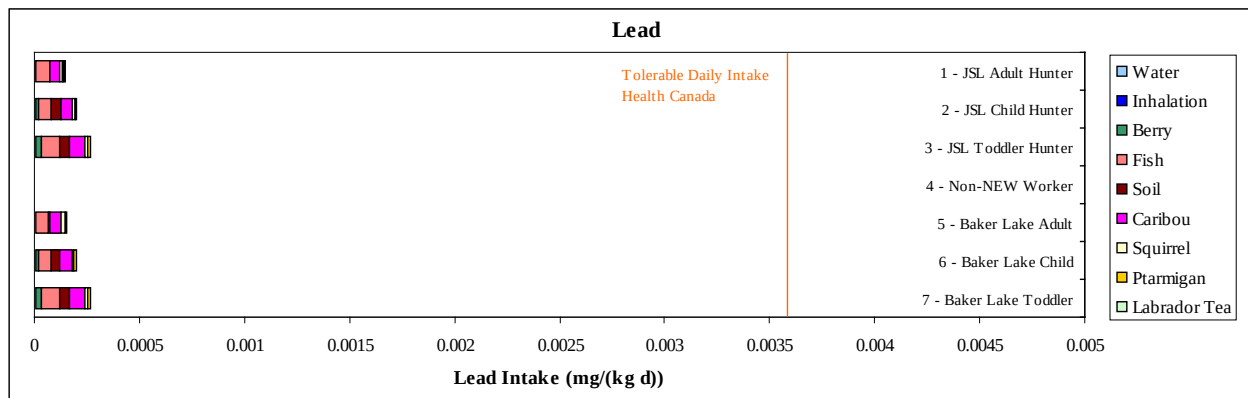
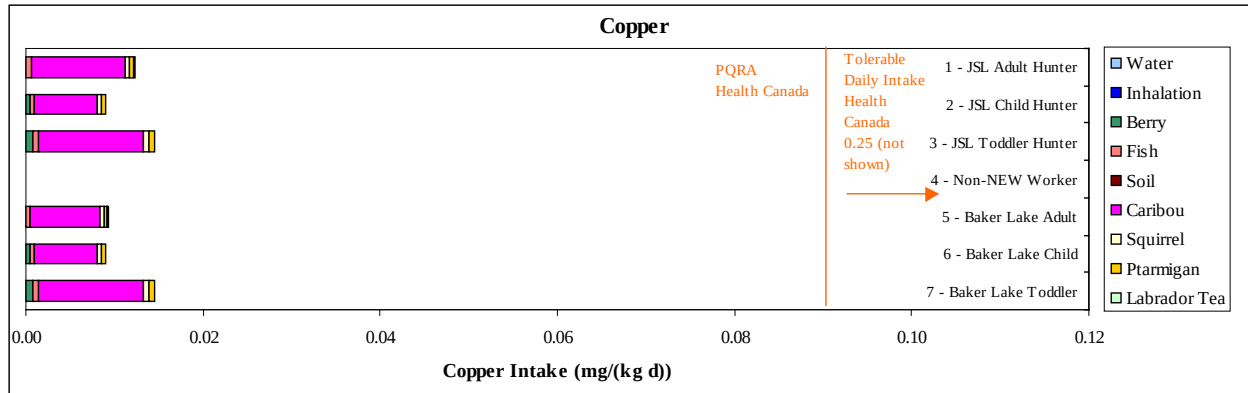
In this assessment, soil and inhalation exposures as well as water intakes and the majority of the diet (meat, fish, berries, and other traditional food consumption) over the year were evaluated; the dermal pathway (a relatively insignificant pathway for non-volatile chemicals); supermarket foods were not considered.

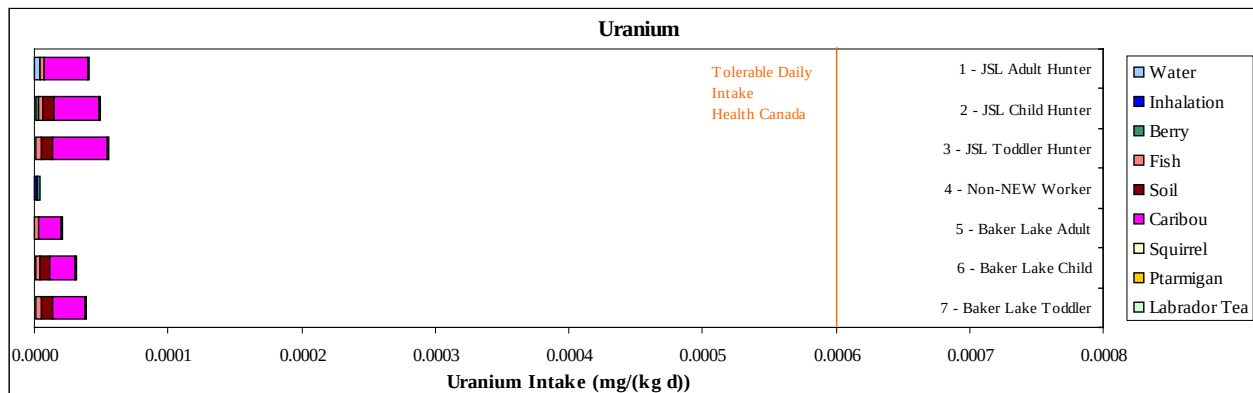
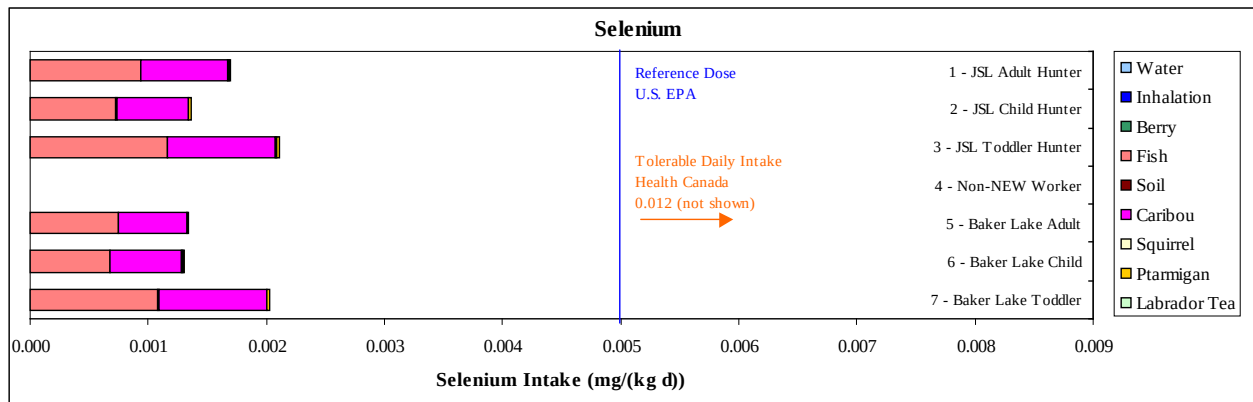
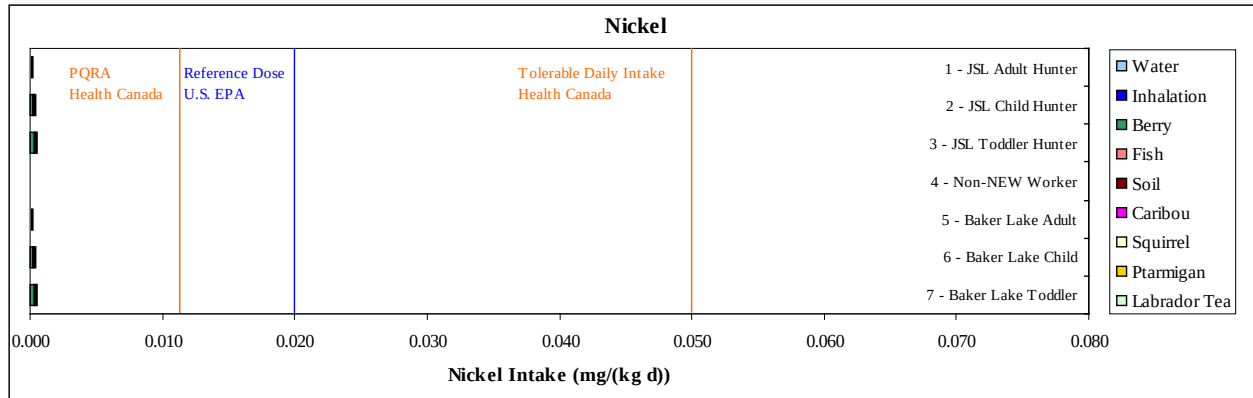
Exposures to non-radionuclides were evaluated as daily intakes. Estimated exposures to non-radionuclides for the adult and child human receptors were obtained from the INTAKE pathways model described in Section 2.10. The annual exposures were converted to a daily exposure (mg/(kg d)) by dividing by the body weight (70.7 kg for an adult and 32.9 kg for a child and 16.5 for a toddler) and the number of days in a year (365 d). These exposures were compared to the toxicity benchmarks, presented in Section 6.2.

Detailed summaries of the contributions of each pathway to the total intakes are provided in Attachment F. Figure 9.2-1 presents a graphical summary of the predicted mean intakes for the maximum exposure during the operation period. The appropriate TRVs are also indicated in Figure 9.2-1 for comparison. The figure shows that the predicted intakes for all the human receptors are below the applicable TRVs for all non-carcinogenic COPC. Values provided by Health Canada were generally preferentially selected as TRVs for evaluation of the health impacts on human receptors. The Toxicology Evaluation Section of the Health Products and Food Branch of Health Canada has published TDIs for a number of trace elements found in foodstuff. These values were also considered for use in this assessment.

Figure 9.2-1 also indicates the most significant pathways for the total intake of each COPC. Fish and caribou ingestion are the biggest contributors for arsenic, cadmium, and selenium. Caribou, soil, berry, and ptarmigan ingestion are the most significant pathways for cobalt and molybdenum. Lead intake is mostly from soil ingestion, with fish and caribou ingestion as less significant pathways. Berry and ptarmigan ingestion dominate the intake of nickel, and caribou ingestion is by far the most significant pathway for copper, uranium and zinc intakes.







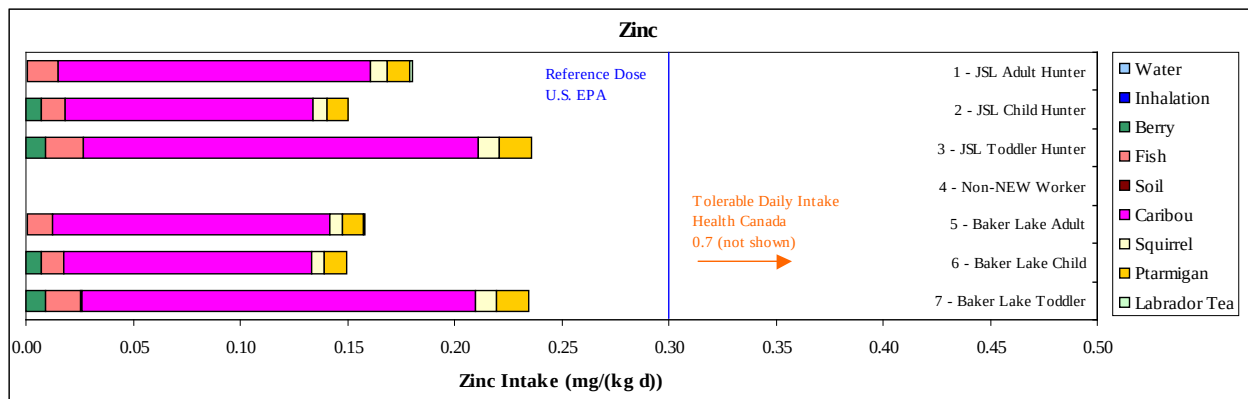


Figure 9.2-1 Predicted Maximum Mean Intakes of Non-Radionuclides by Pathway for Human Receptors

Table 9.2-1 provides a comparison on the intake of the toddler (the most exposed) to intakes that are generally expected for Canadian toddlers. It should be noted that the intakes for the Kiggavik Project and baseline do not account for all pathways of exposure as supermarket foods (e.g. milk, pasta) are not included. This table shows that the exposure to local toddlers is similar to typical Canadian exposure and below levels of concern.

Table 9.2-1 Assessment of Exposure to Non-Radioactive COPC for Members of the Public (Toddler of Judge Sissons Hunter)

	Health Benchmark ($\mu\text{g}/(\text{kg d})$)	Kiggavik Project + Baseline ^a		General Canadian	
		Intake ($\mu\text{g}/(\text{kg d})$)	% Health Benchmark	Intake ($\mu\text{g}/(\text{kg d})$)	% Health Benchmark
Arsenic	1	0.38	38%	0.66	66%
Cadmium	1	0.16	16%	0.56	56%
Cobalt	10	0.16	1.6%	0.71	7.1%
Copper	90	14.48	16%	56.8	63%
Lead	3.6	0.31	8.7%	0.60	17%
Molybdenum	5	0.27	5.5%	8.59	172%
Nickel	11	0.56	5.1%	11.5	104%
Selenium	5	2.11	42%	4.2	84%
Uranium	0.6	0.05	9.0%	0.08	13%
Zinc	300	236	79%	549	183%

Note:

a The intakes reflect the total exposure (baseline + Project emissions) for all routes of exposure included in the assessment. Other routes of exposure (e.g. supermarket foods such as milk, grains) have not been included.

9.3 CARCINOGENIC EFFECTS

For carcinogenic COPC (arsenic in this assessment), a risk is calculated by multiplying the estimated dose (in mg/(kg-d)) by the appropriate slope factor (in (mg/(kg-d))⁻¹). This is shown in equation (9.3-1). The estimate corresponds to an incremental risk of an individual developing cancer over a lifetime as a result of exposure. Risk is defined as follows:

$$Risk = (D_o \times SF_o) + (D_d \times SF_d) \quad (9.3-1)$$

where:

D_o	=	Dose due to oral (ingestion) exposure (mg/(kg-d));
D_d	=	Dose due to dermal exposure (mg/(kg-d));
SF_o	=	Slope Factor for oral exposure (mg/(kg-d)) ⁻¹ ;
SF_d	=	Slope Factor for dermal exposure (mg/(kg-d)) ⁻¹ (assumed equal to SF_o).

The doses or intakes for the different pathways of exposure are presented in Attachment F and the slope factors used in this assessment are presented in Section 6.2. The calculated risk is then compared to acceptable benchmarks. In this assessment, an incremental risk level of 1×10^{-5} (1 in 100,000) was used to assess carcinogenic effects. Health Canada considers this value to represent an “essentially negligible” risk. In this case, two composite receptors are assessed: one composite resident receptor in the Baker Lake community and one Judge Sissons Lake hunter composite receptor. The composite receptors encompass the exposure of a toddler for 4 years, then as a child on the site for 10 years, and the exposure of this child as an adult for another 60 years. In simple terms, the assessment considers that each composite receptor is exposed throughout their lifetime from toddler to child to an adult.

Table 9.3-1 summarizes the predicted lifetime incremental risks from arsenic associated with the Project. The Judge Sissons Lake hunter composite receptor has a higher predicted incremental risk from arsenic than the Baker Lake composite receptor; however, both composite receptors have an incremental arsenic risk below the acceptable benchmark of 1×10^{-5} (1 in 100,000) which, as outlined by Health Canada, represents an “essentially negligible” risk.

Table 9.3-1 Predicted Lifetime Incremental Risk from Arsenic

	Average Lifetime Risk From Incremental Arsenic From Project Effects									
	Water	Inhalation	Berries	Fish	Soil	Caribou	Squirrel	Ptarmigan	L. Tea	Total
JSL Hunter Composite	3.5×10^{-6}	4.3×10^{-10}	3.9×10^{-9}	3.0×10^{-7}	2.5×10^{-9}	3.9×10^{-7}	7.2×10^{-9}	1.1×10^{-7}	1.2×10^{-10}	4.3×10^{-6}
Baker Lake Composite	1.8×10^{-8}	1.6×10^{-10}	1.9×10^{-10}	1.7×10^{-6}	2.5×10^{-9}	1.4×10^{-7}	1.9×10^{-10}	9.1×10^{-11}	3.3×10^{-11}	1.9×10^{-6}

	Breakdown of Average Lifetime Risk by Pathway								
	Water	Inhalation	Berries	Fish	Soil	Caribou	Squirrel	Ptarmigan	L. Tea
JSL Hunter Composite	81.0%	<0.1%	<0.1%	7.0%	<0.1%	9.1%	0.2%	2.6%	<0.1%
Baker Lake Composite	1.0%	<0.1%	<0.1%	91.5%	0.1%	7.4%	<0.1%	<0.1%	<0.1%

9.4 RADIATION DOSE EFFECTS

Regardless of where people live or work, they are exposed to radiation from natural sources; this ranges from about 1,000 to 13,000 microsieverts per year ($\mu\text{Sv}/\text{year}$) (UNSCEAR 2008, Annex B). People are exposed to radiation from natural sources, such as: cosmic rays; radionuclides in air, water and food; and gamma radiation from naturally occurring radioactive elements in the soil, rocks, and building materials used in homes. Table 9.4-1 lists exposure to radiation to some of the common sources of naturally occurring radiation for those living in Canada (AECB 1995). This information is also illustrated in Figure 9.4-1. An additional source of radiation to some individuals is through diagnostic medical procedures.

Table 9.4-1 Typical Natural Sources of Radiation for Canadian Population

Natural Sources of Radiation	Average Annual Dose
Dose from cosmic radiation	300 $\mu\text{Sv}/\text{year}$
Naturally-occurring radionuclides (uranium and thorium series and K-40) found in soil, rocks, sediments that transfer naturally to human food, water and air	350 $\mu\text{Sv}/\text{year}$
Naturally-occurring radionuclides in soils, rocks, and building materials contributing to gamma radiation	350 $\mu\text{Sv}/\text{year}$
Naturally-occurring radon gas and its radioactive decay products	1,000 $\mu\text{Sv}/\text{year}$

Source: AECB (1995)

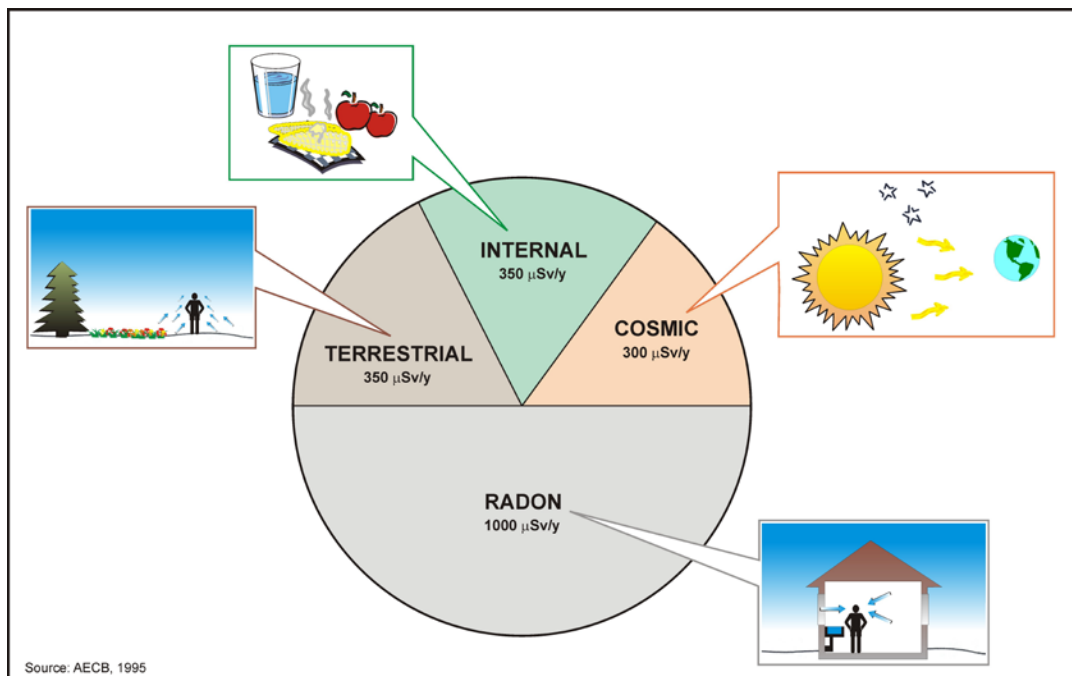


Figure 9.4-1 Typical Distribution of Annual Dose from Natural Radiation

The typical radiation dose for people living in the Project area may be different than that identified in Table 9.4-1 and Figure 9.4-1. Due to consumption of caribou that consume lichen, the internal dose is likely higher than that shown above. For example, ingestion of caribou in northern Canada has been shown to add 1,000 to 4,000 $\mu\text{Sv/y}$, primarily due to the natural background levels of Po-210 (Thomas et al. 2001). Artificial radionuclides from fall-out can also contribute to the dose from ingestion of caribou, although this is expected to be a small factor. For example, Thomas and Gates (1999) estimated that Cs-137 could contribute to just over 10% of the total dose. Due to the lack of basements in houses in the far north, the dose from radon may be less than the typical exposure estimates for radon provided above.

Annual incremental doses (i.e. above baseline) for the Project were evaluated for exposure to radionuclides. For exposure to radionuclides, the incremental dose from the Project was calculated for each receptor.

The incremental annual radiation dose resulting from the Project for the seven receptors is summarized in Table 9.4-2. The highest predicted mean incremental dose is 98 $\mu\text{Sv/year}$ for the non-NEW worker. This is below the CNSC incremental dose limit of 1,000 $\mu\text{Sv/year}$ as well as the Health Canada dose constraint of 300 $\mu\text{Sv/year}$.

Table 9.4-2 Summary of Incremental Annual Radiation Dose Related to Project Activities

Human Receptor	Maximum Mean Incremental Radiation Dose Related to Project Activities ($\mu\text{Sv/year}$)	CNSC Recommended Allowable Incremental Dose for Protection of Members of Public
1 – JSL Adult Hunter	33	1,000 $\mu\text{Sv/year}$
2 – JSL Child Hunter	53	
3 – JSL Toddler Hunter	64	
4 – Non-NEW Worker	98	
5 – Baker Lake Adult	11	
6 – Baker Lake Child	16	
7 – Baker Lake Toddler	20	

Figure 9.4-2 presents a graphical summary of the predicted average incremental dose to human receptors from radiation for the Project activities. The majority of the incremental radiation dose for all receptors except for the non-NEW worker is from caribou. This dose is primarily from Po-210. As discussed in Section 7.1.1, the assessment of Pb-210, and therefore Po-210, was based on uranium in dust and the ingrowth of Pb-210 from radon was not included. The inclusion of this additional source of Pb-210 and Po-210 would increase the estimated doses to

these receptors; however, the dose would remain well below the CNSC recommended allowable dose for members of the public. The non-NEW worker receives most of his/her incremental dose from radon and inhalation.

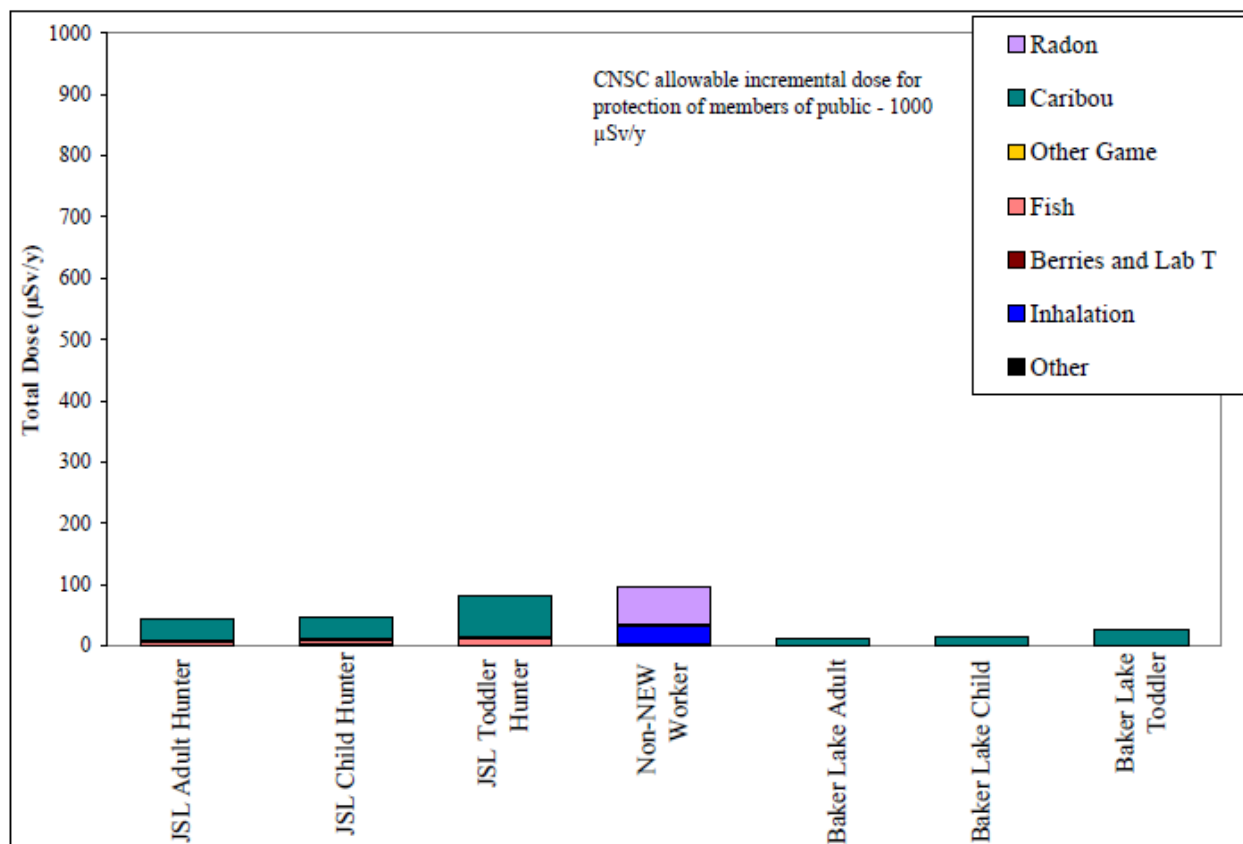


Figure 9.4-2 Breakdown of Incremental Radiation Dose from Kiggavik Project

The estimated dose for the non-NEW receptor provided in Table 9.4-2 and shown in Figure 9.4-2 addresses the exposure while at the Kiggavik camp. However, it is likely that this individual resides in the Baker Lake community the remaining fifty percent of their time. The total dose for the non-NEW could therefore be taken to be 104 µSv/y (i.e. 98 µSv/y for a non-NEW while at the campsite + 0.5*11 µSv/y the dose while an adult resident at Baker Lake). This dose is still well below the CNSC allowable dose for members of the public and the Health Canada dose constraint.

10 SUMMARY AND CONCLUSIONS

The purpose of the assessment was to determine the level of effect on the local environment (including people) for constituents of potential concern (COPC) attributable to the Kiggavik Project.

The study included four major components as follows:

- Atmospheric dispersion modelling which provides estimates of COPC in air due to the various activities associated with the Project (detailed in Appendix 4B);
- Aquatic environment assessment in which potential changes in water and sediment quality due to releases from the Water Treatment Plants at the Kiggavik site are predicted (results are shown in Section 7.2 and 7.3 of this document);
- Ecological risk assessment (ERA) where changes in COPC levels in the environment are examined to determine if there are any potential effects on biota (results are provided in Section 7.5 for vegetation and Section 8 for aquatic biota and wildlife); and,
- Human health risk assessment (HHRA) where the potential for effects on people due to emissions of COPC from the Project that reside in the area and consume local foods is examined (Section 9).

The COPC identified for the risk assessment included: uranium and the uranium-238 decay series (thorium-230, lead-210, radium-226, and polonium-210), arsenic, cadmium, cobalt, copper, lead, molybdenum, nickel, selenium, and zinc, as well as the standard water quality constituents ammonia, chloride, hardness, sulphate, and total dissolved solids (TDS).

The assessment was completed within a probabilistic framework to characterize the variability and uncertainty in the input parameters, such as measured site concentrations, literature-based transfer factors, and receptor characteristics. The results of the probabilistic assessment are probability distributions of the estimated risks from exposure to each COPC, which illustrates the variability and uncertainty in the estimated risks and provides a basis for quantifying the likelihood of exceedances. The variabilities in input parameters were represented by distribution functions and were selected to cover the potential range of values, but also remain conservative. Therefore, the expected values (represented in this assessment by the arithmetic mean values) are the most likely results, yet remain conservatively biased. The upper-bound values (represented by the 95th percentile values) define the range of results and in the case where these upper-bound values are below the selected benchmarks, it can be confidently stated that effects are not expected.

For the ecological risk assessment, a range of ecological receptors were examined from different trophic levels in the aquatic and terrestrial environments. The results of the ERA showed that:

- For the COPC with Canadian Water Quality Guidelines (CWQG) such as arsenic, lead, molybdenum, nickel, selenium, zinc, and un-ionized ammonia, predicted water concentrations were below the guidelines in all segments of Judge Sissons Lake. Predicted water quality for copper does exceed the CWQG in two shallow segments of the lake but this is due to natural fluctuations that occur during winter and is not influenced by the Project. For cadmium, detection limits are not adequate to meet the CWQG therefore in the modelling it was assumed that natural background concentrations were at the detection limit, and exceeded the CWQG of 0.017 µg/L. It was shown that effluent discharge does affect cadmium concentrations in Judge Sissons Lake;
- Similarly, downstream of Judge Sissons Lake, predicted incremental downstream water concentrations are well below the CWQG for all COPC, with the exception of cadmium, which exceeds the guideline both at the baseline concentration and the predicted incremental downstream concentration. For the radionuclides and cobalt, which do not have water quality guidelines, the predicted incremental concentrations are similar to the baseline levels;
- Generally, the sediment is not influenced by the effluent contribution to water; however, there are some minor changes in sediment quality near the effluent discharge locations predicted for uranium, arsenic, cadmium, molybdenum, and selenium. For the COPC with sediment quality guidelines, predicted sediment concentrations of all COPC were below the guidelines in all segments of Judge Sissons Lake, with the exception of nickel. The elevated nickel is associated with baseline and the Project is not expected to have a measureable effect on sediment. The predicted nickel concentrations in sediment are well below the severe effects level (SEL) indicating that there will not be effects to sediment-dwelling organisms as a result of the Project;
- All predicted soil concentrations are below the available soil quality guidelines in all phases of the assessment (operation, final closure, post-closure). There is very little change in soil concentrations predicted as a result of the Project;
- All predicted vegetation (browse and forage) concentrations are below the minimum benchmarks that are available in the literature which indicate potential effects to vegetation, with the exception of predicted cobalt, copper and zinc concentrations. These elevated concentrations are generally characteristic of background concentrations; since the Project is not expected to result in a measurable change in the vegetation concentration, no effects are expected. It is noted that there are a lack of benchmarks with which to determine potential effects on lichen. Based on comparison to baseline and information from other sites wide-spread effects are not expected but it could not be determined whether there would be an effect on lichen at locations close to the site due to metal accumulation;

- In general, the Project does not result in exceedances of benchmarks for aquatic receptors. However, some minor exceedances were identified for copper, cadmium and sulphate. For copper, the exceedance relates to baseline conditions and the Project has no discernable effect on the conditions in Judge Sisson Lake, thus no effect is expected. For cadmium and sulphate there is the potential for the Project to affect zooplankton; however the exceedances are minor and the spatial extent limited;
- For terrestrial ecological receptors, it is unlikely that there will be effects due to the Project as their exposure is expected to remain below the levels where effects are expected.

For the human health assessment, a number of receptors, which represent hypothetical individuals (toddler, child, adult), were considered. It was assumed that these individuals undertake activities on the landscape that are typical of the people of the region. Activities included the gathering of berries, trapping, hunting, and fishing for up to 1.5 months per year and to gather sufficient supply of these food items from the site to last for a 6 month period. The results of the HHRA showed that:

- Predicted SO₂ concentrations do not exceed health-based limits. Predicted NO₂ concentrations do not exceed health-based limits, with the exception of annual NO₂ concentrations at the proposed Kiggavik Camp location, where approximately 1% of the hours exceed the health-based limit of 200 µg/m³. Exposure to fine particulate matter was also identified as a potential issue only at the Kiggavik Camp location. Based on the low frequency of exceedences, the conservative nature of the benchmark and that only working adults would be exposed, negligible health effects are expected;
- There are no effects predicted at the expected (mean) level of exposure for all non-carcinogenic COPC;
- The risk levels calculated for arsenic for both the Judge Sissons Lake hunter composite receptor and the Baker Lake composite receptor are below the acceptable benchmark of 1×10^{-5} (1 in 100,000) for incremental arsenic risk;
- The incremental radiation dose for all receptors were below the CNSC recommended incremental dose limit of 1,000 µSv/year and the Health Canada dose constraint of 300 µSv/year, and well within the range of variability of radiation dose from natural sources.

A summary table of the conclusions of the risk assessment is provided in Table 10.1. From the table it can be seen that while there may be the potential for an effect on sensitive species of zooplankton in certain areas of Judge Sissons Lake due to the exposure to cadmium and sulphate, it is not expected that this will result in population-level effects. No other aquatic biota are expected to be affected. Terrestrial biota are not expected to be affected by emissions from the project. Human receptors that reside at Baker Lake and may use the area for hunting are

not anticipated to experience adverse effects at the expected level of exposure. Workers at the site, not directly involved in mining operations (e.g. a cook) are also not expected to experience any adverse effects from exposure to radioactivity or non-radiological COPC. Although determined to be unlikely, there is the possibility of short-term discomfort for people with asthma respect to exposure to NO₂.

Table 10.1 Summary of Risk Assessment Conclusions

	Judge Sissons Lake		
Aquatic Receptors	Due to exposure to cadmium and sulphate it is possible that in certain segments of the lake some of the more sensitive zooplankton species may be affected. However considering the minor exceedance of the benchmark and the limited spatial extent of the impact, the zooplankton population of Judge Sissons Lake may experience only localized changes in community composition. No other combinations of receptors and COPC were identified as an issue.		
Benthic Organisms	No likely adverse effects from project		
	Rock Lake Watershed	Judge Sissons Lake	Kiggavik Camp
Terrestrial Vegetation	No likely adverse effects from project	No likely adverse effects from project	The potential for effects on lichen cannot be determined. However, it is not expected that population-level effects would be experienced.
Terrestrial Biota	No likely adverse effects from project	No likely adverse effects from project	No likely adverse effects from project
	Hunter	Non-NEW Worker	Baker Lake
Human Health	No likely adverse effects for consumption of berries, medicinal teas, wild game and fish from the LSA	No likely adverse effects for exposure to COPC (metals and radioactivity) from consumption of berries and exposure from radon and through inhalation for a worker at the camp	No likely adverse effects for consumption of berries, medicinal teas, wild game and fish from the RSA
		Although determined to be unlikely, there is a possibility of effects to workers at the accomodation camp due to NO ₂ and dust.	

Note:



Potential adverse effect – based on ecological risks to several species and SI values >10 times benchmarks or a human health effect.

No adverse effect – based on SI values all <10 times benchmarks.

Acceptable – based on no exceedances of benchmarks and consideration of baseline.

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ATTACHMENT A	LAKEVIEW MODEL
ATTACHMENT B	CARIBOU DATA COMPARISON
ATTACHMENT C	EFFLUENT CHARACTERISTICS
ATTACHMENT D	ECOLOGICAL RECEPTOR CHARACTERISTICS
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ATTACHMENT A LAKEVIEW MODEL

A.1 MODEL DESCRIPTION

A.1.1 Overview

To assess the fate of radioactive and non-radioactive constituents in the surface waters and sediments of lakes and rivers, a proprietary computer code called LAKEVIEW has been developed by SENES Consultants Limited. LAKEVIEW is a module of the overall INTAKE Pathways model developed by SENES to assess exposures and risks to ecological species and humans of constituents released to the aquatic and atmospheric environments. The module may be run in either a deterministic or a probabilistic manner. The code has been applied on several occasions on Beaverlodge Lake, Hatchet Lake and Wollaston Lake in northern Saskatchewan to assess the impact of uranium mining operations within the watersheds on metal and radionuclide levels in several of the lake embayments (SENES 1989, 1993a, 1993b, 1995a, 1995b, 1995c, 1995d, 1996, 2000, 2001a, 2003, 2005, 2006, 2007, 2008a, 2008b, 2008c, 2008d). The LAKEVIEW model has also been applied on mining projects at other locations, for example, to simulate the effects of arsenic input to Back Bay and Yellowknife Bay on Great Slave Lake (SENES 2001b, 2006). Using parametric sensitivity analysis, the LAKEVIEW model was applied recently to rank major contaminant sources and to evaluate contaminated sediment loads in the Fulton Creek watershed on Beaverlodge Lake in northern Saskatchewan (SENES 2008c; Manolopoulos *et al.*, 2008). For application in the arctic, the program has been modified by including solid (ice) and liquid phase speciation of contaminants and has been applied to assess the potential impact of treated mine water discharge to Judge Sissons Lake in the Kiggavik mining region, Nunavut (SENES, 2008d).

The important processes incorporated into the LAKEVIEW model include horizontal (lateral) and vertical transport of dissolved species, chemical and biochemical reactions, settling of particulate matter, and sediment exchange. Chemical reactions comprise both equilibrium and dynamic processes. Equilibrium processes are reactions for which the time scale is at least two orders of magnitude less than the time scale of the modelling. These may be metal-ligand interactions, adsorption to solids, colloidal chemistry, etc. (Stumm and Morgan 1981; Stumm 1992), which are necessary to estimate constituent ion balances and pH. Equilibrium modelling algorithms such as MINTEQL (Schecker and McAvoy 1994) and PHREEQC (Parkhurst and Appelo, 2005) are well suited to establish these tasks. However, these programs are rather cumbersome (too slow and detailed) for probabilistic model applications and a simplified equilibrium modelling approach developed by Scharer *et al.* (1994) is employed in LAKEVIEW.

The transport of contaminants in and out of the sediments is governed by both equilibrium and dynamic processes. An important equilibrium process is speciation resulting from the adsorption of dissolved species to solids. These solids may be organic or inorganic in nature. Dynamic

processes comprise oxidative and reductive chemical reactions and consumption of nutrients by aquatic microbiota and macrobiota. An important, and often modeled, dynamic process is the uptake of dissolved oxygen in the water column and benthos underlying the water column. Often the time scale of these reactions is such that steady state approximation is possible on either an annual or monthly time scale. For example, the oxygen re-aeration and consumption rates in a water column may be calculated and be assumed to be constant for a period of one month, say in July, resulting in constant (steady state) concentration of oxygen for that particular month. These steady state approximations greatly reduce the complexity of the calculations.

The movement of various chemical species in the sediment exchange zone is particularly important. Sediments may be a significant source of inorganic substances such as toxic metal ions, nutrient chemicals (phosphate, for example), and recalcitrant organic compounds. Since the solubility of most metal ions is considerably higher under aerobic than anaerobic conditions, most exchange occurs from the oxidized zone of sediments (Davé *et al.* 1997). A portion of the sedimented material may be re-introduced into the water column by diffusive processes; the remaining part becomes buried by the continual deposition of fresh settling mater.

A.1.2 Lake Dispersion Model

A.1.2.1 Control Volume Concept

A very common approach to water quality modelling is the control volume concept. The control volume is defined as a homogeneous volume segment of water with clearly defined boundaries and the water constituent concentrations are either constant or vary continuously in a linear manner within the segment. The control volume segment may be hydraulically connected with one or more other segments forming a network. Control volume models with assumed constant concentrations are known as compartment or box models (Schnoor 1996). Key elements of the control volume models include volume, surface area, areas of exchange zones with adjacent control volumes, data on hydraulic inputs and outputs, information on transport, and reaction kinetics.

In the LAKEVIEW model, a lake is divided into one or more segments. Each segment consists of at least two zones: surface water and sediment. As an optional feature of the model, surface water is allowed to stratify into three layers during the summer months: the upper layer known as the epilimnion, a transition layer (metalimnion) and the bottom layer called the hypolimnion. Taking into account the horizontal aspect of mass transfer between the two or more segments and the vertical aspect between the epilimnion, the hypolimnion and the underlying sediment, the advective and dispersive processes in each segment are modelled by differential equations for the water column and for the sediment. An additional equation is used to simulate chemical constituent behaviour during thermal stratification. The volume change in stratified lake is subject to the following constraint:

$$\frac{dV_T}{dt} = \frac{dV_j}{dt} + \frac{dV_k}{dt} = 0 \quad (1.2-1)$$

where:

V_T = the total lake volume (m^3)

V_j = volume of the epilimnion (m^3)

V_k = volume of the hypolimnion (m^3)

According to equation (1.2-1), the total lake volume is assumed to be constant. The rate of volume change is calculated explicitly for the hypolimnion (V_k) as follows:

$$\frac{dV_k}{dt} = Q_p - cV_k \quad (1.2-2)$$

where:

Q_p = seasonal polishing pond discharge ($m^3 \text{ yr}^{-1}$)

V_k = volume of the hypolimnion (m^3)

c = characteristic time constant (0.69 yr^{-1})

The characteristic time constant in equation (1.2-2) is found by parameter estimation using the seasonal variability of the height of the thermocline as the criterion. The rate of change of the epilimnetic volume is found by employing equation (1.2-1). The rate of contaminant mass change in the stratified layers is calculated using the chain rule. For example, the mass differential for the epilimnion is given by:

$$\frac{d(V_j C_j)}{dt} = V_j \frac{dC_j}{dt} + C_j \frac{dV_j}{dt} \quad (1.2-3)$$

where:

V_j = volume of the epilimnion (m^3)

C_j = concentration of a contaminant in the epilimnion ($g \text{ m}^{-3}$)

A similar equation was written for the hypolimnion. The mass differential given by equation (1.2-3) is equal to the mass input and output for a particular zone. The overall mass balance for the epilimnion is:

$$\frac{d(V_j C_{i,j})}{dt} = W_j(t) - Q_j(C_{i,j} - C_{i,j-1}) + E_{j-1} A_{j-1}(C_{i,j-1} - C_{i,j}) - E_j A_j(C_{i,j} - C_{i,j+1}) + E_k A_k(C_{i,k} - C_{i,j}) - S_j(K_{ds} C_{i,j}) \sigma_j A_k + V_j \left(\frac{dC_{i,j}}{dt} \right)_{RX}$$

(1.2-4)

where:

- $C_{i,j}$ = concentration of the "ith" species in the hypolimnion of segment "j" (g m^{-3})
- W_j = waste load (time dependent) to the epilimnion of segment "j" (g yr^{-1})
- V_j = volume of hypolimnion in segment "j" (m^3)
- Q_j = outflow from segment "j" ($\text{m}^3 \text{yr}^{-1}$)
- E_j, E_{j-1} = lateral mass transfer (i.e. dispersion) coefficient between adjacent segments (m yr^{-1})
- A_j = contact area between segments (m^2)
- E_k = mass transfer coefficient across the thermocline (m yr^{-1})
- A_k = contact area between epilimnion and hypolimnion at the thermocline (m^2)
- C_k = concentration of constituent in the hypolimnion below segment "j" (g m^{-3})
- S_j = solids settling velocity (m yr^{-1})
- σ_j = total suspended solids concentration (g m^{-3})
- K_{ds} = solid/liquid distribution in settling solids ($\text{m}^3 \text{g}^{-1}$)
- $(dC_{i,j}/dt)_{RX}$ = reaction rate in the epilimnion (yr^{-1})

A nominal step size of one month ($\Delta t = 1$ month) is often used for computational purposes. The model allows time step sizes of up to one year. The internal step size for computing is considerably smaller. As shown in equation (1.2-4), dispersion is a two way process, while sedimentation is a one way process. Sedimentation transport is based on adsorption equilibrium with solid surfaces and settling to the bottom of the water column. The numerator in the sedimentation transport term is known as the sedimentation flux for a particular chemical. The solids settling velocity is the gravitational settling velocity in water and may be calculated from a modified Stokes law equation (Thibodeaux 1996) using median settling particle size and density. In lakes, the net settling velocity generally ranges between 10 and 100 m/year. In addition to settling inorganic particles, the settling flux resulting from sedimenting phytoplankton is also considered. Parameter estimates for dispersive transport are derived in the following section.

The differential equation for the hypolimnion was developed in an analogous manner:

$$\frac{d(V_k C_{i,k})}{dt} = W_k(t) - S_k(K_{ds} C_{i,k}) \sigma_k A_k + K_l A_s (C_{i,s} - C_{i,k}) + E_k A_k (C_{i,k} - C_{i,j}) + V_k \left(\frac{dC_{i,k}}{dt} \right)_{RX} \quad (1.2-5)$$

where:

$C_{i,k}$ = concentration of the “ith” species in the hypolimnion (g m^{-3})

$C_{i,s}$ = concentration of the “i” species in the sediment pore water (g m^{-3})

K_l = mass transfer coefficient between sediment and the water column (m yr^{-1})

A_s = interfacial area between the sediment and the water column (m^2)

W_k = contaminant load to the hypolimnion (kg yr^{-1})

$(dC_{i,k}/dt)_{RX}$ = reaction rate of the “ith” species in the hypolimnion (yr^{-1})

Equation (1.2-5) is employed only if the time scale of the simulation is one month or less. The concentration terms $C_{i,j}$ in equation (1.2-4) and $C_{i,k}$ in equation (1.2-5) refer to concentrations at the midpoint of a given segment. In small lakes, often a single segment designation suffices. In case of multiple segments in a large lake or water body, the distances between adjacent segments should be equally spaced for best accuracy.

A.1.2.2 Sediment Transport

Transport in and out of the exchange zone of sediments involves particulate settling of adsorbed constituents, dispersive exchange between sediment porewater and the hypolimnion and “sinking out” of the sediments from the active zone by burial. The differential equation is given as follows:

$$\Psi = ((1 - \varepsilon) \rho_{sed} K_d + \varepsilon) z A_b$$

$$\Psi \frac{dC_{i,S}}{dt} = K_l (C_{i,k} - C_{i,s}) A_b + S_k (K_{ds} C_{i,k}) \sigma_k A_b + R_X A_b - k_b \Psi C_{i,s} \quad (1.2-6)$$

where

ρ_{sed} = density of sediment (g m^{-3})

z = the thickness of the sediment exchange zone (m)

ε = porosity of sediment

R_x	=	reaction rate in the sediment ($\text{g m}^{-2} \text{yr}^{-1}$)
k_b	=	burial rate constant (yr^{-1})
A_b	=	sediment surface area (m^2)

For sediments, the “retardation factor”, Ψ is first calculated. Using this factor, the differential equation given by equation (1.2-6) is applied and solved simultaneously with the equations for surface water. Equation (1.2-6) is the mass balance for the exchange zone of the sediment. The thickness of the zone (Z_j) was assumed to be equal to the oxidized (i.e. oxygenated) microzone. This zone is either estimated from the sedimental oxygen demand flux or inputted directly. The estimated thickness of the sediment exchange zone may range from less than 1 cm to 15 cm, depending on the oxygen demand. Often, the zone thickness is a calibrated value that is entered as such as a model input. Both the epilimnion and the seasonal hypolimnion are assumed to be in contact with the sediment. In addition to transport, the sediment model includes redox reaction kinetics that contributes to the mobility of a given constituent. The redox reactions and the burial ($R_x A_b$ and $k_b \Psi C_{i,s}$) terms in equation (1.2-6) are generally expressed as first order kinetic phenomena. The oxidation rate, of course is constrained to the sediment surface area in contact with the oxygen-rich water column. The approach used in developing the above equations and estimating the parameter is known as the well established and proven Thomann’s (1972) “finite section” method. In the current version of LAKEVIEW the mass balances can result in up to 20 differential equations that are solved simultaneously.

Normally the most important sediment transport mechanism is the dispersive transport in and out of the water column (the first term, $K_l(C_{i,k} - C_{i,s})A_b$, on the right side of equation (1.2-6)). Decades of research and experimental observations support this simple, but elegant mathematical expression for interphase (sediment to water column) transport (Thibodeaux, 2005; Thibodeaux and MacKay, 2003). The concept derives from the Fickian law of diffusion, but the value of the mass transfer coefficient, K_l , is often higher than the value expected for molecular diffusion. As shown by the equation, the flux is a positive vector if the net transport is from the water column to the sediment. In modeling chemical transport to and from the sediments, K_l is often a calibrated parameter (Manolopoulos *et al.*, 2008).

Contaminant levels in the sediment are differentiated in LAKEVIEW into exchangeable and non-exchangeable fractions. This differentiation is usually accomplished on the basis of Tessier’s extraction data (Mossop and Davidson, 2003). The non-exchangeable fraction comprises contaminants embedded in insoluble minerals or present as sparsely soluble pure solids. This non-exchangeable fraction may undergo chemical oxidation/reduction to convert to an exchangeable state or “sink out” from the transport zone. A minimum residual (background) concentration is defined for each constituent. The exchangeable fraction includes adsorbed (K_d -dependent) components, components forming solid solution with soluble host minerals, and pure soluble minerals. Solid solution is a homogeneous solid phase having either a trace element interstitially in the host crystal structure (Ra-226 in barite, for example) or a chemically similar species replacing the host component in the crystal matrix.

The mass transfer coefficient between the exchangeable sediment component and the water column, K_i , is either a calibrated value or calculated from the physical properties of the sediment. The sediment porewater concentration term, $C_{i,s}$, is a key parameter that is evaluated in specific subroutines in every time step. To perform the necessary calculations, first the pH-dependent carbonate/bicarbonate equilibrium is established as a function of the CO_2 partial pressure in the sediment porewater. Then the ionic strength is calculated by taking into account either the major ions in solution or the TDS values. The ionic strength, in turn, is used to calculate the activity coefficients of the various ions and their ligands using the Davies equation. Using the activity coefficients and the appropriate equilibrium expressions, dissolved ion speciation is performed and the total solute concentration is compared to adsorption-based (K_D -based) equilibrium. Unless simultaneous porewater/solid phase concentration data are available, the K_D value is either calibrated or calculated for each sediment type. These calculations take into account published clay, quartz, and organics-based K_D values.

The controlling mechanism (solubility versus adsorption) is established for each key constituent in every time step using established thermodynamic stability (minimum free energy) criteria. The constituent concentrations in the porewater of the sediment exchange zone are calculated for each lake segment in each time step and are used to calculate the sediment transport flux as outlined in Section A.1.3 (Computational Procedure).

A.1.2.3 Dispersive/Diffusive Parameters

Prior to solving the differential equations outlined above, the nominal parameter values for the various exchange processes and their stochastic distributions need to be established (Duever and Reilly 1990). Particularly, the dispersive parameter estimates require close analysis. It has been shown in numerous studies that the turbulent dispersion coefficient in lakes is scale dependent. This is due to the increasingly large eddies coming into play as two points are further and further apart (Csanady 1973). The scale dependence of horizontal dispersion derived and computed by several methods has been summarized by Thibodeaux (1996) and is presented in Figure 1.2-1. In the open waters of larger lakes and in oceans, the horizontal dispersion is generally governed by the 4/3 power law (Okubo, 1971; Thibodeaux 1996; Stacey *et al.*, 2000), thus the dispersion coefficient is given by the following expression:

$$E = 10^{-4} l^{4/3} \quad (1.2-7)$$

where:

E = dispersion coefficient between two points estimated "l" distance apart ($\text{m}^2 \text{s}^{-1}$)

l = distance (m)

The coefficient for equation (1.2-7) (i.e. 10^{-4}), which was derived by SENES, represents the mid-value of the range shown in Figure 1.2-1. Equation (1.2-7) refers to the applicable dispersion between two points. The expression seems to apply from point-to-point scale of one meter to

point-to-point scale in excess of one hundred kilometers. It is well known, however, that the coefficient of dispersion does not remain constant for a region, but varies from a distance 0 to a distance X between two points within connected regions. Thus, to calculate the expected dispersion between two hydraulically connected segments an averaging of the dispersion is necessary. In the LAKEVIEW model, the line average dispersion coefficient between the midpoints of connected segments is calculated by integral averaging:

$$\bar{E} = \frac{10^{-4} \int_0^l l^{4/3} dl}{l} = \frac{4}{7} \times 10^{-4} \times l^{4/3} \quad (1.2-8)$$

where:

$\bar{E}$ = scale (line) averaged turbulent dispersion coefficient ($m^2 s^{-1}$)

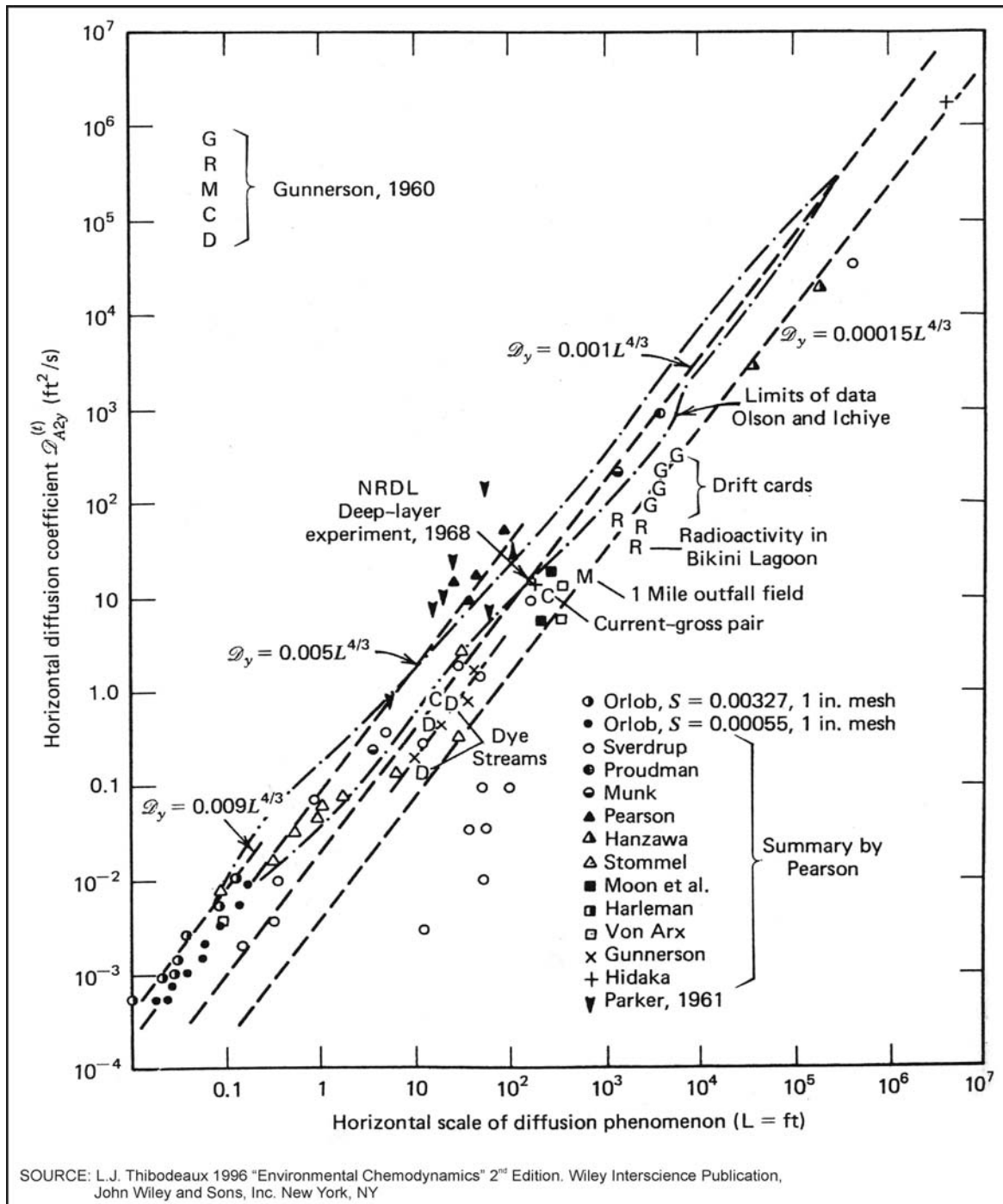


Figure 1.2-1

Plot of Horizontal Dispersion Coefficients

The units of $\bar{E}$ in equation (1.2-8) are given in ($\text{m}^2 \text{s}^{-1}$), however, it is easily scaled to more convenient computational units ($\text{m}^2 \text{yr}^{-1}$, for example). Although the use of the 4/3 power law dependence of the dispersion coefficient with distance is conventional in large lakes and oceans, Stocker and Imberger (2003) argued that the range of eddies implied by the 4/3 power

law may not develop in confined bays or small lakes. Experimental observations in small lakes indicate that the power value may be somewhat less, ranging from 1.1 to 1.25. In Figure 1.2-2, the turbulent dispersion coefficient is compared with the dispersion models of Lawrence *et al.* (1995), Okubo (1968) and Kullenberg *et al.* (1973). It is evident that the predicted values of the various dispersion models are comparable at distances less than 3000 m. The lower values of the Kullenberg *et al.* model is probably due to data taken in the thermocline and the hypolimnion.

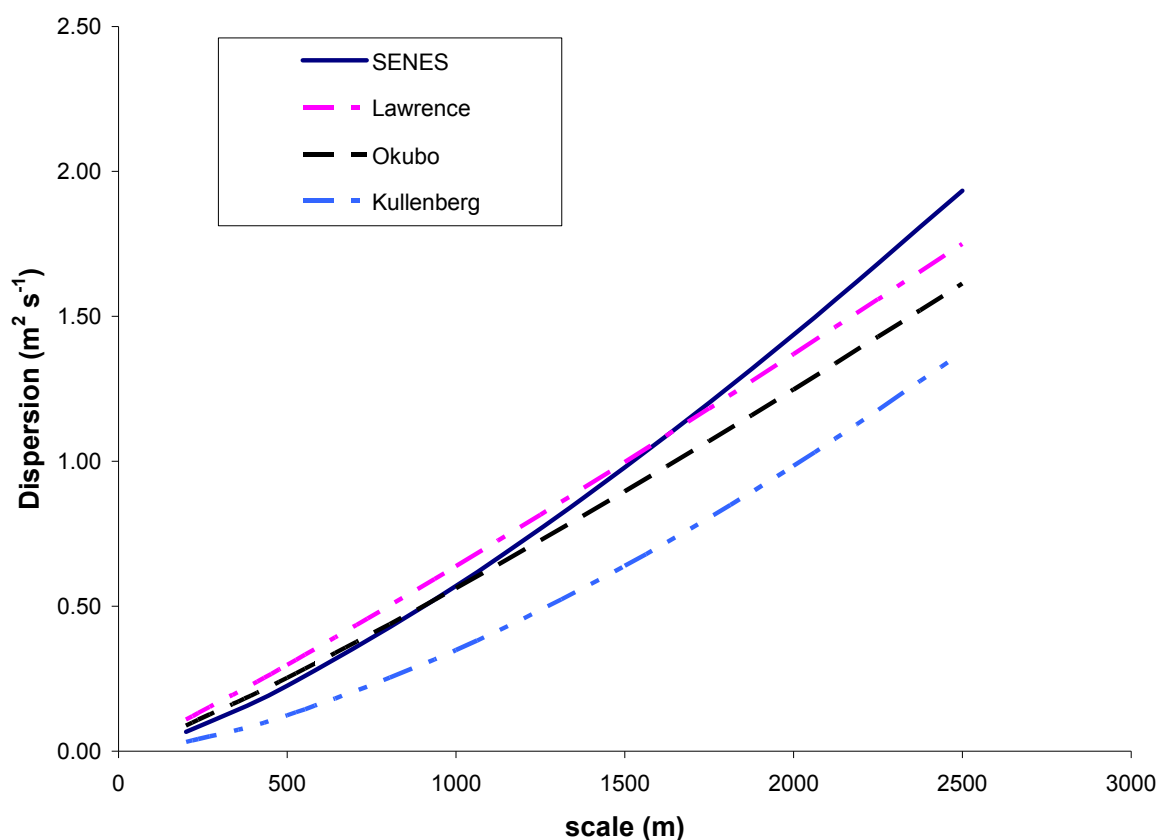


Figure 1.2-2

Comparison of Horizontal Dispersion Models

An important modelling criterion is the assessment of the relative significance of the dispersion with respect to other transport processes. To appraise this relative significance, Schnoor (1996) suggests that the Nusselt number (Nu) be evaluated for a particular water body as follows:

$$Nu = \frac{Q_o l}{A \bar{E}} \quad (1.2-9)$$

where:

Q_o = outflow from the control volume ($m^3 yr^{-1}$)

A = an average cross-sectional area (depth x width) in the direction of outflow (m^2)

l = distance between the midpoints of hydraulically connected segments (m)

$\bar{E}$ = characteristic turbulent dispersion coefficient between hydraulically connected segments ($\text{m}^2 \text{yr}^{-1}$).

Dispersion becomes important for Nusselt numbers less than unity. It can be easily shown that dispersion dominance is a characteristic feature of pollutant transport from embayments to midlake in most mid to large sized lakes. Once the average dispersion coefficient is obtained, the volumetric (bulk average) dispersion coefficient for a control volume can be evaluated as follows (Chapra and Rechow 1983):

$$E' = \frac{\bar{E} A_c}{l} \quad (1.2-10)$$

where:

E' = volumetric dispersion coefficient ($\text{m}^3 \text{yr}^{-1}$)

$\bar{E}$ = scale average diffusion coefficient between two connected segments ($\text{m}^2 \text{yr}^{-1}$)

A_c = cross-sectional area (depth x width) between two connected segments (m^2)

l = distance between the midpoints of two connected segments (m).

It is the dispersion gradient ($\bar{E}/l$) that is employed in the differential equations (1.2-4) and (1.2-5). The value calculated as outlined above is the nominal value. For probabilistic calculations, the probability density function for the volumetric dispersion coefficient is assumed to be distributed symmetrically (i.e. mean and the median being the same) about the nominal value.

Although the two processes are structurally similar (see equation (1.2-6)), a different methodology is applied for calculating the diffusive exchange between the sediment and the overlying water column. The scale of the transport parameters differs by several orders of magnitude. Lateral transport is orders of magnitude greater than molecular diffusion, while the vertical transport parameter is the same order of magnitude as molecular diffusion for a given dissolved species in water. First, the effective molecular diffusion coefficient (D_e) is evaluated by the following equation (Dulien 1979):

$$D_e = \frac{\varepsilon D_m}{\tau} \quad (1.2-11)$$

where:

D_m = the molecular diffusion coefficient for a given dissolved species in water ($\text{m}^2 \text{yr}^{-1}$)

ε = porosity of the sediment

τ = tortuosity

The minimum value of the tortuosity determined from Einstein's relationship is 1.417 in unconsolidated porous media (Cussler 1984) while the maximum realistic value in sediments is about 4.5. In the LAKEVIEW model, a tortuosity factor of 3.14 (i.e. π) is usually employed as a mid-range estimate.

The estimation of the effective diffusion coefficient for dissolved oxygen transport in the sediment is particularly important. Since most metal ions and their stable counterions are more soluble in oxidative environments, the thickness of the sediment exchange zone needs to be established. Conceptually, this zone is equivalent to the boundary layer concept of Thibodeaux (1996). For zero order or near zero order (i.e. hyperbolic reaction rate expressions with a relatively low half saturation constant) reactions with respect to dissolved oxygen, the thickness of the oxygenated zone can be established from the benthic oxygen demand, the effective diffusion coefficient, and the oxygen concentration at the outer limit of the viscous sublayer above the sediment surface (Scharer *et al.* 1991) as described by the following equation:

$$Z_j = 2 \frac{D_e C_{O_2}}{J_{O_2}} \quad (1.2-12)$$

where:

Z_j = thickness of the exchange zone (m)

D_e = effective diffusion coefficient of oxygen ($m^2 \text{ yr}^{-1}$)

C_{O_2} = concentration of oxygen at the water sediment interface ($g \text{ m}^{-3}$)

J_{O_2} = benthic oxygen demand ($g^2 \text{ m}^{-2} \text{ yr}^{-1}$)

The numerical factor of 2 in equation (1.2-12) is due to a parabolic oxygen profile resulting from constant effective diffusivity and zero order oxygen consumption in the exchange (reactive) zone. The oxygen concentration reaches zero at the lower limit of the reactive zone. The benthic oxygen demand ranges from $7.4 \text{ g(O}_2\text{)} \text{ m}^{-2} \text{ yr}^{-1}$ for inorganic reactive tailings under a water cover (Davé *et al.* 1997) to $24 \text{ g(O}_2\text{)} \text{ m}^{-2} \text{ yr}^{-1}$ in oligotrophic lakes (Wetzel 1975). Combining these values with an effective oxygen diffusion coefficient of $3.85 \times 10^{-2} \text{ m}^2 \text{ yr}^{-1}$ and a dissolved oxygen concentration of $12 \text{ g(O}_2\text{)} \text{ m}^{-3}$ at the interface yields a sediment exchange zone thickness (Z_j in equation (1.2-6) and in equation (1.2-12)) of 3.85 cm for oligotrophic lakes to 12.5 cm in reactive tailings deposits. The experimentally observed oxidative zone in reactive

tailings was approximately 10 cm (Davé *et al.* 1997). In mesotrophic to eutrophic lakes where the benthic oxygen demand may range up to greater than 100 g(O₂) m⁻² yr⁻¹ in eutrophic systems, the boundary layer thickness is in the order of 1 cm or less resulting in much higher mass transfer rates from the boundary layer (Schnoor 1996).

In the LAKEVIEW model, linear adsorption models are used as the dissolved concentration of the individual species are expected to be 10⁻³ mol/L or less. The mass transfer coefficient in equation (1.2-6) takes into account the effective diffusion coefficient (D) for a given species, the thickness of the exchange zone (Z_j), the porosity of the exchange zone (ε), the solid-liquid distribution coefficient (K_d), and the density of the sediment in the exchange zone (ρ) as follows:

$$K_s = \frac{D \varepsilon}{Z_j [\varepsilon + (1 - \varepsilon) K_d \rho]} \quad (1.2-13)$$

where:

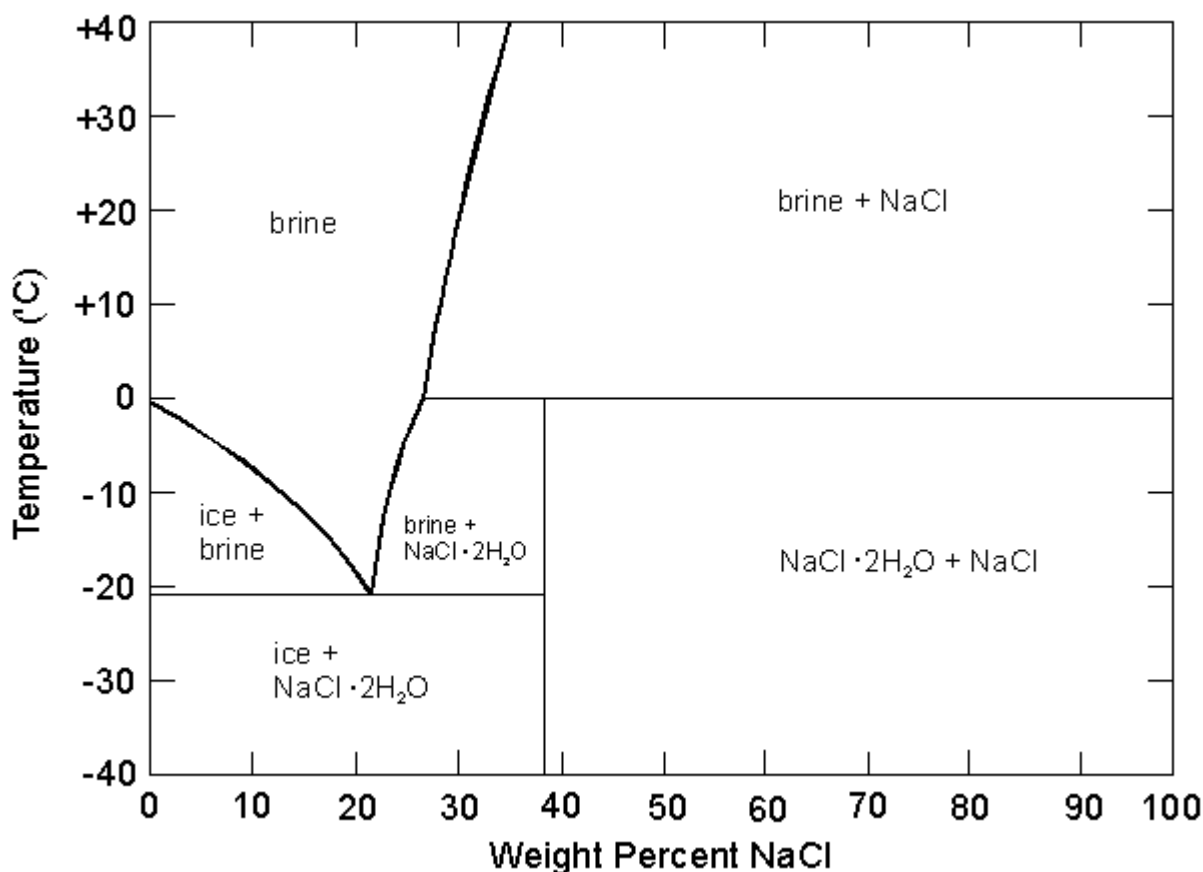
- K_s = mass transfer coefficient in the sediment (m yr⁻¹)
- ε = porosity of sediment
- D = diffusion coefficient (m² yr⁻¹)
- ρ = solids density (g m⁻³)
- K_d = solid-liquid distribution coefficient (m³ g⁻¹)
- Z_j = thickness of the exchange zone (m)

Molecular diffusion coefficients, hence, effective diffusion coefficients are evaluated as a function of temperature (4 °C in deep water bodies).

A.1.2.4 Ice Cover

For four months or more lakes are covered with ice in most of Canada. The thickness of ice varies, but it may reach 2 m or more in Northern arctic lakes. If the of ice volume is significant with respect to the total lake volume, then the concentration effect due to ice formation is significant and distribution of solutes between the solid phase (ice) and the liquid phase (water) needs to be evaluated. In general, the concentration of solutes due to ice formation reaches a maximum level in the liquid in late winter. The distribution of a solute between the solid (ice) and liquid (water) phases can be estimated from appropriate phase diagrams. The phase diagram for salt in sea water is presented in Figure 1.2-3. Sodium chloride forms a near ideal liquid solution. At initial concentrations that are normally observed in lakes and oceans, the cooling of saline solution results in essentially pure ice formation and an ideal stoichiometric concentration of the salt in the liquid solution. This concentration effect continues until a eutectic concentration of 279.6 g/L salt is reached at -21.1 °C. The density of the liquid is 1.2 g/L at this point. At

temperatures below the eutectic point, the saline solution solidifies as a eutectic mixture. However, in deeper lakes the eutectic point is never reached, therefore a liquid phase below the ice cover is maintained. Phase diagrams, for inorganic solutes other than salt (NaCl) is rare, therefore Figure 1.2-3 has been used to model the solid/liquid distribution of all dissolved constituents.



(Adapted from C. Clarke, 2004)

Figure 1.2-3
Solid/Liquid Phase Diagram for NaCl

Horizontal dispersion is affected by ice cover. It seems that horizontal transport processes shielded from wind effects by ice cover are simpler to measure than in open water (Coleman and Armstrong, 1983). It has been shown that under ice cover dispersion depends on lake size (Bengtsson, 1986, 1996). In small lakes horizontal dispersion under ice was found to be two orders of magnitude less (i.e. nearly insignificant) than in open water. In larger lakes, however, seiche induced currents and thermal effects due to sunlight on bare ice cover are significant and the dispersion coefficients are almost as high as those normally observed under ice-free conditions (Bengtsson, 1986). In fact, the dispersion under ice cover is comparable to horizontal dispersion in the hypolimnion of larger lakes (Umlauf and Lemmin, 2005). From data

reported by Coleman and Armstrong (1983) and Bengtsson (1986) the horizontal dispersion coefficient was estimated to be:

$$E = 3.8 \times 10^{-5} l^n \quad (1.2-14)$$

where:

E = dispersion coefficient between two points estimated "l" distance apart (m²/s)

L = distance (m)

n = exponent with value between 1.1 and 1.5

For a unit distance and n = 4/3, the value of the dispersion coefficient is approximately 1/3 of the value found in open water. The cross sectional mass transfer area, A_C (see equation 1.2-10), is re-evaluated taking into account the transport area occupied by ice. Usually ice formation is assumed to take place in two months (November and December) and ice break-up in one month. The period of ice cover depends on location.

The dispersion coefficient is applicable for a time scale of 1 month or less. For larger time scales, a geometric mean of the summer and winter cross sectional transfer areas (A_C in equation 1.2-10) and a calibrated horizontal dispersion coefficient are applied for taking into account ice formation. Horizontal dispersion calibration entails normal monthly model simulations with periodic ice cover under stationary state conditions are reached. The monthly values are then averaged and the horizontal dispersion coefficient on the annual scale is calibrated to give the same yearly steady state concentration than the monthly mean.

A.1.3 Computational Procedure

In each segment of the LAKEVIEW model, the change of water quality is formulated as ordinary differential equations such as equation (1.2-4) to equation (1.2-6). Ordinary finite difference solutions of the differential equations resulted in numerical dispersion, particularly at very low retention times (i.e. retention times less than the integration interval, Δt). Consequently, the equations were solved by asymptotic integration (Kodakova, 2000; Shkil and Samusenko, 2000) as indicated below. These differential equations have the following structure:

$$\frac{dC_i}{dt} = \{\omega_i\} + \{a_{i,j}\} \times \{C_j\} \quad (1.3-1)$$

where:

C_i = dependent variable (concentrations) (g m⁻³)

- t = independent variable (time) (yr)
 ω_i = mass loading (time dependent) (g yr^{-1})
 $a_{i,j}$ = constants
 $\{ \}$ = matrix (vector) designation

The left-hand side of equation (1.3-1) is an $n \times 1$ vector of the differentials. The term $\{\omega_i\}$ is a time dependent vector of the normalized mass loadings to each segment. The term $\{a_{i,j}\}$ designates an $n \times n$ sparse matrix of inverse time constants, while $\{C_i\}$ is the local concentration vector. It can be shown, that the series of equations may be solved analytically in the following format (Wiley 1960):

$$\{C_{i,t+\Delta t}\} = \overline{C_i} + \left[(C_{i,t} - \overline{C_i}) \sum_{k=1}^n \alpha_k \exp(-\lambda_k \Delta t) \right] \quad (1.3-2)$$

and $\sum \alpha_k = 1$

where:

- $C_{i,t}$ = concentration in the ' i^{th} ' segment at time t (g m^{-3})
 $C_{i,t+\Delta t}$ = concentration in the ' i^{th} ' segment at $t+\Delta t$ (g m^{-3})
 $\overline{C_i}$ = theoretical "steady state" concentration in the ' i^{th} ' segment (g m^{-3})
 α_k = partitioning coefficient
 λ_k = eigen values
 $\{ \}$ = matrix elements

In equation (1.3-2), $\overline{C_i}$ represents a theoretical steady state concentration provided the external mass load, ω_i , remains invariant between $t = t$ and $t = \infty$. This concentration, however, is never reached in practice, since the load varies continually. Thus, the numerical values of $\overline{C_i}$ were derived annually from the following equality:

$$\{a_{i,j}\} \times \{C_i\} + \{\omega_i\} = 0 \quad (1.3-3)$$

Next, the matrix is symmetrised and the eigenvalues of the matrix, $\{a_{i,j}\}$, are obtained by Jacobi's methods. The elements of the eigenvector are often approximately equal to the elements of the main diagonal of the $\{a_{i,j}\}$ matrix:

$$\lambda_1 = a_{11} ; \lambda_2 = a_{22} ; \lambda_3 = a_{33} ; \lambda_n = a_{n,n} \quad (1.3-4)$$

Matrix solutions for second and higher order are also available. Second order solutions were used for evaluating sediment to water column exchanges. The eigenvalues, of course, were independent of the load. They depend only on the local exchange parameters and the particular contaminant species. The entire computational procedure is iterative. The time interval of integration (one day, one month, or one year – depending on the purpose) is partitioned into successively smaller sub-time steps until the integral converges to a constant (within 0.5%) value.

Once the liquid phase concentration of each constituent is established, the solids phase concentration change in the sediment reactive zone is calculated by flux balance. Any uptake of a constituent is considered as exchangeable fraction. However, the constituent may undergo chemical transformation (e.g. reduction of soluble “selenium” as selenate to insoluble “selenium” as selenide, for example) to a non-exchangeable state. Both the exchangeable and the non-exchangeable solid phase fractions undergo burial due to the deposition of fresh inert material. The average life span of solids in a 5 cm reactive zone is 20 to 85 years.

A.1.4 Parameter Estimation

Data based environmental modeling often requires parameter estimates by some statistical methods. Parameter estimation from data is an important task to be undertaken prior to predictive simulations. However, parameters are not known precisely at the onset of modeling but must be estimated from available data. This is particularly cumbersome if the parameters are embedded in differential equations in water quality models. Several regression techniques, both linear and non-linear, are available to estimate parameter values for algebraic expressions. However, many of these techniques break down if the parameters are defined on the differential level, while observations need to be compared with predictions after some integration is performed. Markov Chain Monte Carlo (MCMC) methods such as the Metropolis-Hastings algorithm have been found to be powerful tools, especially when some prior knowledge about the parameters is available (Gilks *et al.*, 1996; Gamerman and Lopez, 2006). This method is applicable to any set of observations that conform to a Markov chain. The algorithm has been employed to solve difficult, non-linear parameter estimation problems arising in various disciplines (Siddhartha and Greenberg, 1995; Berg, 2004; Biglari *et al.*, 2006; Manolopoulos *et al.*, 2008). It involves one parameter at a time sampling and iteration to find the posterior parameter distribution.

Let us assume that $y_1, y_2, y_3 \dots y_{n-1}, y_n$ are independent observations that have been collected in a temporal or physical space. These observations are said to form a Markov chain if the following conditional probability is obeyed:

$$P(y_n | y_1, y_2, \dots, y_{n-2}, y_{n-1}) = P(y_n | y_{n-1}) \quad (1.4-1)$$

Thus the probability of obtaining the current observation (i.e. observation “n”) is conditional on only the previous (i.e. penultimate) observation (“n-1”). A number of data sets resulting from natural processes such as growth, death, reaction products, etc., are in fact Markov chain observations. Generally, water quality observations from lakes and rivers also obey this requirement, since any prediction at some time $t + \Delta t$ is conditional upon the current observation at time t . For this reason, the Metropolis-Hastings algorithm is fully incorporated into the LAKEVIEW program.

If one wishes to develop a model to represent water quality observations (see equations (1.2-4), (1.2-5), (1.2-6) and (1.2-9)), these models will contain a set of parameters θ (i.e. $\theta_1, \theta_2, \theta_3$ etc.) that needs to be estimated given the set of observations, y . The Bayesian inference of model parameters θ given the observed data involves the joint posterior probability distribution conditional on the data $P(\theta | y)$. According to Bayes’ theorem, the joint probability of θ given y is:

$$P(\theta | y) \propto P(\theta) P(y | \theta) \quad (1.4-2)$$

where:

$P(\theta)$ = prior distribution of the parameters

$P(y | \theta)$ = likelihood function conditional on θ .

The Metropolis-Hastings algorithm for parameter estimation can be summarized as follows (Gilks *et al.* 1996):

- Assign prior probability distribution $J(\theta_n | \theta_{n-1})$ for each parameter to be estimated.
- Obtain $\theta_{(0)}$ as the initial realization of the parameter vector.
- Sample the proposed distribution $J(\theta_n | \theta_{n-1})$ to obtain parameter value θ^* .
- Calculate the decision variable (r).

$$r = \frac{P(\theta^* | y) / J(\theta^* | \theta_{n-1})}{P(\theta_{n-1} | y) / J(\theta_{n-1} | \theta^*)} \quad (1.4-3)$$

set $\theta_n = \theta^*$ with probability $\min(r, 1)$

$\theta_n = \theta_{n-1}$ otherwise

Continue obtaining realizations of θ_n for $n = 1, 2, 3, N$ until $P(\theta_n | y)$ converges to $P(\theta | y)$.

In the LAKEVIEW model, each parameter to be estimated is assigned a triangular *a priori* distribution, $J(\theta_n|\theta_{n-1})$, containing the maximum, mean (most likely) and the minimum possible values. The mean value is established either by graphical means or "eyeballing" the experimental data. The obvious advantage of choosing a symmetric prior distribution such as the triangular distribution is that $J(\theta^*|\theta_{n-1}) = J(\theta_{n-1}|\theta^*)$. Consequently " r " reduces to:

$$r = \frac{P(\theta^* | y)}{P(\theta_{n-1} | y)} \quad (1.4-4)$$

The parameter distribution space is sampled and a given parameter value is assigned by a Monte Carlo draw. Using the sampled value, the predicted concentrations are computed by integrating the differential equations. The predictions are then compared with measurements by calculating the normalized sum of squares between the observations and predictions. In LAKEVIEW, the normalized squared differences are calculated between predictions and observations for surface water and/or porewater. The parameter sampling procedure is repeated a number of times. Both the new parameter and its value are chosen by random draw using the Monte Carlo technique.

The objective of the parameter estimation is to minimize the sum of squared differences between predicted and observed dependent variables. A "benchmark" conditional model probability is calculated after substituting the expected parameter values $\theta_{\text{mean}} = E(\theta_{ii})$ into the differential equations and integrating to give the predicted dependent variable $y(\theta_{\text{mean}}, t)$:

$$p(y|\theta_{\text{mean}}) \propto \exp - \frac{\sum [y(\theta_{\text{mean}}, t_k) - y(t_k)]^2}{2 n_t \sigma^2} \quad (1.4-5)$$

where:

$p(y \theta_{\text{mean}})$	=	conditional "baseline" model probability
$y(\theta_{\text{mean}}, t_k)$	=	model prediction using expected parameter values at time t_k
$y(t_k)$	=	observation taken at time t_k
n_t	=	total number of observations
σ^2	=	variance

Using Bayesian inference, the posterior probability is given by:

$$P(\theta_{\text{mean}} | y) \propto p(\theta_{\text{mean}}) \times p(y|\theta_{\text{mean}}) \quad (1.4-6)$$

where:

$P(\theta_{\text{mean}} | y)$ = "benchmark" predictive model probability for a given set of observations, y_k

$p(\theta_{\text{mean}})$ = the probability of selecting parameter set θ_{mean}

It is evident that minimizing the sum of squared differences between predictions and observations implies maximizing the probability $P(\theta_{\text{mean}} | y)$. The posterior probability is recalculated after each parameter selection.

The sampling space consists of n trials and a maximum of m iterations per trial. This leads to a maximum of $n \times m$ parameter selection. The number of trials (the value of " n ") should be at least 100 resulting in a set ($\theta_1, \theta_2, \theta_3$ etc.) of 100 parameter estimates. The number of iterations is based on the number of parameters to be estimated. As a rule of thumb, the number of draws should be about 10 for each parameter. Thus, the total number of iterations per trial, m , should be about tenfold the number of parameters to be estimated.

The first trial commences with the calculation of the benchmark (or baseline probability) with the expected parameter values, $E(\theta_i)$ -s. Then the selection of the parameter, say parameter " i " and its value (θ_i) is performed by random draw as described above. Model probability with the selected value, θ_i is given as:

$$P(\theta_i | y) = p(\theta_i | \delta_i, \theta) \times p(y | \theta_i, \theta) \quad (1.4-7)$$

where:

$$p(y | \theta_i, \theta) \propto \exp - \frac{\sum [y | (\theta_i, \theta, t_k) - y(t_k)]^2}{2 n_t \sigma^2} \quad (1.4-8)$$

where:

θ_i = most recently drawn parameter value

It should be noted that the Metropolis-Hastings algorithm is quite flexible and the posterior probability function (equation (1.4-5)) can also be defined as:

$$p(y|\theta_i, \theta) \propto \exp - \frac{\sum \left[\ln \frac{y(\theta_i, \theta, t_k)}{y(t_k)} \right]^2}{2 n_t \sigma^2} \quad (1.4-9)$$

If the probability $\min\{r, 1\}$ for equation (1.4-4) is satisfied with respect to the benchmark value in trial 1, then $P(\theta_i | y)$ becomes a "first" estimate of a "global probability maximum", $P(\theta^g | y)$.

In practice, the variance, σ^2 , is not known. An estimate of σ^2 is obtained from the "previous best" $p(y|\theta_i, \theta)$ value that resulted in the acceptance of θ_i in a following manner:

$$\sigma^2 \approx s^2 = \frac{\sum [y(\theta_i, \theta, t_k) - y(t_k)]^2}{n_t} \quad (1.4-10)$$

It can be shown that the estimated model variance σ^2 is X^2 distributed.

After storing the accepted parameter values, the parameters are reset to their expectations ($E(\theta)$) and a new trial begins. Alternatively, the selected parameter values are replaced and the draw may continue until the number of trials, n , is exceeded. At this point the parameters are also reset to $E(\theta)$ -s and a new trial begins. In subsequent trials, if the probability $P(\theta_i | y)$ is greater than the benchmark probability, but less than the current global probability, then the drawn parameter θ_i is retained and is used in subsequent iterations within the trial as a starter value. If, however, the probability $P(\theta_i | y)$ is less than the benchmark probability then θ_i is replaced by previous estimate. An accelerated search technique allows the parameters corresponding to interim $P(\theta | y)$ to become the benchmark parameters (new $E(\theta_i)$ -s by centering the triangular distribution on the best current estimate of θ^g) after a certain number of unsuccessful trials (i.e. trials in which the number of iterations exceeds "m"). This is performed once after a number of "training" trials (1/3 of the total number of trials). In this case, the "bins" for storing the accepted θ -s is established after the initial number of "training" trials. If needed, the triangular parameter range (i.e. $\theta_{\max}$ and $\theta_{\min}$) is adjusted to maintain symmetry. This adjustment becomes necessary whenever the current best parameter value approaches but cannot be less than zero.

A difficult problem remains the need to estimate the marginal posterior density for the parameter set θ :

$$P(\theta | y(t_k)) = \int p\{\theta | \sigma, \delta, y(t_k)\} d\delta \quad (1.4-11)$$

It is well known that the posterior density for θ possesses a multivariate normal distribution, but the performance of the integration analytically is far too difficult (Min 1998). An acceptable empirical solution is to save the set of θ -s after the training trials. The argument is that, if the maximum trial number " n " is chosen large enough, then the parameters have converged (or

nearly so) to their best estimate by try nxm-l so the variance may be calculated empirically as follows:

$$\sigma_i^2 = \frac{\sum_l (\theta_{i,j} - \theta_{i,mean})^2}{\ell - 1} \quad (1.4-12)$$

where:

σ_i^2 = variance of parameter “i”

$\theta_{i,j}$ = the parameter value of type “i” in the j th data set ($\eta-k \leq j \leq \eta$)

$\theta_{i,mean}$ = the average value of parameter “i”

ℓ = total number accepted of parameter sets in nxm-l to “nxm” number of tries

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ATTACHMENT B CARIBOU DATA COMPARISON

This attachment provides a summary of the measured caribou data collected from Baker Lake with a comparison to caribou data from other herds across the north.

B.1 CARIBOU DATA FROM BAKER LAKE

Twenty-seven caribou samples (comprised of various numbers of muscle, bone, kidney and liver) from Baker Lake were analyzed for metals and radionuclide concentrations. A summary of the data by tissue type is provided in Tables B.1-1 through B.1-4 for muscle, bone, kidney, and liver, respectively.

Table B.1-1

Summary of Baker Lake Caribou Data - Muscle

Muscle											
Parameter	Units	N	N<MDL	Min	Median	95th percentile	Max	Average	St. Dev	Geomean	GSD
Aluminum	µg/g ww	23	1	0.005	0.73	1.89	2.9	0.72	0.71	0.38	4.19
Antimony	µg/g ww	23	22	0.01	0.01	0.01	0.22	0.02	0.04	0.01	1.91
Arsenic	µg/g ww	23	1	0.005	0.04	0.05	0.06	0.03	0.01	0.03	1.78
Barium	µg/g ww	23	0	0.05	0.12	0.57	0.62	0.17	0.15	0.13	1.93
Beryllium	µg/g ww	23	23	0.001	0.001	0.001	0.001	0.001	0.0	0.001	1.00
Boron	µg/g ww	23	22	0.1	0.1	0.1	0.5	0.12	0.08	0.11	1.40
Cadmium	µg/g ww	23	2	0.001	0.006	0.02	0.07	0.01	0.01	0.01	2.49
Chromium	µg/g ww	23	20	0.05	0.05	0.1	0.1	0.06	0.02	0.06	1.31
Cobalt	µg/g ww	23	0	0.002	0.006	0.018	0.021	0.01	0.005	0.01	1.86
Copper	µg/g ww	23	0	0.74	2.1	4.03	4.2	2.4	0.81	2.2	1.44
Iron	µg/g ww	23	0	22	40	73.9	87	42.74	15.6	40.6	1.38
Lead	µg/g ww	23	0	0.002	0.014	0.038	0.049	0.02	0.01	0.01	2.50
Manganese	µg/g ww	23	0	0.19	0.31	0.60	0.74	0.36	0.14	0.34	1.41
Mercury	µg/g ww	0	-	-	-	-	-	-	-	-	-
Molybdenum	µg/g ww	23	13	0.01	0.01	0.07	0.46	0.05	0.09	0.02	2.83
Nickel	µg/g ww	23	7	0.005	0.02	0.088	0.16	0.03	0.04	0.02	2.95
Selenium	µg/g ww	23	0	0.1	0.18	0.21	0.22	0.17	0.02	0.17	1.17
Silver	µg/g ww	23	22	0.001	0.001	0.001	0.002	0.001	0.0	0.001	1.16
Strontium	µg/g ww	23	0	0.03	0.07	0.27	0.34	0.10	0.08	0.08	1.88
Thallium	µg/g ww	23	23	0.005	0.005	0.005	0.005	0.01	0.0	0.01	1.00
Tin	µg/g ww	23	20	0.005	0.005	0.02	0.03	0.01	0.01	0.01	1.70
Titanium	µg/g ww	23	0	0.06	0.64	0.82	0.93	0.47	0.33	0.30	3.03
Uranium	µg/g ww	23	8	0.0005	0.002	0.03	0.17	0.01	0.04	0.00	5.22
Vanadium	µg/g ww	23	23	0.01	0.01	0.01	0.01	0.01	0.0	0.01	1.00
Zinc	µg/g ww	23	0	18	41	61.8	62	40.4	14.2	37.8	1.48
Moisture	%	14	0	72.5	74.5	75.7	75.9	74.4	0.89	74.4	1.01
Lead-210	Bq/g ww	23	14	0.0005	0.0005	0.004	0.007	0.001	0.002	0.001	2.26
Polonium-210	Bq/g ww	23	0	0.0042	0.026	0.039	0.046	0.027	0.008	0.025	1.58
Radium-226	Bq/g ww	23	6	0.000025	0.0001	0.0002	0.00035	0.00011	0.00008	0.00009	2.06
Thorium-230	Bq/g ww	23	22	0.000035	0.00005	0.0001	0.0005	0.00008	0.00009	0.00006	1.70
Thorium-232	Bq/g ww	23	22	0.000035	0.00005	0.00028	0.0005	0.00008	0.00011	0.00006	1.86
Source: AREVA (2010)											

Table B.1-2**Summary of Baker Lake Caribou Data - Bone**

Bone											
Parameter	Units	N	N<MDL	Min	Median	95th percentile	Max	Average	St. Dev	Geomean	GSD
Aluminum	µg/g ww	24	1	0.01	1.8	4.9	5.4	2.13	1.34	1.55	3.31
Antimony	µg/g ww	24	24	0.025	0.025	0.025	0.025	0.03	0.0	0.03	1.00
Arsenic	µg/g ww	24	24	0.01	0.01	0.01	0.01	0.01	0.0	0.01	1.00
Barium	µg/g ww	24	0	42	352	438.4	440	336.3	90.24	313.9	1.60
Beryllium	µg/g ww	24	24	0.005	0.005	0.005	0.005	0.01	0.0	0.01	1.00
Boron	µg/g ww	24	24	0.25	0.25	0.25	0.25	0.25	0.0	0.25	1.00
Cadmium	µg/g ww	24	24	0.005	0.005	0.005	0.005	0.01	0.0	0.01	1.00
Chromium	µg/g ww	24	24	0.1	0.1	0.1	0.1	0.10	0.0	0.10	1.00
Cobalt	µg/g ww	24	1	0.005	0.04	0.06	0.07	0.04	0.01	0.04	1.67
Copper	µg/g ww	24	1	0.01	0.12	0.19	0.22	0.12	0.05	0.10	1.89
Iron	µg/g ww	24	0	0.47	7	10	11	6.9	2.35	6.1	1.85
Lead	µg/g ww	24	0	0.3	2.4	4.9	5.8	2.6	1.3	2.3	1.81
Manganese	µg/g ww	24	0	0.08	1.05	1.3	1.3	1.00	0.26	0.92	1.73
Mercury	µg/g ww	0	-	-	-	-	-	-	-	-	-
Molybdenum	µg/g ww	24	11	0.025	0.05	0.28	0.33	0.09	0.09	0.06	2.45
Nickel	µg/g ww	24	1	0.01	0.16	0.21	0.24	0.16	0.04	0.15	1.81
Selenium	µg/g ww	24	8	0.01	0.02	0.05	0.05	0.02	0.01	0.02	1.82
Silver	µg/g ww	24	24	0.005	0.005	0.005	0.005	0.01	0.0	0.01	1.00
Strontium	µg/g ww	24	0	29	225	278.8	287	212.5	59.9	197.9	1.60
Thallium	µg/g ww	24	24	0.01	0.01	0.01	0.01	0.01	0.0	0.01	1.00
Tin	µg/g ww	24	24	0.01	0.01	0.01	0.01	0.01	0.0	0.01	1.00
Titanium	µg/g ww	24	0	0.04	0.64	0.85	1.4	0.64	0.22	0.58	1.83
Uranium	µg/g ww	24	12	0.005	0.0075	0.049	0.65	0.04	0.13	0.01	3.10
Vanadium	µg/g ww	24	24	0.025	0.025	0.025	0.025	0.03	0.0	0.03	1.00
Zinc	µg/g ww	24	0	10	98	128.5	140	98.9	24.1	92.4	1.64
Moisture	%	14	0	15.1	18.4	27.1	30.5	19.6	4.6	19.1	1.24
Lead-210	Bq/g ww	24	0	0.49	0.93	1.59	2	1.00	0.36	0.94	1.41
Polonium-210	Bq/g ww	24	0	0.32	0.595	1.17	1.3	0.65	0.25	0.61	1.44
Radium-226	Bq/g ww	24	0	0.016	0.053	0.083	0.087	0.05	0.02	0.05	1.51
Thorium-230	Bq/g ww	24	23	0.0015	0.002	0.0025	0.004	0.0020	0.0005	0.0019	1.25
Thorium-232	Bq/g ww	24	23	0.0015	0.002	0.0025	0.004	0.0020	0.0005	0.0019	1.25

Table B.1-3**Summary of Baker Lake Caribou Data - Kidney**

Kidney											
Parameter	Units	N	N<MDL	Min	Median	95th percentile	Max	Average	St. Dev	Geomean	GSD
Aluminum	µg/g ww	15	0	0.11	0.34	0.92	1.4	0.45	0.33	0.37	1.92
Antimony	µg/g ww	15	14	0.01	0.01	0.019	0.04	0.01	0.01	0.01	1.43
Arsenic	µg/g ww	15	0	0.01	0.02	0.03	0.03	0.02	0.01	0.02	1.38
Barium	µg/g ww	15	0	0.37	0.76	1.6	2.8	0.85	0.58	0.74	1.67
Beryllium	µg/g ww	15	15	0.001	0.001	0.001	0.001	0.001	0.0	0.001	1.00
Boron	µg/g ww	15	14	0.1	0.1	0.43	1.2	0.17	0.28	0.12	1.90
Cadmium	µg/g ww	15	0	0.6	3.1	5.6	5.8	3.17	1.53	2.74	1.86
Chromium	µg/g ww	15	14	0.05	0.05	0.065	0.1	0.05	0.01	0.05	1.20
Cobalt	µg/g ww	15	0	0.029	0.042	0.068	0.076	0.05	0.01	0.04	1.37
Copper	µg/g ww	15	0	3.1	4.6	5.7	6.4	4.54	0.79	4.48	1.19
Iron	µg/g ww	15	0	25	46	68	68	45.9	12.1	44.5	1.31
Lead	µg/g ww	15	0	0.11	0.14	0.18	0.2	0.14	0.02	0.14	1.18
Manganese	µg/g ww	15	0	1.2	1.8	2.3	2.3	1.86	0.30	1.84	1.19
Mercury	µg/g ww	0	-	-	-	-	-	-	-	-	-
Molybdenum	µg/g ww	15	0	0.03	0.13	0.16	0.17	0.12	0.04	0.11	1.53
Nickel	µg/g ww	15	4	0.005	0.02	0.073	0.08	0.02	0.02	0.02	2.52
Selenium	µg/g ww	15	0	0.76	1.1	1.26	1.4	1.09	0.16	1.08	1.17
Silver	µg/g ww	15	14	0.001	0.001	0.0055	0.016	0.002	0.004	0.001	2.05
Strontium	µg/g ww	15	0	0.08	0.14	0.74	1.4	0.25	0.33	0.17	2.06
Thallium	µg/g ww	15	13	0.005	0.005	0.01	0.01	0.01	0.002	0.01	1.28
Tin	µg/g ww	15	13	0.005	0.005	0.02	0.02	0.01	0.01	0.01	1.63
Titanium	µg/g ww	15	0	0.08	0.68	1.05	1.2	0.55	0.45	0.32	3.38
Uranium	µg/g ww	15	6	0.0005	0.001	0.013	0.021	0.004	0.01	0.002	3.71
Vanadium	µg/g ww	15	15	0.01	0.01	0.01	0.01	0.01	0.0	0.01	1.00
Zinc	µg/g ww	15	0	20	22	27.3	28	22.6	2.4	22.5	1.11
Moisture	%	8	0	77.7	78.3	79.8	80.4	78.5	0.84	78.5	1.01
Lead-210	Bq/g ww	15	0	0.04	0.07	0.12	0.12	0.07	0.03	0.07	1.47
Polonium-210	Bq/g ww	15	0	0.18	0.36	0.47	0.51	0.34	0.09	0.33	1.32
Radium-226	Bq/g ww	15	11	0.0003	0.001	0.003	0.004	0.0010	0.0011	0.0007	2.33
Thorium-230	Bq/g ww	15	15	0.0005	0.0005	0.002	0.002	0.0012	0.0008	0.0010	2.05
Thorium-232	Bq/g ww	15	15	0.0005	0.0005	0.002	0.002	0.0012	0.0008	0.0010	2.05

Table B.1-4**Summary of Baker Lake Caribou Data - Liver**

Liver											
Parameter	Units	N	N<MDL	Min	Median	95th percentile	Max	Average	St. Dev	Geomean	GSD
Aluminum	µg/g ww	14	0	0.14	0.40	0.93	1.2	0.47	0.27	0.40	1.76
Antimony	µg/g ww	14	14	0.01	0.01	0.01	0.01	0.01	0.0	0.01	1.00
Arsenic	µg/g ww	14	0	0.01	0.02	0.02	0.02	0.02	0.005	0.02	1.41
Barium	µg/g ww	14	0	0.12	0.36	0.49	0.52	0.35	0.12	0.32	1.52
Beryllium	µg/g ww	14	14	0.001	0.001	0.001	0.001	0.001	0.0	0.001	1.00
Boron	µg/g ww	14	14	0.1	0.1	0.1	0.1	0.10	0.0	0.10	1.00
Cadmium	µg/g ww	14	0	0.15	0.62	0.84	0.87	0.58	0.21	0.53	1.62
Chromium	µg/g ww	14	13	0.05	0.05	0.10	0.2	0.06	0.04	0.06	1.45
Cobalt	µg/g ww	14	0	0.069	0.084	0.09	0.095	0.08	0.01	0.08	1.12
Copper	µg/g ww	14	0	9.6	29	39.1	41	25.4	10.1	23.2	1.61
Iron	µg/g ww	14	0	160	435	824	980	468.6	247.4	406.1	1.78
Lead	µg/g ww	14	0	0.21	0.44	0.65	0.86	0.42	0.17	0.39	1.48
Manganese	µg/g ww	14	0	3	3.7	4.2	4.5	3.64	0.40	3.61	1.12
Mercury	µg/g ww	0	-	-	-	-	-	-	-	-	-
Molybdenum	µg/g ww	14	0	0.33	0.60	0.73	0.74	0.57	0.12	0.56	1.25
Nickel	µg/g ww	14	7	0.005	0.008	0.31	0.61	0.07	0.16	0.02	4.80
Selenium	µg/g ww	14	0	0.33	0.435	0.54	0.57	0.44	0.07	0.43	1.17
Silver	µg/g ww	14	0	0.043	0.09	0.26	0.38	0.13	0.09	0.11	1.79
Strontium	µg/g ww	14	0	0.03	0.06	0.13	0.14	0.07	0.03	0.06	1.64
Thallium	µg/g ww	14	14	0.005	0.005	0.005	0.005	0.01	0.0	0.01	1.00
Tin	µg/g ww	14	14	0.005	0.005	0.005	0.005	0.01	0.0	0.01	1.00
Titanium	µg/g ww	14	0	0.11	1.1	1.3	1.3	0.81	0.53	0.55	2.95
Uranium	µg/g ww	14	6	0.0005	0.001	0.014	0.017	0.004	0.01	0.001	3.70
Vanadium	µg/g ww	14	14	0.01	0.01	0.01	0.01	0.01	0.0	0.01	1.00
Zinc	µg/g ww	14	0	18	21.5	28.7	30	22.8	3.79	22.51	1.17
Moisture	%	9	0	70.2	71.2	74.0	75.2	71.7	1.51	71.63	1.02
Lead-210	Bq/g ww	14	0	0.075	0.19	0.30	0.36	0.19	0.08	0.18	1.51
Polonium-210	Bq/g ww	14	0	0.27	0.44	0.58	0.68	0.45	0.10	0.43	1.26
Radium-226	Bq/g ww	14	8	0.000035	0.0003	0.00087	0.001	0.0003	0.0003	0.0003	2.23
Thorium-230	Bq/g ww	14	12	0.00005	0.0005	0.014	0.04	0.0032	0.011	0.0004	5.34
Thorium-232	Bq/g ww	14	14	0.00005	0.0005	0.002	0.005	0.0007	0.0013	0.0003	3.79

B.2 CARIBOU DATA FROM OTHER HERDS

AECOM/Gartner Lee (2005) provided analytical data on 10 caribou (collected between 2004 and 2007) that were captured in the study area of the Faro Mine Complex Site (Yukon). Dry weight concentrations were reported by the laboratory and were converted to fresh weight based on the reported sample moisture content. These data are presented in Tables B.2-1 through B.2-3 for muscle, kidney, and liver.

Table B.2-1**Summary of Faro Mine Complex Caribou Data - Muscle**

Muscle											
Parameter	Units	N	N<MDL	Min	Median	95th percentile	Max	Average	St. Dev.	Geomean	GSD
Antimony	mg/kg (ww)	10	9	0.001	0.001	0.004	0.006	0.002	0.002	0.002	1.6
Arsenic	mg/kg (ww)	10	2	0.001	0.010	0.036	0.048	0.01	0.01	0.01	3.2
Beryllium	mg/kg (ww)	10	10	0.001	0.001	0.002	0.002	0.001	0.0	0.001	1.0
Boron	mg/kg (ww)	10	1	0.08	0.34	0.52	0.59	0.34	0.13	0.31	1.8
Cadmium	mg/kg (ww)	10	2	0.001	0.008	0.021	0.024	0.009	0.007	0.007	2.6
Chromium	mg/kg (ww)	10	6	0.03	0.029	0.15	0.17	0.06	0.05	0.05	2.0
Cobalt	mg/kg (ww)	10	1	0.002	0.01	0.12	0.13	0.03	0.05	0.01	4.3
Copper	mg/kg (ww)	10	0	1.3	2.3	2.9	3.0	2.2	0.52	2.1	1.3
Lead	mg/kg (ww)	10	0	0.008	0.012	0.024	0.027	0.014	0.006	0.013	1.5
Manganese	mg/kg (ww)	10	0	0.17	0.25	0.75	0.85	0.34	0.22	0.30	1.7
Nickel	mg/kg (ww)	10	9	0.006	0.007	0.01	0.02	0.01	0.00	0.01	1.2
Selenium	mg/kg (ww)	10	0	0.05	0.18	0.8	1.2	0.26	0.33	0.18	2.3
Silver	mg/kg (ww)	10	0	0.008	0.03	0.08	0.10	0.03	0.03	0.03	2.3
Strontium	mg/kg (ww)	10	0	0.03	0.05	0.12	0.14	0.06	0.03	0.05	1.5
Tin	mg/kg (ww)	10	3	0.001	0.006	0.11	0.18	0.023	0.055	0.006	4.6
Vanadium	mg/kg (ww)	10	6	0.007	0.007	0.040	0.044	0.015	0.014	0.012	2.1
Zinc	mg/kg (ww)	10	0	42.2	55.6	71.6	73.7	54.9	11.9	53.8	1.3
Source: AECOM/Gartner Lee (2005)											

Table B.2-2**Summary of Faro Mine Complex Caribou Data - Kidney**

Kidney											
Parameter	Units	N	N<MDL	Min	Median	95th percentile	Max	Average	St. Dev.	Geomean	GSD
Antimony	mg/kg (ww)	11	11	0.001	0.0011	0.0012	0.0012	0.0011	0.0	0.0011	1.0
Arsenic	mg/kg (ww)	11	0	0.009	0.016	0.043	0.051	0.02	0.01	0.02	1.7
Beryllium	mg/kg (ww)	11	11	0.001	0.0011	0.0012	0.0012	0.0011	0.0	0.0011	1.0
Boron	mg/kg (ww)	11	1	0.05	0.27	0.36	0.36	0.26	0.09	0.23	1.7
Cadmium	mg/kg (ww)	11	0	1.2	9.5	20.4	20.9	10.0	6.5	7.7	2.3
Chromium	mg/kg (ww)	11	3	0.02	0.05	0.13	0.15	0.06	0.04	0.05	1.9
Cobalt	mg/kg (ww)	11	0	0.002	0.05	0.09	0.10	0.06	0.03	0.04	2.8
Copper	mg/kg (ww)	11	0	4.3	5.2	5.4	5.4	5.0	0.36	5.0	1.1
Lead	mg/kg (ww)	11	0	0.23	0.61	1.1	1.3	0.60	0.32	0.54	1.7
Manganese	mg/kg (ww)	11	0	1.2	1.5	2.0	2.0	1.6	0.25	1.6	1.1
Nickel	mg/kg (ww)	11	6	0.005	0.006	0.03	0.05	0.01	0.01	0.01	2.3
Selenium	mg/kg (ww)	11	0	0.14	0.82	1.2	1.2	0.81	0.34	0.70	2.0
Silver	mg/kg (ww)	11	0	0.010	0.02	0.34	0.39	0.09	0.13	0.04	3.9
Strontium	mg/kg (ww)	11	0	0.03	0.13	0.18	0.19	0.12	0.04	0.11	1.7
Tin	mg/kg (ww)	11	6	0.001	0.0012	0.011	0.015	0.004	0.004	0.002	2.6
Vanadium	mg/kg (ww)	11	2	0.006	0.017	0.041	0.045	0.019	0.012	0.016	1.9
Zinc	mg/kg (ww)	11	0	17.8	24.0	29.0	29.8	24.4	4.0	24.0	1.2
Source: AECOM/Gartner Lee (2005)											

Table B.2-3**Summary of Faro Mine Complex Caribou Data - Liver**

Liver											
Parameter	Units	N	N<MDL	Min	Median	95th percentile	Max	Average	St. Dev.	Geomean	GSD
Antimony	mg/kg (ww)	11	10	0.002	0.002	0.004	0.006	0.002	0.001	0.002	1.5
Arsenic	mg/kg (ww)	11	2	0.002	0.0128	0.027	0.035	0.01	0.01	0.01	2.7
Beryllium	mg/kg (ww)	11	11	0.002	0.002	0.002	0.002	0.002	0.0	0.002	1.0
Boron	mg/kg (ww)	11	0	0.19	0.35	0.51	0.59	0.35	0.11	0.34	1.3
Cadmium	mg/kg (ww)	11	0	0.30	1.5	2.8	3.2	1.5	0.82	1.3	1.9
Chromium	mg/kg (ww)	11	7	0.03	0.033	0.16	0.22	0.06	0.06	0.05	1.9
Cobalt	mg/kg (ww)	11	1	0.002	0.09	0.13	0.13	0.09	0.04	0.06	3.5
Copper	mg/kg (ww)	11	0	6.3	15.1	30.2	34.2	16.6	8.48	14.7	1.7
Lead	mg/kg (ww)	11	0	0.13	0.41	0.68	0.77	0.41	0.17	0.38	1.6
Manganese	mg/kg (ww)	11	0	2.9	4.4	5.0	5.0	4.3	0.60	4.2	1.2
Nickel	mg/kg (ww)	11	7	0.008	0.008	0.04	0.05	0.02	0.01	0.01	2.0
Selenium	mg/kg (ww)	11	0	0.17	0.39	1.0	1.6	0.47	0.39	0.39	1.8
Silver	mg/kg (ww)	11	0	0.30	0.52	0.88	1.0	0.54	0.21	0.51	1.5
Strontium	mg/kg (ww)	11	0	0.04	0.06	0.12	0.17	0.07	0.04	0.06	1.5
Tin	mg/kg (ww)	11	5	0.002	0.003	0.029	0.043	0.008	0.012	0.004	3.0
Vanadium	mg/kg (ww)	11	6	0.008	0.008	0.036	0.044	0.017	0.012	0.014	1.9
Zinc	mg/kg (ww)	11	0	13.5	23.8	29.5	31.2	23.4	5.1	22.8	1.3
Source: AECOM/Gartner Lee (2005)											

Concentrations for caribou at background locations were represented by data collected from other Yukon locations. The caribou samples were provided by the community and the Northern Contaminants Program and the data were summarized by EDI (2007). Dry weight concentrations were reported by the laboratory and were converted to fresh weight based on the reported sample moisture content. Table B.2-4 provides the summary statistics for caribou muscle.

Table B.2-4**Summary of Yukon Background Caribou Data - Muscle**

Muscle											
Parameter	Units	N	N<MDL	Min	Median	95th percentile	Max	Average	St. Dev.	Geomean	GSD
Antimony	mg/kg (ww)	2	0	0.001	0.001	0.001	0.001	0.001	0	0.001	1.0
Arsenic	mg/kg (ww)	2	0	0.003	0.007	0.011	0.011	0.007	0.006	0.005	2.8
Beryllium	mg/kg (ww)	2	1	<0.0001	0.0005	0.001	0.001	0.0005	0.0007	0.0003	2.7
Cadmium	mg/kg (ww)	2	0	0.03	0.031	0.036	0.04	0.03	0.007	0.03	1.1
Chromium	mg/kg (ww)	2	0	0.10	0.12	0.13	0.14	0.12	0.02	0.12	1.1
Cobalt	mg/kg (ww)	2	0	0.003	0.004	0.004	0.005	0.004	0.0008	0.004	1.1
Copper	mg/kg (ww)	2	0	3.4	3.6	3.7	3.7	3.6	0.18	3.6	1.0
Lead	mg/kg (ww)	2	0	0.002	0.002	0.002	0.002	0.002	0	0.002	1.9
Manganese	mg/kg (ww)	2	0	0.35	0.41	0.45	0.46	0.41	0.07	0.40	1.1
Nickel	mg/kg (ww)	2	0	0.06	0.067	0.074	0.08	0.07	0.01	0.07	1.1
Selenium	mg/kg (ww)	2	0	0.04	0.055	0.069	0.07	0.06	0.02	0.05	2.2
Silver	mg/kg (ww)	2	0	0.022	0.030	0.036	0.037	0.03	0.01	0.03	1.2
Strontium	mg/kg (ww)	2	0	0.033	0.042	0.049	0.05	0.04	0.01	0.04	1.1
Tin	mg/kg (ww)	2	1	<0.01	0.09	0.17	0.18	0.09	0.12	0.06	7.4
Vanadium	mg/kg (ww)	2	1	<0.001	0.001	0.001	0.001	0.0008	0.0004	0.0007	1.3
Zinc	mg/kg (ww)	2	0	24.4	26.3	28.0	28.2	26.3	2.7	26.2	1.2
Source: EDI (2007)											

EDI (2007) summarized caribou samples provided by the community and the Northern Contaminants Program for the Mt. Nansen Mine area. Dry weight concentrations were reported by the laboratory and are converted to fresh weight based on the reported sample moisture content. The data are summarized in Table B.2-5.

Table B.2-5**Summary of Mt. Nansen Mine Caribou Data - Muscle**

Muscle											
Parameter	Units	N	N<MDL	Min	Median	95th percentile	Max	Average	St. Dev.	Geomean	GSD
Aluminum	mg/kg (ww)	2	0	0.013	0.043	0.070	0.073	0.043	0.043	0.03	3.5
Antimony	mg/kg (ww)	2	0	0.00025	0.00026	0.00027	0.00027	0.00026	0.00001	0.0003	1.1
Arsenic	mg/kg (ww)	2	0	0.001	0.002	0.003	0.003	0.002	0.002	0.002	2.6
Barium	mg/kg (ww)	2	0	0.005	0.007	0.009	0.009	0.007	0.003	0.007	1.6
Beryllium	mg/kg (ww)	2	1	0.00001	0.0001	0.00026	0.00027	0.00014	0.0002	0.0001	8.8
Cadmium	mg/kg (ww)	2	0	0.006	0.008	0.010	0.010	0.008	0.002	0.008	1.3
Chromium	mg/kg (ww)	2	0	0.026	0.031	0.036	0.037	0.031	0.008	0.03	1.3
Cobalt	mg/kg (ww)	2	0	0.0008	0.0010	0.0012	0.0012	0.0010	0.0003	0.0010	1.3
Copper	mg/kg (ww)	2	0	0.9	0.94	1.0	1.0	0.9	0.10	0.93	1.1
Iron	mg/kg (ww)	2	0	9.5	10.4	11.3	11.4	10.4	1.3	10.4	1.1
Lead	mg/kg (ww)	2	0	0.0005	0.001	0.0005	0.0005	0.0005	0.00003	0.001	1.1
Manganese	mg/kg (ww)	2	0	0.10	0.11	0.11	0.12	0.11	0.013	0.11	1.1
Mercury	mg/kg (ww)	2	0	0.0008	0.001	0.0012	0.0013	0.0010	0.0003	0.001	1.4
Molybdenum	mg/kg (ww)	2	0	0.006	0.008	0.010	0.010	0.008	0.003	0.007	1.5
Nickel	mg/kg (ww)	2	0	0.015	0.018	0.020	0.020	0.018	0.004	0.017	1.3
Potassium	mg/kg (ww)	2	0	836	919	993	1001	919	117	915	1.1
Selenium	mg/kg (ww)	2	0	0.011	0.014	0.017	0.018	0.014	0.005	0.014	1.4
Silver	mg/kg (ww)	2	2	0.00001	0.00001	0.00001	0.00001	0.00001	0.000001	0.00001	1.1
Strontium	mg/kg (ww)	2	0	0.008	0.011	0.013	0.014	0.011	0.004	0.011	1.4
Thallium	mg/kg (ww)	2	0	0.00014	0.00014	0.00015	0.00015	0.00014	0.00001	0.00014	1.1
Tin	mg/kg (ww)	2	1	0.001	0.023	0.043	0.045	0.023	0.031	0.008	11.9
Uranium	mg/kg (ww)	2	2	0.00001	0.00001	0.00001	0.00001	0.00001	0.000001	0.00001	1.1
Vanadium	mg/kg (ww)	2	1	0.00013	0.00020	0.00026	0.00027	0.00020	0.00010	0.00019	1.7
Zinc	mg/kg (ww)	2	0	6.64	6.87	7.08	7.10	6.87	0.33	6.87	1.0
Source: EDI (2007)											

B.3 COMPARISON OF AVERAGE CARIBOU DATA - MUSCLE

Table B.3-1 provides a summary of the average concentrations from the various caribou muscle data sets presented above.

Table B.3-1**Summary of Average Caribou Concentrations - Muscle**

Average Muscle Concentration					
Parameter	Units	Baker Lake	Faro Mine	Yukon BG	Mt. Nansen Mine
Aluminum	µg/g ww	0.72	-	-	0.04
Antimony	µg/g ww	0.02	0.002	0.001	0.0003
Arsenic	µg/g ww	0.03	0.01	0.007	0.002
Barium	µg/g ww	0.17	-	-	0.007
Beryllium	µg/g ww	0.001	0.001	0.0005	0.00014
Boron	µg/g ww	0.12	0.34	-	-
Cadmium	µg/g ww	0.01	0.009	0.03	0.008
Chromium	µg/g ww	0.06	0.06	0.12	0.031
Cobalt	µg/g ww	0.01	0.03	0.004	0.001
Copper	µg/g ww	2.4	2.2	3.6	0.9
Iron	µg/g ww	42.7	-	-	10.4
Lead	µg/g ww	0.02	0.014	0.002	0.0005
Manganese	µg/g ww	0.36	0.34	0.41	0.11
Mercury	µg/g ww	-	-	-	0.0010
Molybdenum	µg/g ww	0.05	-	-	0.008
Nickel	µg/g ww	0.03	0.01	0.07	0.018
Potassium	µg/g ww	-	-	-	919
Selenium	µg/g ww	0.17	0.26	0.06	0.014
Silver	µg/g ww	0.001	0.03	0.03	0.00001
Strontium	µg/g ww	0.10	0.06	0.04	0.011
Thallium	µg/g ww	0.01	-	-	0.00014
Tin	µg/g ww	0.01	0.023	0.09	0.023
Titanium	µg/g ww	0.47	-	-	-
Uranium	µg/g ww	0.01	-	-	0.00001
Vanadium	µg/g ww	0.01	0.015	0.0008	0.0002
Zinc	µg/g ww	40.4	54.9	26.3	6.9
Lead-210	Bq/g ww	0.001	-	-	-
Polonium-210	Bq/g ww	0.027	-	-	-
Radium-226	Bq/g ww	0.00011	-	-	-
Thorium-230	Bq/g ww	0.00008	-	-	-
Thorium-232	Bq/g ww	0.00008	-	-	-

B.4 COMPARISON OF GEOMETRIC MEAN CARIBOU DATA - MUSCLE

Table B.4-1 provides a summary of the geometric mean concentrations from the various caribou muscle data sets presented above.

Table B.4-1**Summary of Geometric Mean Caribou Concentrations - Muscle**

Geometric Mean Muscle Concentration					
Parameter	Units	Baker Lake	Faro Mine	Yukon BG	Mt. Nansen Mine
Aluminum	µg/g ww	0.38	-	-	0.03
Antimony	µg/g ww	0.01	0.002	0.001	0.0003
Arsenic	µg/g ww	0.03	0.01	0.005	0.002
Barium	µg/g ww	0.13	-	-	0.007
Beryllium	µg/g ww	0.001	0.001	0.0003	0.0001
Boron	µg/g ww	0.11	0.31	-	-
Cadmium	µg/g ww	0.01	0.007	0.03	0.008
Chromium	µg/g ww	0.06	0.05	0.12	0.03
Cobalt	µg/g ww	0.01	0.01	0.004	0.0010
Copper	µg/g ww	2.2	2.1	3.6	0.93
Iron	µg/g ww	40.6	-	-	10.4
Lead	µg/g ww	0.01	0.013	0.002	0.001
Manganese	µg/g ww	0.34	0.30	0.40	0.11
Mercury	µg/g ww	-	-	-	0.001
Molybdenum	µg/g ww	0.02	-	-	0.007
Nickel	µg/g ww	0.02	0.01	0.07	0.017
Potassium	µg/g ww	-	-	-	915
Selenium	µg/g ww	0.17	0.18	0.05	0.014
Silver	µg/g ww	0.001	0.03	0.03	0.00001
Strontium	µg/g ww	0.08	0.05	0.04	0.011
Thallium	µg/g ww	0.01	-	-	0.00014
Tin	µg/g ww	0.01	0.006	0.06	0.008
Titanium	µg/g ww	0.30	-	-	-
Uranium	µg/g ww	0.00	-	-	0.00001
Vanadium	µg/g ww	0.01	0.012	0.0007	0.00019
Zinc	µg/g ww	37.8	53.8	26.2	6.9
Lead-210	Bq/g ww	74.4	-	-	-
Polonium-210	Bq/g ww	0.001	-	-	-
Radium-226	Bq/g ww	0.025	-	-	-
Thorium-230	Bq/g ww	0.00009	-	-	-
Thorium-232	Bq/g ww	0.00006	-	-	-

B.5 REFERENCES

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ATTACHMENT C EFFLUENT CHARACTERISTICS

C.1 OPTION 2 DISCHARGE SCENARIO

The Option 2 discharge scenario considers Kiggavik WTP and Sissons WTP discharge locations at segment JSL-2. Tables C.1-1 and C.1-2 summarize the water quality distributions assumed to characterize the Kiggavik WTP and Sissons WTP for this discharge scenario. Figures C.1-1 and C.1-2 present the assumed monthly flows for the Option 2 discharge scenario (under the extended scenario). The predicted monthly flows were provided by AREVA and these values were assumed to be the mode of a triangular distribution, with the minimum and maximum represented by +/- 33%.

Table C.1-1

Effluent Concentration Distributions for Kiggavik WTP Discharge – Option 2

COPC	Lognormal Distribution Descriptors (mg/L or Bq/L)			
	Geometric Mean (GM) ^a	Geometric Standard Deviation (GSD) ^b	Minimum (-3 GSD)	Maximum (+3 GSD)
Uranium	0.002	2.24	0.0002	0.02
Thorium-230	0.011	2.05	0.0013	0.10
Lead-210	0.052	1.54	0.014	0.19
Radium-226	0.008	2.53	0.0005	0.13
Polonium-210	0.007	2.10	0.0007	0.06
Arsenic	0.021	1.76	0.004	0.11
Cadmium	0.007	1.44	0.0023	0.02
Cobalt	0.007	2.12	0.0007	0.07
Copper	0.002	2.41	0.0001	0.02
Lead	0.002	2.63	0.0001	0.04
Molybdenum	0.2	1.75	0.038	1.1
Nickel	0.02	1.57	0.005	0.08
Selenium	0.01	1.28	0.0047	0.02
Zinc	0.003	2.06	0.0003	0.03
Ammonia	17.3	1.36	6.9	44
Calcium	470	1.29	219	1010
Chloride	237	1.49	71	792
Sulphate	2199	1.29	1027	4708
TDS ^c	3115	1.31	1373	7068

Note: a - GM from predicted Kiggavik WTP data, if not specified. Kiggavik WTP values provided by AREVA were assumed to be geometric mean values for the distributions.
b – GSDs preferentially selected from Key Lake data (4/2009-9/2010) for uranium, radium-226, arsenic, copper, molybdenum, nickel, selenium, and ammonia. GSDs from McClean (2011) for the JEB WTP (future quality) were used in the absence of other data for thorium-230, lead-210, polonium-210, cadmium, cobalt, lead, zinc, chloride, sulphate, and TDS.
c – TDS calculated as the sum of the anions and cations (as available).

Table C.1-2

**Effluent Concentration Distributions for Sissons WTP Discharge –
Option 2**

COPC	Lognormal Distribution Descriptors (mg/L or Bq/L)			
	Geometric Mean (GM) ^a	Geometric Standard Deviation (GSD) ^b	Minimum (-3 GSD)	Maximum (+3 GSD)
Uranium	0.034	2.24	0.003	0.38
Thorium-230	0.19	2.05	0.022	1.64
Lead-210	0.59	1.54	0.16	2.17
Radium-226	0.10	2.53	0.006	1.62
Polonium-210	0.17	2.10	0.018	1.58
Arsenic	0.018	1.76	0.003	0.10
Cadmium	0.0001	1.44	0.00004	0.0004
Cobalt	0.0003	2.12	0.00003	0.003
Copper	0.001	2.41	0.00007	0.014
Lead	0.0005	2.63	0.00003	0.009
Molybdenum	0.085	1.75	0.016	0.46
Nickel	0.001	1.57	0.0003	0.005
Selenium	0.004	1.28	0.002	0.008
Zinc	0.014	2.06	0.002	0.12
Ammonia	3.1	1.36	1.24	7.86
Calcium	336	1.29	157	721
Chloride	846.6	1.49	254	2825
Sulphate	167.0	1.29	78	357
TDS ^c	1528	1.31	673	3466
Note: a - GM from predicted Kiggavik WTP data, if not specified. Kiggavik WTP values provided by AREVA were assumed to be geometric mean values for the distributions. b – GSDs preferentially selected from Key Lake data (4/2009-9/2010) for uranium, radium-226, arsenic, copper, molybdenum, nickel, selenium, and ammonia. GSDs from McClean (2011) for the JEB WTP (future quality) were used in the absence of other data for thorium-230, lead-210, polonium-210, cadmium, cobalt, lead, zinc, chloride, sulphate, and TDS. c – TDS calculated as the sum of the anions and cations (as available).				

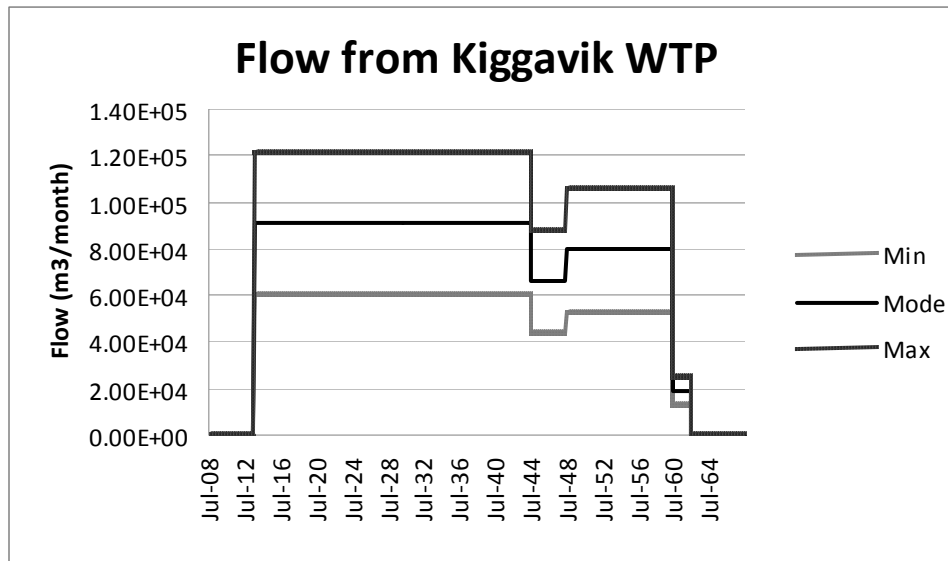


Figure C.1-1 Assumed Flow Distributions for the Kiggavik WTP

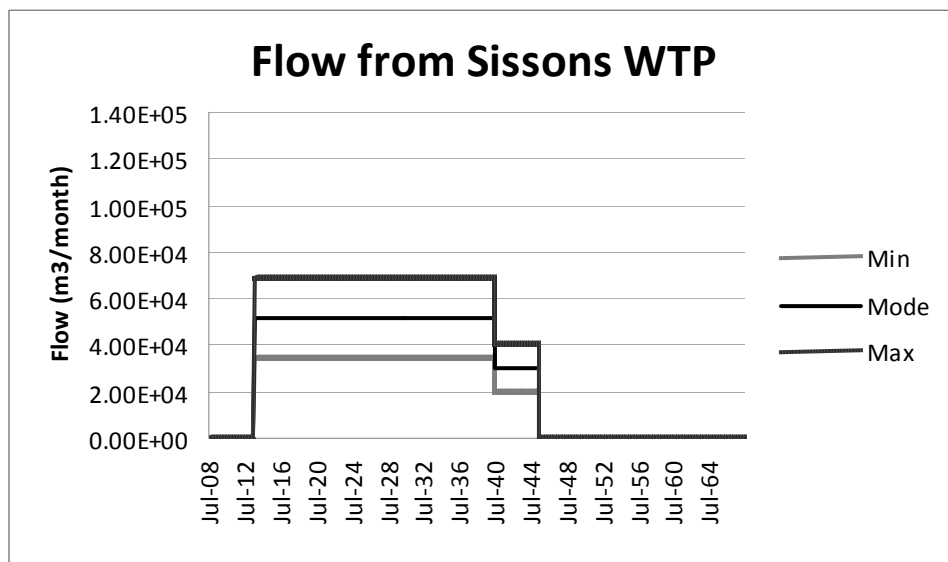


Figure C.1-2 Assumed Flow Distributions for the Sissons WTP

C.2 OPTION 3 DISCHARGE SCENARIO

The Option 3 discharge scenario considers one expanded Kiggavik WTP for the treatment of both Kiggavik and Sissons wastewater. The expanded Kiggavik WTP discharges to segment JSL-2. Table C.2-1 summarizes the water quality distributions assumed to characterize the expanded Kiggavik WTP for this discharge scenario. Figure C.2-1 presents the assumed

monthly flows for the Option 3 discharge scenario (under the extended scenario). The predicted monthly flows were provided by AREVA and these values were assumed to be the mode of a triangular distribution, with the minimum and maximum represented by +/- 33%.

Table C.2-1

**Effluent Concentration Distributions for Expanded Kiggavik WTP
Discharge – Option 3**

COPC	Lognormal Distribution Descriptors (mg/L or Bq/L)			
	Geometric Mean (GM) ^a	Geometric Standard Deviation (GSD) ^b	Minimum (-3 GSD)	Maximum (+3 GSD)
Uranium	0.0275	2.24	0.0025	0.3
Thorium-230	0.1	2.05	0.012	0.9
Lead-210	0.325	1.54	0.089	1.2
Radium-226	0.0099	2.53	0.0006	0.16
Polonium-210	0.086	2.10	0.009	0.79
Arsenic	0.026	1.76	0.005	0.14
Cadmium	0.007	1.44	0.0022	0.02
Cobalt	0.009	2.12	0.0009	0.08
Copper	0.004	2.41	0.0003	0.06
Lead	0.004	2.63	0.0002	0.08
Molybdenum	0.2	1.75	0.037	1.1
Nickel	0.02	1.57	0.005	0.08
Selenium	0.009	1.28	0.0047	0.02
Zinc	0.007	2.06	0.0008	0.06
Ammonia	17.3	1.36	6.9	44
Calcium	556	1.29	259	1190
Chloride	627	1.49	190	2080
Sulphate	2199	1.29	1020	4720
TDS ^c	4330	1.31	1920	9730
Note: a - GM from predicted Kiggavik WTP data, if not specified. Kiggavik WTP values provided by AREVA were assumed to be geometric mean values for the distributions. b – GSDs preferentially selected from Key Lake data (4/2009-9/2010) for uranium, radium-226, arsenic, copper, molybdenum, nickel, selenium, and ammonia. GSDs from McClean (2011) for the JEB WTP (future quality) were used in the absence of other data for thorium-230, lead-210, polonium-210, cadmium, cobalt, lead, zinc, chloride, sulphate, and TDS. c – TDS calculated as the sum of the anions and cations (as available).				

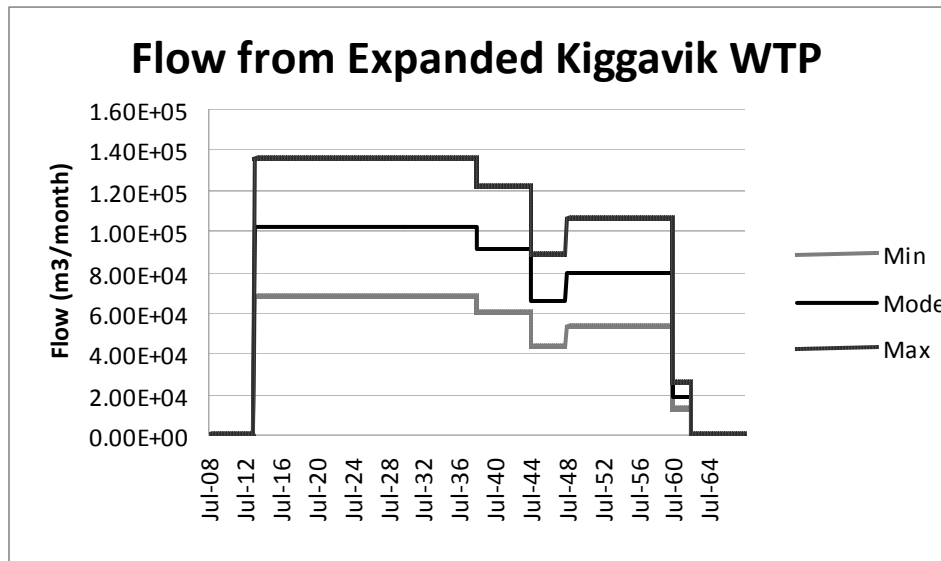


Figure C.2-1 Assumed Flow Distributions for the Expanded Kiggavik WTP

C.3 CLOSURE SCENARIOS

Four closure scenarios for the Kiggavik effluent were considered for the assessment:

- Base Case: for the Project Scenario only, East Zone and Centre Zone consolidation and decommissioning completed during the operational period, Main Zone TMF partially full at the end of the operational period
 - o 14-years for Main Zone Consolidation (Kiggavik closure complete June 2043)
 - o 22-years for Main Zone Consolidation (Kiggavik closure complete June 2050)
- Bounding Case: for the Extended Scenario only, the three TMFs are filled with tailings and no consolidation has occurred prior to the decommissioning period
 - o 14-years for Main Zone Consolidation (Kiggavik closure complete June 2055)
 - o 22-years for Main Zone Consolidation (Kiggavik closure complete June 2062)

Table C.3-1 summarizes the closure scenarios for the Base Case 14-years for Main Zone Consolidation and 22-years for Main Zone Consolidation.

Table C.3-1

**Treated Effluent Discharge Assumptions – Decommissioning and Post-
Decommissioning Base Case**

Year Post-Operations	Kiggavik (14 year MZ consolidation)		
	Expected Treated Effluent Discharge (m3/day)	Percentage Chemical WTP Effluent (%)	Percentage RO permeate (%)
1	3,482	60	40
2	3,482	60	40
3	3,482	60	40
4	3,041	60	40
5	3,041	60	40
6	3,041	60	40
7	2,821	100	0
8	2,821	100	0
9	2,821	100	0
10	2,821	100	0
11	2,821	100	0
12	2,821	100	0
13	2,821	100	0
14	2,821	100	0
15	621	100	0
16	621	100	0
17	621	100	0
Year Post-Operations	Kiggavik (22 year MZ consolidation)		
	Expected Treated Effluent Discharge (m3/day)	Percentage Chemical WTP Effluent (%)	Percentage RO permeate (%)
1	2,782	100	0
2	2,782	100	0
3	2,782	100	0
4	2,341	100	0
5	2,341	100	0
6	2,341	100	0
7	2,121	100	0
8	2,121	100	0
9	2,121	100	0
10	2,121	100	0
11	2,121	100	0
12	2,121	100	0
13	2,121	100	0
14	2,121	100	0
15	2,121	100	0

16	2,121	100	0
17	2,121	100	0
18	1,621	100	0
19	1,621	100	0
20	1,621	100	0
21	1,621	100	0
22	1,621	100	0
23	621	100	0
24	621	100	0

Table C.3-2 summarizes the closure scenarios for the Bounding Case 14-years for Main Zone Consolidation and 22-years for Main Zone Consolidation.

Table C.3-2

Treated Effluent Discharge Assumptions – Decommissioning and Post-Decommissioning Bounding Case

Year Post-Operations	Kiggavik (14 year MZ consolidation)		
	Expected Treated Effluent Discharge (m3/day)	Percentage Chemical WTP Effluent (%)	Percentage RO permeate (%)
1	5,000	60	40
2	5,000	60	40
3	5,000	60	40
4	5,000	60	40
5	5,000	60	40
6	5,000	60	40
7	5,000	60	40
8	5,000	60	40
9	5,000	60	40
10	5,000	60	40
11	5,000	60	40
12	5,000	60	40
13	5,000	60	40
14	5,000	60	40
15	1,621	100	0
16	621	100	0
17	621	100	0
Year Post-Operations	Kiggavik (22 year MZ consolidation)		
	Expected Treated Effluent Discharge (m3/day)	Percentage Chemical WTP Effluent (%)	Percentage RO permeate (%)
1	5,000	60	40

2	5,000	60	40
3	5,000	60	40
4	5,000	60	40
5	5,000	60	40
6	5,000	60	40
7	3,621	60	40
8	3,621	60	40
9	3,621	60	40
10	3,621	60	40
11	2,621	100	0
12	2,621	100	0
13	2,621	100	0
14	2,621	100	0
15	2,621	100	0
16	2,621	100	0
17	2,621	100	0
18	2,621	100	0
19	2,621	100	0
20	2,621	100	0
21	2,621	100	0
22	2,621	100	0
23	621	100	0
24	621	100	0

Table C.3-3 summarizes the closure scenario for the Sissons WTP.

Table C.3-3

**Treated Effluent Discharge Assumptions – Decommissioning and Post-
Decommissioning Sissons WTP**

Year Post- Operations	Sissons		
	Expected Treated Effluent Discharge (m3/day)	Percentage Chemical WTP Effluent (%)	Percentage RO permeate (%)
1	1700	100	0
2	1700	100	0
3	1000	100	0
4	1000	100	0
5	1000	100	0
6	1000	100	0
7	1000	100	0

ATTACHMENT D ECOLOGICAL RECEPTOR CHARACTERISTICS

Caribou



The caribou (*Rangifer tarandus*) is a medium-sized member of the deer family. In Europe, caribou are called reindeer, but in Alaska and Canada only the domestic forms are called reindeer. Both female and male caribou carry antlers. Four subspecies of caribou occur in Canada: woodland, Peary, barren-ground west of the Mackenzie River (also known as Grant's caribou), and barren-ground east of the Mackenzie River. About half of the 2.4 million caribou in Canada are barren-ground caribou. They spend much or all of the year on the tundra from Alaska to Baffin Island. (CWS 2005, Shefferly and Joly 2000)

Size:

Barren-ground caribou are somewhat smaller than woodland caribou. (CWS 2005).

Mass 55 to 318 kg, subspecies inhabiting the more southerly latitudes are larger than their northern cousins (Shefferly and Joly 2000).

Weight 270000 grams (NatureServe 2007).

Weights of adult bulls average 159-182 kg. Mature females average 80-120 kg. (ADF&G 1999).

Based on the above information a typical barren-ground caribou is expected to weigh 135 kg (ADF&G 1999).

Home Range:

Caribou are known to travel distances greater than any other terrestrial mammal. They can traverse more than 5,000 kilometres in a year, with extensive migrations in spring and fall (Shefferly and Joly 2000).

Tundra caribou may travel extensively in summer in attempt to avoid bothersome insects (NatureServe 2007)

It was assumed that the caribou spends 100% of its time in the study area; although most herds are migratory, there have been observances of non-migratory herds in the area.

Feeding Habits:

Ground and tree lichens are the primary winter food of caribou, providing a highly digestible and energy-rich food source. Although lichens are a good source of energy, they are not a good source of protein (nitrogen). As soon as spring snow melts, caribou are eager to switch to fresh green vegetation (e.g. leaves of willows and birches, mushrooms, cotton grass, sedges), which is rich in nitrogen. (CWS 2005, NatureServe 2007, Shefferly and Joly 2000)

Based on the available information caribou is assumed to consume terrestrial vegetation. This is likely to comprise primarily lichen in the winter and primarily forage and browse in the summer (75% lichen, 11% summer forage, 11% browse and 3% soil (as discussed below)).

Food Consumption Rate:

Allometric equation for mammals (U.S. EPA 1993): $FI (g\ dw/day) = 0.235\ Wt^{0.822} (g)$

Based on a body weight of 1.35×10^5 g the FI is 3874 g dw/d, or 6457 g ww/d (moisture content of 40%, based on diet composed mainly of lichen as discussed below). This wet weight value is taken as the mode of a triangular distribution with maximum and minimum values of +/- 30%.

Soil Ingestion:

No specific information is available; therefore the general value for all mammals of 5% based on the information provided by Beyer *et al.* (1994) was used.

Based on a dry weight consumption rate of 3874 g/d this corresponds to approximately 194 g/d, or 3% of the wet weight FI of 6457 g ww/d.

Water Intake Rate:

Allometric equation for mammals (U.S. EPA 1993): $WI (L/day) = 0.099\ Wt^{0.9} (kg)$

Based on a body weight of 135 kg the WI is 8.2 L/d. This value is taken as the mode of a triangular distribution with maximum and minimum values of +/- 50%.

Summary Table:

Exposure Characteristics		
Body Weight (kg)	135	ADF&G 1999
Food Intake Rate (g ww/d)	TRI(4520, 6457, 8394)	U.S. EPA 1993 (allometric scaling)
Soil Ingestion Rate (g dw/d)	194	Beyer <i>et al.</i> 1994
Water Intake Rate (L/d)	TRI(4.1, 8.2, 12.3)	U.S. EPA 1993 (allometric scaling)
Fraction of time in area	Varies by scenario	Assumed
Fractional Composition of Diet		
Soil	0.03	Based on CWS 2005, NatureServe 2007, Shefferly and Joly 2000
Summer Forage	0.11	
Browse	0.11	
Lichen	0.75	

Note: TRI = triangular distribution (minimum, mode, maximum)

References:

Alaska Department of Fish & Game (ADF&G) 1999. Wildlife Notebook Series: Caribou. Accessed September 19, 2007 at: <http://www.adfg.state.ak.us/pubs/notebook/biggame/caribou.php>

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Canadian Wildlife Service (CWS) 2005. *Hinterland Who's Who. Mammal Fact Sheet: Caribou*. Available at: <http://www.hww.ca/hww2.asp?id=85>

NatureServe. 2007. NatureServe Explorer: An online encyclopedia of life. Version 6.2. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. 8 June (Accessed: September 19, 2007).

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United States Environmental Protection Agency (U.S. EPA) 1993. *Wildlife Exposure Factors Handbook*. EPA/600/R-93/187.

Lemming



The lemming is a mouse-like rodent which lives in treeless areas in Northern Canada. The true lemming is the brown lemming (*Lemmus sibiricus*), and along with the collared lemming (*Dicrostonyx torquatus*) are the two predominant lemming species in the mainland tundra west of Hudson Bay. The collared lemming has colonized the Queen Elizabeth Islands to the northern tip of Ellesmere Island. The lemming is the smallest of the mammals of the high Arctic and is an important food for ermines, arctic foxes,

Snowy Owls, Gyrfalcons and jaegers. It has roughly four years of cycles of drastically fluctuating populations and therefore controls the rhythm of life on the tundra (CWS 2010, NatureServe 2009).

Size:

The brown lemming is the largest of the various lemming species and weighs from 40 to 112 g, with an average weight of 78 g (ADF&G 1994).

The closely related Neararctic collared lemming (*D. groenlandicus*) weighs from 30 to 112 g (Poloskey 200), with various average weights reported: a little over 40 g (ADF&G 1994); 112 g (NatureServe 2009); or 71 g (Poloskey 2000).

Adult collared lemmings are approximately 150 mm in total length (CWS 2010).

Weight varies from year to year, ranging from 55 g to 115 g for the brown lemming. Collared lemmings are a similar size (CWS 2010).

Based on the above information a typical adult lemming is expected to weigh 70 g (ADF&G 1994, Poloskey 2000, CWS 2010).

Home Range:

Lemmings are not migrant creatures and, in general, home ranges are quite small; however, some species will travel several kilometres from their natal area. Roads, especially divided highways, are major barriers to their dispersal (NatureServe 2009).

Feeding Habits:

Collared lemmings consume mostly plants, including willow buds, cranberries, flowers, grasses and twigs. Brown lemmings prefer sedges, arctic cotton and certain mosses. In the winter, the segregation in diets between collared and brown lemmings tends to break down as collared lemmings seek out snow shelter in lower ground areas, thereby consuming more sedges and

mosses. Although the morphology of the teeth suggests that they consume insects, this has not been observed in the wild (Poloskey 2000, ADF&G 1994, CWS 2010).

Based on the available information the lemming is assumed to consume primarily forage with some lichen and small amounts of berries (75% forage, 15% lichen, 8.5% berries and 1.5% soil (as discussed below)).

Food Consumption Rate:

Allometric equation for mammals (U.S. EPA 1993): $FI (g\ dw/day) = 0.235\ Wt^{0.822} (g)$

Based on a body weight of 70 g the FI is 7.7 g dw/d, or 26 g ww/d (moisture content of 70% based on diet composed mainly of terrestrial vegetation as discussed below). The wet weight value is taken as the mode of a triangular distribution with maximum and minimum values of +/- 30%.

Soil Ingestion:

No specific information is available; therefore the general value for all mammals of 5% based on the information provided by Beyer *et al.* (1994) was used.

Based on a dry weight consumption rate of 7.7 g/d this corresponds to approximately 0.39 g/d, or 1.5% of the wet weight FI of 26 g/d

Water Intake Rate:

Allometric equation for mammals (U.S. EPA 1993): $WI (L/day) = 0.099\ Wt^{0.9} (kg)$

Based on a body weight of 0.071 kg the WI is 0.01 L/d. This value is taken as the mode of a triangular distribution with maximum and minimum values of +/- 50%.

Summary Table:

Exposure Characteristics		
Body Weight (g)	71	ADF&G 1994, Poloskey 2000, CWS 2010
Food Intake Rate (g ww/d)	TRI(18, 26, 33)	U.S. EPA 1993 (allometric scaling)
Soil Ingestion Rate (g dw/d)	0.39	Beyer <i>et al.</i> 1994
Water Intake Rate (L/d)	TRI(0.005, 0.009, 0.014)	U.S. EPA 1993 (allometric scaling)
Fraction of time in area	1	Assumed
Fractional Composition of Diet		
Soil	0.015	Fraction of wet weight diet (Beyer <i>et al.</i> 1994)
Berries	0.085	Based on Poloskey 2000, ADF&G 1994, CWS 2010
Forage	0.75	
Lichen	0.15	

Note: TRI = triangular distribution (minimum, mode, maximum)

References:

Alaska Department of Fish & Game (ADF&G) 1994. *Wildlife Notebook Series: Lemmings*. Accessed July 22 2010 at: <http://www.adfg.state.ak.us/pubs/notebook/smgame/lemmings.php>

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United States Environmental Protection Agency (U.S. EPA) 1993. *Wildlife Exposure Factors Handbook*. EPA/600/R-93/187.

Muskox



The muskox (*Ovibos moschatus*) is an arctic mammal of the Bovidae family. It resembles the bison: humped shoulders and a long black coat accentuate the shortness of its legs and is generally found in the low-lying coastal and inland plains or river valleys of the Arctic, where shrubs are most abundant (CWS 1990).

Size:

The few weights of wild muskoxen available indicate that adult bulls weigh 270 to 315 kg and cows about 90 kg or less (CWS 1990).

405000 grams (NatureServe 2008).

180 to 400 kg; avg. 285 kg (Elder 2005).

Based on the above information, a typical muskox is expected to weigh 300 kg (CWS 1990, Elder 2005).

Home Range:

Relatively sedentary; seasonal movements between winter and summer ranges do not exceed 80 km and are probably often less than 50 km (NatureServe 2008).

Feeding Habits:

On the mainland, muskoxen feed extensively on the shrubby willows that follow the river courses. On the arctic islands they feed in the wet meadows. When snow covers the ground, the muskoxen must dig craters through the snow to find the willows, grasses, and sedges that form the major part of their diet (CWS 1990). The muskox eats mainly sedges, grasses, and willows in summer, primarily sedges or woody plants in winter (NatureServe 2008).

Based on the available information, the muskox is assumed to consume primarily browse with some forage during the summer (90% browse, 8.5% forage and 1.5% soil (as discussed below)).

Food Consumption Rate:

Allometric equation for mammals (U.S. EPA 1993): $FI (g\ dw/day) = 0.235\ Wt^{0.822} (g)$

Based on a body weight of 300 kg the FI is 7.5 kg dw/d or 25 kg ww/d (moisture content of 70% based on a diet of mainly terrestrial vegetation as discussed below). The wet weight value is taken as the mode of a triangular distribution with maximum and minimum values of +/- 30%.

Soil Ingestion:

No specific information is available, therefore the general value for all mammals of 5% based on the information provided Beyer *et al.* (1994) was used.

Based on a dry weight FI of 7.5 kg/d this corresponds to approximately 373 g/d, or 1.5% of the wet weight FI of 25 kg/d.

The arctic wolf is the only wild predator of muskoxen (CWS 1990).

Water Intake Rate:

Allometric equation for mammals (U.S. EPA 1993): $WI (L/day) = 0.099 Wt^{0.9} (kg)$

Based on a body weight of 300 kg the WI is 17 L/d, which is taken as the mode of a triangular distribution with maximum and minimum values of +/- 50%.

Summary Table:

Exposure Characteristics		
Body Weight (kg)	300	CWS 1990, Elder 2005
Food Intake Rate (kg ww/d)	TRI(17, 25, 32)	U.S. EPA 1993 (allometric scaling)
Soil Ingestion Rate (g dw/d)	373	Beyer <i>et al.</i> 1994
Water Intake Rate (L/d)	TRI(8.4, 17, 25)	U.S. EPA 1993 (allometric scaling)
Fraction of time in area	0.1	Assumed
Fractional Composition of Diet		
Soil	0.015	Fraction of wet weight diet (Beyer <i>et al.</i> 1994)
Summer forage	0.085	NatureServe 2008
Browse	0.9	CWS 1991

Note: TRI = triangular distribution (minimum, mode, maximum)

References:

Beyer, W. N., E. Connor, and S. Gerould. 1994. *Survey of Soil Ingestion by Wildlife*. Journal of Wildlife Management 58:375-382.

Canadian Wildlife Service (CWS) 1990. Hinterland Who's Who. Muskox. Available at: <http://www.hww.ca/hww2.asp?id=95>

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NatureServe. 2008. NatureServe Explorer: An online encyclopedia of life. Version 7.0. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. 1 February (Accessed: April 7, 2008).

United States Environmental Protection Agency (U.S. EPA) 1993. Wildlife Exposure Factors Handbook. EPA/600/R-93/187.



Rock Ptarmigan

Ptarmigans are hardy members of the grouse family that spend most of their lives on the ground at or above the treeline. The Rock Ptarmigan (*Lagopus muta*) is a typical bird of the arctic tundra. It prefers high elevations and barren areas. Ptarmigan are known for dramatically fluctuating population densities (CWS 1994, NatureServe 2007, Cornell 2003).

Size:

Weight: 601 grams (NatureServe 2007).

Weight: 430 to 810 g (Cornell 2003).

Ptarmigans weigh from 450 to 800 g (CWS 1994, for Willow Ptarmigan).

Based on the above information a typical ptarmigan is expected to weigh approximately 620 g (0.62 kg) (NatureServe 2007, Cornell 2003, CWS 1994).

Home Range:

Mainly permanent resident but somewhat migratory (NatureServe 2007).

Note: Home range for a female grouse is from 0.16 km² to 0.40 km²; home range for a male grouse is from 0.04 km² to 0.20 km² (North Carolina State University 1995)

Feeding Habits:

Ptarmigans are mostly plant eaters. In summer, the diet consists of a variety of vegetation consisting of leaves, flowers, buds and berries of a wide variety of tundra plants as well as catkins, seed capsules and bulblets. They also consume mosses and supplement their menu with insects and spiders when these are abundant. In winter the choice and quantity of food are reduced, and ptarmigans eat the buds, twigs, seeds and catkins of low willows, alders, and dwarf birches (CWS 1994, NatureServe 2007, Cornell 2003, Weeden 1994).

Based on the available information the ptarmigan is assumed to ingest terrestrial vegetation and insects (80% browse, 10% berries, 7% insects and 3% soil (as discussed below)).

Food Consumption Rate:

Allometric equation for birds (U.S. EPA 1993): $FI (g\ d)/day = 0.648 Wt^{0.651} (g)$

Based on a body weight of 620 g the FI is 43 g dw/d, or 142 g ww/d (moisture content of 70% based on a diet of mainly terrestrial vegetation as discussed below). The wet weight value is taken as the mode of a triangular distribution with maximum and minimum values of +/- 30%.

Soil Ingestion:

Beyer *et al.* (1994) provides a value of 10.4% for a woodcock and 9.3% for wild turkey, the average of these values (9.9%) was used in lieu of species specific data.

Based on a dry weight FI of 43 g/d this corresponds to approximately 4.2 g/d, or 3% of the wet weight FI of 142 g/d.

Water Intake Rate:

Allometric equation for birds (U.S. EPA 1993): $WI (L/day) = 0.059 Wt^{0.67} (kg)$

Based on a body weight of 0.62 kg the WI is 0.04 L/d. This value is taken as the mode of a triangular distribution with maximum and minimum values of +/- 50%.

Summary Table:

Exposure Characteristics		
Body Weight (kg)	0.62	NatureServe 2007, Cornell 2003
Food Intake Rate (g ww/d)	TRI(99, 142, 185)	U.S. EPA 1993 (allometric scaling)
Soil Ingestion Rate (g dw)/d)	4.2	Beyer <i>et al.</i> 1994
Water Intake Rate (L/d)	TRI(0.02, 0.04, 0.06)	U.S. EPA 1993 (allometric scaling)
Fraction of Time in Area	1	Assumed (mainly resident)
Fractional Composition of Diet		
Soil	0.03	Fraction of wet weight diet (Beyer <i>et al.</i> 1994)
Insects	0.07	Based on information from CWS 1994, NatureServe 2007, Cornell 2003, Weeden 1994
Browse	0.8	
Berries	0.1	

Note: TRI = triangular distribution (minimum, mode, maximum)

References:

Beyer, W. N., E. Connor, and S. Gerould. 1994. *Survey of Soil Ingestion by Wildlife*. Journal of Wildlife Management 58:375-382.

Canadian Wildlife Service (CWS) 1994. *Hinterland Who's Who. Bird Fact Sheet: Ptarmigan*. Available at <http://www.fdp.ca/hww2.asp?id=64>

Cornell 2003. *All About Birds. Bird Guide*. Cornell Lab of Ornithology. Accessed September 18, 2007 <http://www.birds.cornell.edu/AllAboutBirds/BirdGuide/>

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United States Environmental Protection Agency (U.S. EPA) 1993. *Wildlife Exposure Factors Handbook*. EPA/600/R-93/187.

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Masked Shrew



The masked shrew or common shrew (*Sorex cinereus*) is found in Alaska and most of Canada. The majority of the shrew's activities occur at night (Lee 2001).

Size:

Weighs 4g (NatureServe 2011)

Weighs 2.5 to 4g (Lee 2001)

Weighs 3 to 6 g (U.S. EPA. 1993)

Based on the above information the average weight of a masked shrew is expected to be 4 g (NatureServe 2011).

Home Range:

The average home range of a masked shrew is 0.6 hectares. The masked shrew lives in a wide range of habitats (open areas, forest and brush) where moister environments are more favourable. The masked shrew may also inhabit areas that have been disturbed by either fires or logging (Lee 2001, U.S. EPA. 1993).

Feeding Habits:

The masked shrew diet varies based on the geography of the habitat. It is a carnivore, which primarily feeds on insects. The masked shrew also consumes seeds and fungi (Lee 2001, U.S. EPA. 1993).

Based on the available information the masked shrew is assumed to consume insects (90%) and terrestrial vegetation (10%).

Food Consumption Rate:

Allometric equation for mammals (U.S. EPA 1993): $FI \text{ (g dw/day)} = 0.235 Wt^{0.822} \text{ (g)}$

Based on a body weight of 4 g the FI is 0.73g dw/d or 3.67 g ww/d (moisture content of 80%).

Specific food consumption rates were not available for the masked shrew thus the average food consumption rate for the short-tailed shrew (0.55 g ww/d per body weight) was applied as both

species of shrews have a similar diet. With a body weight of 4g for the masked shrew this corresponds to an intake rate of 2.2 g ww/d, which is 0.44 g dw/d with a moisture content of 80%.

Soil Ingestion:

No information was available for the masked shrew. Beyer et. al (1994) provided values for two possible surrogates: 2.7% to 7.7% for prairie dogs, and 2.4% for the meadow vole. The average prairie dog value of 5.2% used in lieu of specific information, as the prairie dog value is higher. Based on a dry weight FI of 0.44 g/d this corresponds to approximately 0.02 g ww/d.

Water Intake Rate:

Allometric equation for mammals (U.S. EPA 1993): $WI (L/day) = 0.099 Wt^{0.9} (kg)$

Based on a body weight of 0.004 kg the WI is 0.0007 L/d

Inhalation Rate:

Allometric equation for mammals (U.S. EPA 1993): $IR (m^3/day) = 0.5458 Wt^{0.8} (kg)$

Based on a body weight of 0.004 kg the IR is 0.007 m³/d

Summary Table:

Exposure Characteristics		
Body Weight (kg)	0.004	NatureServe 2011, Lee 2001, U.S. EPA 1993
Food Intake Rate (g ww/d)	2.2	U.S. EPA 1993 (using the average food consumption rate for the short-tailed shrew (0.55 g ww/d per body weight))
Soil Ingestion Rate: (g/d) Fraction of ww diet:	0.02 0.01	Beyer <i>et al.</i> 1994
Water Intake Rate (L/d)	0.0007	U.S. EPA 1993 (allometric scaling)
Inhalation rate (m ³ /d)	0.007	U.S. EPA 1993 (allometric scaling)
Fraction of time in area	1	Assumed
Fractional Composition of Diet		
Insects	0.9	Lee 2001, U.S. EPA. 1993
Terrestrial vegetation	0.1	

References:

- Lee, W. 2001. "Sorex cinereus" (On-line), Animal Diversity Web. Accessed June 06, 2011
http://animaldiversity.ummz.umich.edu/site/accounts/information/Sorex_cinereus.html.
- NatureServe. 2011. NatureServe Explorer: An online encyclopedia of life. Version 6.2. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed June 6, 2011).
- United States Environmental Protection Agency (U.S. EPA) 1993. *Wildlife Exposure Factors Handbook*. EPA/600/R-93/187.

Arctic Ground Squirrel



The arctic ground squirrel (*Spermophilus parryi*), a.k.a gopher or sik sik, is a species of ground squirrel native to the Arctic. It inhabits tundra and forest clearings from eastern Siberia to Hudson Bay (Environment Yukon 2007).

Size:

900 g in weight (Environment Yukon 2007)

Weight: 791 grams (NatureServe 2008).

Based on the above information, a typical arctic ground squirrel is expected to weigh 800 g (Environment Yukon 2007, NatureServe 2008).

Home Range:

Recorded home ranges for most species are very small, in the order of 0.1 to 0.6 hectares but occasionally up to 4 hectares (NatureServe 2008).

Feeding Habits:

Eats stems and leaves, seeds, fruits, and roots of grasses, sedges, and other green plants, as well as woody plants and mushrooms (NatureServe 2008).

This rodent is primarily herbivorous, favouring such foods as grasses, sedges, mushrooms, bog rushes, bilberries, willows, roots, stalks, leaves, flowers, and seeds (Brensike 2000).

Based on the available information, the sik sik is assumed to consume terrestrial vegetation (50% forage, 48.5% berries and 1.5% soil (as discussed below)).

Predators of *Spermophilus parryi* include the grizzly bear, foxes, wolves, ermine, and various types of birds (Brensike 2000).

Food Consumption Rate:

Allometric equation for mammals (U.S. EPA 1993): $FI \text{ (g dw/day)} = 0.235 Wt^{0.822} \text{ (g)}$

Based on a body weight of 800 g, the FI is 57 g dw/d, or 191 g ww/d (moisture content of 70% based on a diet composed mainly of terrestrial plants as discussed below). The wet weight value is taken as the mode of a triangular distribution with maximum and minimum values of +/- 30%.

Soil Ingestion:

Beyer *et al.* (1994) provides values of 2.7 and 7.7% for prairie dogs; an average of 5.4% was used.

Based on a dry weight FI of 57 g/d this corresponds to approximately 3 g/d, or 1.5% of the wet weight FI of 191 g/d.

Water Intake Rate:

Allometric equation for mammals (U.S. EPA 1993): $WI \text{ (L/day)} = 0.099 Wt^{0.9} \text{ (kg)}$

Based on a body weight of 800 g the WI is 0.1 L/d. This value is taken as the mode of a triangular distribution with maximum and minimum values of +/- 50%.

Summary Table:

Exposure Characteristics		
Body Weight (kg)	0.8	Environment Yukon 2007, NatureServe 2008
Food Intake Rate (g ww/d)	TRI(133, 191, 248)	U.S. EPA 1993 (allometric scaling)
Soil Ingestion Rate (g dw/d)	3	Beyer <i>et al.</i> 1994
Water Intake Rate (L/d)	TRI(0.04, 0.08, 0.12)	U.S. EPA 1993 (allometric scaling)
Fraction of time in area	1	Assumed (Small home range)
Fractional Composition of Diet		
Soil	0.015	Fraction of wet weight diet (Beyer <i>et al.</i> 1994)
Forage	0.5	NatureServe 2008
Berry	0.485	

Note: TRI = triangular distribution (minimum, mode, maximum)

References:

Beyer, W. N., E. Connor, and S. Gerould. 1994. *Survey of Soil Ingestion by Wildlife*. Journal of Wildlife Management 58:375-382.

Brensike, J. 2000. "Spermophilus parryii" (On-line), Animal Diversity Web. Accessed April 08, 2008 at http://animaldiversity.ummz.umich.edu/site/accounts/information/Spermophilus_parryii.html.

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United States Environmental Protection Agency (U.S. EPA) 1993. Wildlife Exposure Factors Handbook. EPA/600/R-93/187.

Red-Breasted Merganser



The Red-Breasted Merganser (*Mergus serrator*) is large diving duck. Red-breasted mergansers live in large lakes, rivers, and oceans, and prefer salt water more than the other two species of merganser (Cornell 2003). Nests are typically in the ground, under a boulder, or in a shrub. Mergansers are diving predators who locate their prey by sight, and therefore tend to feed in clear waters, less than 4 m deep. The long bill has toothy projections along its edges that help the duck hold onto its fish prey (Cornell 2003, Becker and Fraser 2006).

Size:

Red-breasted mergansers are 800 to 1350 g (Cornell 2003).

Based on the above information a typical red-breasted merganser is expected to weigh approximately 1.0 kg, or 1000 g (Cornell 2003).

Home Range:

Nesting sites are usually separated from one another, but mergansers have also been known to nest in close proximity in some cases. Territorial behaviour is minimal. Individuals feed over a large range, seeking medium to large bodies of clear water (Becker and Fraser 2006).

Feeding Habits:

Mergansers are skilled diving predators, eating mainly fish. Clear water is preferred for feeding because the birds hunt primarily by sight. When fish are scarce, mergansers will substitute other small aquatic prey such as insects, mollusks, crustaceans, frogs, and other invertebrates (Becker and Fraser 2006, NatureServe 2008, Cornell 2003).

Based on the available information the merganser, the principal source of food is fish. The diet is assumed to comprise equal quantities of pelagic and benthic fish.

Food Consumption Rate:

Daily food consumption rate for the red-breasted merganser is 0.235 kg ww/d (CCME 1997).

The allometric equation for birds (U.S. EPA 1993): $FI (g\ dw/day) = 0.648\ Wt^{0.651} (g)$

Based on a body weight of 1000 g the FI is 58 g dw/d, or 290 g ww/d (moisture content of 80% based on a diet comprising mainly aquatic species as discussed below). The wet weight value is taken as the mode of a triangular distribution with maximum and minimum values of +/- 30%.

Sediment Ingestion:

Data on sediment ingestion by merganser were not found in the open literature. However, Beyer *et al.* (1994) provides a value of 2% for the ring-necked duck and the blue winged teal. Since the merganser is piscivorous and would not ingest significant amounts of sediment, this value was considered appropriate.

Based on a dry weight FI of 58 g/d this corresponds to approximately 1.2 g/d, which represents 0.4% of the wet weight FI of 290 g/d.

Water Intake Rate:

Allometric equation for birds (U.S. EPA 1993): $WI (L/day) = 0.059 Wt^{0.67} (kg)$

Based on a body weight of 1.00 kg the WI is 0.06 L/d. This value is taken as the mode of a triangular distribution with maximum and minimum values of +/- 50%.

Summary Table:

Exposure Characteristics		
Body Weight (kg)	1.0	Cornell 2003
Food Intake Rate (g (ww)/d)	TRI(203, 290, 377)	U.S. EPA 1993 (allometric scaling)
Sediment Ingestion Rate (g dw/d)	1.2	Beyer <i>et al.</i> 1994
Water Intake Rate (L/d)	TRI(0.03, 0.06, 0.09)	U.S. EPA 1993 (allometric scaling)
Fraction of time in area	0.33	Assumed (migratory)
Fractional Composition of Diet		
Sediment	0.004	Fraction of wet weight diet (Beyer <i>et al.</i> 1994)
Fish	0.996	Based on information from Becker and Fraser 2006, NatureServe 2008, Cornell 2003

Note: TRI = triangular distribution (minimum, mode, maximum)

References:

Becker, R. and A. Fraser. 2006. "Mergus merganser" (On-line), Animal Diversity Web. Accessed January 11, 2008 at http://animaldiversity.ummz.umich.edu/site/accounts/information/Mergus_merganser.html.

Beyer, W. N., E. Connor, and S. Gerould. 1994. *Survey of Soil Ingestion by Wildlife*. Journal of Wildlife Management 58:375-382.

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United States Environmental Protection Agency (U.S. EPA) 1993. *Wildlife Exposure Factors Handbook*. EPA/600/R-93/187.



Long-Tailed Duck

The Long-Tailed Duck (*Clangula hyemalis*), formerly known as the Oldsquaw, breeds in the Arctic and is distinctive among ducks in plumage, molt sequences, foraging behavior, and vocalizations (Cornell 2003). The nests of the long-tailed duck are on the ground, along the edge of water (Cornell 2003).

Size:

Weight: 500-1100 g (Cornell 2003).

Based on the above information, a typical long-tailed duck is expected to weigh 0.8 kg (Cornell 2003).

Home Range:

Long-tailed ducks breed in Arctic ponds, streams, and wetlands (Cornell 2003) and migrates to coastal areas in the winter. As a species, these ducks have a large geographic range and population size.

Feeding Habits:

Long-tailed ducks feed mainly on benthic invertebrates (molluscs and crustaceans) and aquatic insects, fish and plants in summer (Cornell 2003, NatureServe 2008, SAS 2005). They may dive very deep to obtain food (NatureServe 2008).

Based on the available information the duck is assumed to consume benthic invertebrates (75%, of which 0.7% is sediment) and fish (25%).

Food Consumption Rate:

Allometric equation for birds (U.S. EPA 1993): $FI (g\ dw/day) = 0.648\ Wt^{0.651} (g)$

Based on a body weight of 800 g the FI is 50 g dw/d, or 251 g ww/d (moisture content of 80% based on a diet comprising mainly aquatic species as discussed below). The wet weight value is taken as the mode of a triangular distribution with maximum and minimum values of +/- 30%.

Sediment Ingestion:

Data on sediment ingestion by the long-tailed duck were not found in the open literature. However, Beyer *et al.* (1994) provides a value of 3.3% for the mallard duck. This value was considered appropriate for the long-tailed duck.

Based on a dry weight FI of 50 g/d this corresponds to approximately 1.7 g/d, which represents 0.7% of the wet weight FI of 251 g/d.

Water Intake Rate:

Allometric equation for birds (U.S. EPA 1993): $WI (L/day) = 0.059 Wt^{0.67} (kg)$

Based on a body weight of 800 g the WI is 0.05 L/d. This value is taken as the mode of a triangular distribution with maximum and minimum values of +/- 50%.

Summary Table:

Exposure Characteristics		
Body Weight (kg)	0.8	Cornell 2003
Food Intake Rate (g ww/d)	TRI(203, 290, 377)	U.S. EPA 1993 (allometric scaling)
Sediment Ingestion Rate (g dw/d)	1.7	Beyer <i>et al.</i> 1994
Water Intake Rate (L/d)	TRI(0.025, 0.05, 0.075)	U.S. EPA 1993 (allometric scaling)
Fraction of time in area	0.33	Assumed (migratory)
Fractional Composition of Diet		
Sediment	0.007	Fraction of wet weight diet (Beyer <i>et al.</i> 1994)
Benthic invertebrates	0.743	SAS 2005 and NatureServe 2008
Fish	0.25	

Note: TRI = triangular distribution (minimum, mode, maximum)

References:

Beyer, W. N., E. Connor, and S. Gerould. 1994. *Survey of Soil Ingestion by Wildlife*. Journal of Wildlife Management 58:375-382.

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Seattle Audubon Society (SAS). 2005. *Bird Web*.
http://birdweb.org/birdweb/bird_details.aspx?id=87. Accessed January 14, 2011.

United States Environmental Protection Agency (U.S. EPA) 1993. Wildlife Exposure Factors Handbook. EPA/600/R-93/187.



Lapland Longspur

The Lapland Longspur (*Calcarius lapponicus*) is a common songbird on the Arctic tundra (Cornell 2003). The longspur is a ground forager and breeds in the Arctic tundra in grassy tussocks or scrub (Cornell 2003). These sparrow-like birds are known for forming large flocks.

Size:

Weight: 23-33 g (Cornell 2003).

Based on the above information, a typical longspur is expected to weigh 0.030 kg (Cornell 2003).

Home Range:

Lapland longspur breed in Arctic tundra in grassy tussocks or scrub (Cornell 2003) and migrate to prairie, pastures and coastal areas in the winter (SAS 2005).

Feeding Habits:

Lapland longspur feed mainly on seeds and insects (Cornell 2003, SAS 2005). During the summer, insects are about 50% of the diet (SAS 2005).

Based on the available information the longspur is assumed to consume insects (50%) and seeds (50%, of which 3% is soil).

Food Consumption Rate:

Allometric equation for birds (U.S. EPA 1993): $FI (g dw/day) = 0.648 Wt^{0.651} (g)$

Based on a body weight of 30 g the FI is 6 g dw/d, or 20 g ww/d (moisture content of 70% based on a diet comprising mainly terrestrial species as discussed below). The wet weight value is taken as the mode of a triangular distribution with maximum and minimum values of +/- 30%.

Soil Ingestion:

Beyer *et al.* (1994) provides a value of 10.4% for a woodcock and 9.3% for wild turkey, the average of these values (9.9%) was used in lieu of species specific data.

Based on a dry weight FI of 13 g/d this corresponds to approximately 1.3 g/d, or 3% of the wet weight FI of 43 g/d.

Water Intake Rate:

Allometric equation for birds (U.S. EPA 1993): $WI (L/day) = 0.059 Wt^{0.67} (kg)$

Based on a body weight of 30 g the WI is 0.006 L/d. This value is taken as the mode of a triangular distribution with maximum and minimum values of +/- 50%.

Summary Table:

Exposure Characteristics		
Body Weight (kg)	0.03	Cornell 2003
Food Intake Rate (g ww/d)	TRI(14, 20, 26)	U.S. EPA 1993 (allometric scaling)
Soil Ingestion Rate (g dw/d)	1.3	Beyer <i>et al.</i> 1994
Water Intake Rate (L/d)	TRI(0.003, 0.006, 0.009)	U.S. EPA 1993 (allometric scaling)
Fraction of time in area	0.33	Assumed (migratory)
Fractional Composition of Diet		
Soil	0.003	Fraction of wet weight diet (Beyer <i>et al.</i> 1994)
Insects	0.5	SAS 2005 and Cornell 2003
Seeds	0.497	

Note: TRI = triangular distribution (minimum, mode, maximum)

References:

Beyer, W. N., E. Connor, and S. Gerould. 1994. *Survey of Soil Ingestion by Wildlife*. Journal of Wildlife Management 58:375-382.

Cornell 2003. *All About Birds. Bird Guide*. Cornell Lab of Ornithology. Accessed January 14, 2011 <http://www.birds.cornell.edu/AllAboutBirds/BirdGuide/>

Seattle Audubon Society (SAS) 2005. *Bird Web*. http://birdweb.org/birdweb/bird_details.aspx?id=87. Accessed January 14, 2011.

United States Environmental Protection Agency (U.S. EPA) 1993. *Wildlife Exposure Factors Handbook*. EPA/600/R-93/187.



Northern Pintail

The Northern Pintail (*Anus acuta*) is a medium sized dabbling duck (Cornell 2003). The pintail nests in shallow wetlands amidst prairie grasslands or Arctic tundra (Cornell 2003). These birds are among the earliest nesting birds in North America (Cornell 2003).

Size:

Weight: 500-1450 g (Cornell 2003).

Based on the above information, a typical longspur is expected to weigh 1.0 kg (Cornell 2003).

Home Range:

Northern pintail breed in Arctic tundra and are an early fall migrant to wintering areas in the southern areas of North America (Cornell 2003).

Feeding Habits:

Northern pintail feed mainly on aquatic vegetation (Cornell 2003, SAS 2005). Insects are also a part of the northern pintail diet (Robinson 2002).

Based on the available information the pintail is assumed to consume insects (10%) and aquatic vegetation (90%, of which 0.66% is sediment).

Food Consumption Rate:

Allometric equation for birds (U.S. EPA 1993): $FI (g\ dw/day) = 0.648\ Wt^{0.651} (g)$

Based on a body weight of 1000 g the FI is 58 g dw/d, or 290 g ww/d (moisture content of 80% based on a diet comprising mainly aquatic species). The wet weight value is taken as the mode of a triangular distribution with maximum and minimum values of +/- 30%.

Soil Ingestion:

Beyer *et al.* (1994) provides a value of 3.3% for a mallard duck and this value was used in lieu of species specific data.

Based on a dry weight FI of 58 g/d this corresponds to approximately 1.9 g/d, or 0.66% of the wet weight FI of 290 g/d.

Water Intake Rate:

Allometric equation for birds (U.S. EPA 1993): $WI (L/day) = 0.059 Wt^{0.67} (kg)$

Based on a body weight of 1 kg the WI is 0.06 L/d. This value is taken as the mode of a triangular distribution with maximum and minimum values of +/- 50%.

Summary Table:

Exposure Characteristics		
Body Weight (kg)	1.0	Cornell 2003
Food Intake Rate (g ww/d)	TRI(203, 290, 377)	U.S. EPA 1993 (allometric scaling)
Sediment Ingestion Rate (g dw/d)	1.9	Beyer <i>et al.</i> 1994
Water Intake Rate (L/d)	TRI(0.03, 0.06, 0.09)	U.S. EPA 1993 (allometric scaling)
Fraction of time in area	0.33	Assumed (migratory)
Fractional Composition of Diet		
Sediment	0.0066	Fraction of wet weight diet (Beyer <i>et al.</i> 1994)
Insects	0.1	Cornell 2003, Robinson 2002
Aquatic vegetation	0.8934	

Note: TRI = triangular distribution (minimum, mode, maximum)

References:

Beyer, W. N., E. Connor, and S. Gerould. 1994. *Survey of Soil Ingestion by Wildlife*. Journal of Wildlife Management 58:375-382.

Cornell 2003. *All About Birds. Bird Guide*. Cornell Lab of Ornithology. Accessed January 14, 2011 <http://www.birds.cornell.edu/AllAboutBirds/BirdGuide/>

Robinson, J. 2002. "Anas acuta" (On-line), Animal Diversity Web. Accessed February 07, 2011 http://animaldiversity.ummz.umich.edu/site/accounts/information/Anas_acuta.html

Shorebirds (Semipalmated Sandpiper)



Shorebirds comprise a diverse group of species, including the plovers, oystercatchers, avocets, stilts, turnstones, sandpipers, yellowlegs, snipes, godwits, curlews, and phalaropes (CWS 2001). The areas frequented by shorebirds include wetlands, estuaries, and coastlines. Shorebirds generally forage on sandy beaches and mudflats and feed almost exclusively on small invertebrates, either by probing into or gleaning from the substrate. Sandpipers, specifically the Semipalmated Sandpiper

(possibly the most abundant shorebird), was selected as the representative species. These birds breed on open tundra, generally near water (CWS 1991, Cornell 2003).

Size:

About 30 grams (CWS 1991)

Weight: 28 grams (NatureServe 2008).

Weight: 21-32 g (Cornell 2003)

Based on the above information, typical shorebird is expected to weigh 30 g (CWS 1991 and NatureServe 2008).

Home Range:

Average territory size 1 ha on breeding grounds in Manitoba (NatureServe 2008). The territory size of the spotted sandpiper is 0.25 ha (U.S. EPA 1993).

Feeding Habits:

On the tundra, many feed on surface insects. On migration, they feed on invertebrates such as polychaete worms, bivalves such as *Macoma balthica* and mud shrimp or *Corophium volutator* (CWS 2001).

Semipalmated Sandpipers feed on insects and tiny, mostly shrimplike, water animals that collectively are called aquatic invertebrates. (CWS 1991)

Feeds primarily on aquatic insects; also eats mollusks, worms, and crustaceans (NatureServe 2008).

Shorebirds feed almost exclusively on small invertebrates, either by probing into or gleaning from the substrate (U.S. EPA 1993).

Based on the available information the sandpiper is assumed to consume benthic invertebrates (CWS 2001 and NatureServe 2008).

Food Consumption Rate:

Allometric equation for birds (U.S. EPA 1993): $FI \text{ (g (dw)/day)} = 0.648 Wt^{0.651} \text{ (g)}$

Based on a body weight of 30 g the FI is 5.9 g dw/d, or 30 g ww/d (moisture content of 80% based on diet comprising mainly aquatic species as discussed below). The wet weight value is taken as the mode of a triangular distribution with maximum and minimum values of +/- 30%.

Sediment Ingestion:

Beyer *et al.* (1994) provides values for the stilt sandpiper (17%), semipalmated sandpiper (30%), least sandpiper (7.3%) and western sandpiper (18%). The average of these (18%) was used.

Based on a dry weight FI of 5.9 g/d this corresponds to approximately 1.1 g/d, which represents 0.04% of the wet weight FI of 30 g/d.

Water Intake Rate:

Allometric equation for birds (U.S. EPA 1993): $WI \text{ (L/day)} = 0.059 Wt^{0.67} \text{ (kg)}$

Based on a body weight of 30 g the WI is 0.006 L/d. This value is taken as the mode of a triangular distribution with maximum and minimum values of +/- 50%.

Summary Table:

Exposure Characteristics		
Body Weight (kg)	0.03	CWS 1991, NatureServe 2008
Food Intake Rate (g ww/d)	TRI(21, 30, 39)	U.S. EPA 1993 (allometric scaling)
Soil Ingestion Rate (g dw/d)	1.1	Beyer <i>et al.</i> 1994
Water Intake Rate (L/d)	TRI(0.003, 0.006, 0.008)	U.S. EPA 1993 (allometric scaling)
Fraction of time in area	0.33	Assumed (migratory)
Fractional Composition of Diet		
Sediment	0.04	Fraction of wet weight diet (Beyer <i>et al.</i> 1994)
Benthic invertebrates	0.96	CWS 1991 and NatureServe 2008

Note: TRI = triangular distribution (minimum, mode, maximum)

References:

- Beyer, W. N., E. Connor, and S. Gerould. 1994. *Survey of Soil Ingestion by Wildlife*. Journal of Wildlife Management 58:375-382.
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Grizzly Bear



Brown bears (*Ursus arctos*) found inland and in northern habitats are often called “grizzlies”.

The grizzly is the second largest North American land carnivore. Historically, it ranged across the western half of North America, approximately to the eastern boundary of Manitoba. As human populations have grown, the grizzly's range has gradually shrunk and is now limited to northwestern North America (CWS 1990).

Size:

Bear weights vary depending on the time of year. At this time most mature males weigh between 500 and 900 pounds (180-410 kg) (ADF&G 2003).

Although grizzly bears have been known to weigh as much as 500 kg. An average male weighs 250 to 350 kg and the female about half that (CWS 1990).

Based on the above information, a typical grizzly bear is expected to weigh 300 kg (CWS 1990).

Home Range:

The home range for a female bear can range between 2.6 km² to 40 km²; the home range for a male bear can range from 21 km² to 155 km² (American Bear Association 2003).

It is a solitary animal whose home range may be as large as 1,800 km² for males (CWS 1990).

Feeding Habits:

Common foods include berries, grasses, sedges, horsetails, cow parsnips, fish, ground squirrels, and roots of many kinds of plants (ADF&G 2003).

Plants make up 80 to 90 percent of its diet. Grizzlies prey on mammals and migrating salmon, where they are available, but on the whole rely on vegetation for food. For a brief time in spring, grizzly bears are significant predators of caribou. Grizzly bears that live on the arctic tundra feed heavily on arctic ground squirrels in late summer. However, berries are the most important item in the bears' diet (CWS 1990).

Based on the above information, the grizzly bear is assumed to eat browse (30%), berries (40%), fish (18.5%), caribou (5%), squirrels (5%) and soil (1.5%, as discussed above).

Food Consumption Rate:

Allometric equation for mammals (U.S. EPA 1993): $FI (g\ dw/day) = 0.235\ Wt^{0.822} (g)$

Based on a body weight of 300,000 g the FI is 7.5 kg dw/d or 25 kg ww/d (moisture content of 70% based on dietary characteristics as described below). The wet weight value is taken as the mode of a triangular distribution with maximum and minimum values of +/- 30%.

Soil Ingestion:

No specific information is available, therefore the general value for all mammals of 5% based on the information provided Beyer *et al.* (1994) was used.

Based on a dry weight FI of 7.5 kg/d this corresponds to approximately 373 g/d of soil. This accounts for 1.5% of the wet weight FI of 25 kg/d.

Water Intake Rate:

Allometric equation for mammals (U.S. EPA 1993): $WI (L/day) = 0.099\ Wt^{0.9} (kg)$

Based on a body weight of 300 kg the WI is 17 L/d. This value is taken as the mode of a triangular distribution with maximum and minimum values of +/- 50%.

Summary Table:

Exposure Characteristics		
Body Weight (kg)	300	CWS 1990
Food Intake Rate (kg ww/d)	TRI(17, 25, 32)	U.S. EPA 1993 (allometric scaling)
Soil Ingestion Rate (g dw/d)	373	Beyer <i>et al.</i> 1994
Water Intake Rate (L/d)	TRI(8.4, 17, 25)	U.S. EPA 1993 (allometric scaling)
Fraction of time in area	0.5	Assumed
Fractional Composition of Diet		
Soil	0.015	Fraction of wet weight diet (Beyer <i>et al.</i> 1994) ADF&G (2003) and CWS (1999)
Browse	0.3	
Berries	0.4	
Fish	0.185	
Caribou	0.05	
Arctic Ground Squirrel	0.05	

Note: TRI = triangular distribution (minimum, mode, maximum)

References:

- Alaska Department of Fish & Game (ADF&G) 2003. Wildlife Notebook Series: Brown Bear. Accessed on June 24, 2008 at <http://www.adfg.state.ak.us/pubs/notebook/biggame/brnbear.php>
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- United States Environmental Protection Agency (U.S. EPA) 1993. *Wildlife Exposure Factors Handbook*. EPA/600/R-93/187.

Falcon



The Peregrine Falcon (*Falco peregrinus*) is found in Nunavut. It is a sturdy crow-sized falcon and has a small head, firm compact plumage, and long pointed wings; adaptations that allow it to fly at great speed. Powerful and fast-flying, the Peregrine Falcon hunts medium-sized birds, dropping down on them from high above in a spectacular stoop. They nest on cliff faces and crevices (CWS 1990, Cornell 2003).

Size:

Adult females weigh about 910 g while males weigh about 570 g (CWS 1990).

Weight: 530-1600 g (Cornell 2003).

Weight: 1500 grams (NatureServe 2008)

Mass: 907 g (average) (Dewey and Potter 2002)

Based on the above information, a typical Peregrine Falcon is expected to weigh 900 g (CWS 1990, Cornell 2003, Dewey and Potter 2002).

Home Range:

Home ranges have been estimated from 177 to 1508 km² (White 2002).

Home ranges in Great Britain varied from 44-65 km², and averaged km². In Utah, home range radii varied from 0.3 to 29.8 kilometers, average 12.2 km (NatureServe 2008)

Feeding Habits:

At Rankin Inlet, on the west shore of Hudson Bay, Peregrines eat mostly lemmings and shorebirds (CWS 1990).

The peregrine falcon feeds primarily on birds (medium-size passerines up to small waterfowl). Rarely or locally, small mammals (e.g., bats, lemmings), lizards, fishes, and insects (by young birds) may be eaten (NatureServe 2008).

Peregrine falcons prey almost exclusively on birds, which make up 77 to 99% of prey items. The most important set of prey, by biomass, is Columbidae (doves, pigeons) as well as shorebirds, waterfowl, ptarmigan, grouse, and relatives, and smaller songbirds. They will also

eat small reptiles and mammals. Most frequent mammal prey include bats, rodents, squirrels, and rats. (Dewey and Potter 2002).

Based on the available information the Peregrine Falcon is assumed to consume birds (90%), small mammals (10%) and soil (1.5%, as discussed below).

Food Consumption Rate:

Allometric equation for birds (U.S. EPA 1993): $FI \text{ (g (dw)/day)} = 0.648 Wt^{0.651} \text{ (g)}$

Based on a body weight of 900 g the FI is 54 g dw/d or 181 g ww/d (moisture content of 70%). The wet weight value is taken as the mode of a triangular distribution with maximum and minimum values of +/- 50%.

Soil Ingestion:

There is no specific information available on soil ingestion by falcons. The estimated % soil/sediment in diet (dry weight) for birds (other than shorebirds) is 5% (Beyer *et al.* 1994). This value was used in lieu of species specific data.

Based on a dry weight consumption rate of 54 g/d this corresponds to approximately 2.7 g/d, which represents 1.5% of the wet weight FI of 181 g/d.

Water Intake Rate:

Allometric equation for birds (U.S. EPA 1993): $WI \text{ (L/day)} = 0.059 Wt^{0.67} \text{ (kg)}$

Based on a body weight of 900 g the WI is 0.05 L/d. This value is taken as the mode of a triangular distribution with maximum and minimum values of +/- 50%.

Summary Table:

Exposure Characteristics		
Body Weight (kg)	0.9	CWS 1990, Cornell 2003
Food Intake Rate (g ww/d)	TRI(127, 181, 235)	U.S. EPA 1993 (allometric scaling)
Soil Ingestion Rate (g dw/d)	2.7	Beyer <i>et al.</i> 1994
Water Intake Rate (L/d)	TRI(0.03, 0.05, 0.08)	U.S. EPA 1993 (allometric scaling)
Fraction of time in area	0.33	Assumed
Fractional Composition of Diet		
Soil	0.015	Fraction of wet weight diet (Beyer <i>et al.</i> 1994)
Small mammals:		CWS 1990, Dewey and Potter 2002 and NatureServe 2008
Lemming	0.05	
Arctic Ground Squirrel	0.05	
Birds:		
Merganser	0.295	
Sandpiper	0.295	
Ptarmigan	0.295	

Note: TRI = triangular distribution (minimum, mode, maximum)

References:

Beyer, W. N., E. Connor, and S. Gerould. 1994. *Survey of Soil Ingestion by Wildlife*. Journal of Wildlife Management 58:375-382.

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Gray Wolf



Dewey and Smith 2002).

The gray wolf (*Canis lupus*) is a social animal and has a highly organized social structure centring on a dominant male and a dominant female. Gray wolves are one of the most wide ranging land animals. They occupy a wide variety of habitats, from arctic tundra to forest, prairie, and arid landscapes. The original range of the wolf consisted of the majority of the Northern hemisphere, however, gray wolf populations are now found only in a few areas of the contiguous United States, Alaska, Canada, Mexico (a small population), and Eurasia. They are mainly nocturnal (CWS 1993,

Size:

Weigh between 20 and 75 kg (Dewey and Smith 2002)

Weight 40000 grams (NatureServe 2007)

43 kg (Schmidt and Gilbert 1978)

Based on the above information a typical wolf is expected to weigh 43 kg (Schmidt and Gilbert 1978).

Home Range:

Wolves are territorial. Each pack occupies an area that it will defend against intruders. Sizes of territories vary greatly and are dependent on the kind and abundance of prey available (CWS 1993).

The territory of a pack ranges from 130 to 13,000 km², and is defended against intruders (Dewey and Smith 2002).

Wolves have a territory of 100 to 2500 km² (Resources Inventory Committee 1998).

Feeding Habits:

Gray wolves are carnivores. Wolves' chief preys are large mammals such as deer, moose, caribou, elk, bison, and muskox. Wolves also eat a variety of smaller mammals and birds, but these rarely make up more than a small part of their diet. (CWS 1993, NatureServe 2007, Dewey and Smith 2002)

Based on the available information the wolf is assumed to consume caribou and muskox in equal proportion.

Food Consumption Rate:

The gray wolf in northeastern Alberta eats 5.5 kg/d (Fuller and Keith 1980).

The allometric equation for mammals (U.S. EPA 1993): $FI (g dw/day) = 0.235 Wt^{0.822} (g)$

Based on a body weight of 43,000 g the FI is approximately 1.5 kg dw/d, or 5 kg ww/d (moisture content of 70% based on dietary characteristics as discussed below). For assessment purposes, the FI was taken to be 5.5 kg (ww)/d (Fuller and Keith 1980) (corresponding to a dry weight FI of 1.65 kg/d), which agrees well with the allometric estimate. This value is taken as the mode of a triangular distribution with maximum and minimum values of +/- 30%.

Soil Ingestion:

Beyer *et al.* (1994) provides a value of 2.8% for the red fox; this value was considered appropriate for the wolf. This is a conservative assumption as the wolves hunt larger prey and would therefore ingest less soil. Based on a dry weight consumption rate of 1.65 kg/d this corresponds to approximately 46 g/d, which represents 0.8% of the wet weight FI of 5.5 kg/d.

Water Intake Rate:

Allometric equation for mammals (U.S. EPA 1993): $WI (L/day) = 0.099 Wt^{0.9} (kg)$

Based on a body weight of 43 kg the WI is 2.9 L/d. This value is taken as the mode of a triangular distribution with maximum and minimum values of +/- 50%.

Summary Table:

Exposure Characteristics		
Body Weight (kg)	43	Schmidt and Gilbert 1978
Food Intake Rate (kg ww/d)	TRI(3.9, 5.5, 7.2)	Fuller and Keith 1980
Soil Ingestion Rate (g dw/d)	46	Beyer <i>et al.</i> 1994
Water Intake Rate (L/d)	TRI(1.5, 2.9, 4.4)	U.S. EPA 1993 (allometric scaling)
Fraction of time in area	0.5-1	Assumed
Fractional Composition of Diet		
Soil	0.008	Fraction of wet weight diet (Beyer <i>et al.</i> 1994)
Caribou	0.496	Based on information from CWS 1993, NatureServe 2007, Dewey and Smith 2002
Muskox	0.496	

Note: TRI = triangular distribution (minimum, mode, maximum)

References:

- Beyer, W. N., E. Connor, and S. Gerould. 1994. Survey of Soil Ingestion by Wildlife. *Journal of Wildlife Management* 58:375-382.
- Canadian Wildlife Service (CWS) 1993. Hinterland Who's Who. Mammal Fact Sheet: Wolf. Available at: <http://www.ffdp.ca/hww2.asp?id=107>
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- United States Environmental Protection Agency (U.S. EPA) 1993. *Wildlife Exposure Factors Handbook*. EPA/600/R-93/187.

Arctic Fox



The arctic fox (*Alopex lagopus*) is also known as the white fox. It is found in the treeless tundra extending through the arctic regions of Eurasia, North America, Greenland, and Iceland. The foxes live a communal and nomadic life. Foxes construct homes called dens; these dens have 4-8 entrances and a system of tunnels covering about 30 square meters. They do not hibernate during the winter months. (CWS 1990, Middlebrook 1999)

Size:

Weighs from 2.5 to 9 kg (CWS 1990)

Weighs 4000 grams (NatureServe 2007)

Fully grown arctic foxes weigh from 6 to 10 pounds (2.7 to 4.5 kg) (ADF&G 1994).

Based on the above information a typical arctic fox is expected to weigh 4 kg (NatureServe 2007).

Home Range:

When food is abundant the foxes hunt over an area of 2.5 to 5.0 km². However, when food is scarcer, the adults probably range much further. (CWS 1990)

The home range is much larger in winter than in summer. Based on a few radiotelemetry studies, the adult home range is around 10-20 km² but depends on food resources.

Feeding Habits:

The arctic fox is a carnivore and an opportunistic feeder, eating practically any animal. Their diet varies greatly from one part of its range to another. In the vast expanses of the continental tundra region, the arctic fox is almost entirely dependent on lemmings throughout the year. In other areas, other rodents such as ground squirrels and voles are an important source of food. In the summer, adult birds, eggs, and flightless young also make up a large part of the diet. (CWS 1993, NatureServe 2007, Middlebrook 1999)

Based on the available information the fox is assumed to consume small mammals (75%), birds (25%) and soil (0.8%, as discussed below).

Food Consumption Rate:

Specific information for the arctic fox not available in U.S. EPA (1993), however a food consumption rate of 0.069 g ww/d per g body weight is provided for a red fox (weight of 4.5 kg). With a body weight of 4,000 g for an arctic fox this corresponds to an intake of 276 g ww/d which is 83 g dw/d with a 70% moisture content.

Allometric equation for mammals (U.S. EPA 1993): $FI (g\ dw/day) = 0.235\ Wt^{0.822} (g)$

Based on a body weight of 4,000 g the FI is 215 g dw/d, or 716 g ww/d (moisture content of 70% based on dietary characteristics as described below). To be conservative, the allometric value was selected over the lower value derived from the red fox ingestion rate. The wet weight value is taken as the mode of a triangular distribution with maximum and minimum values of +/- 30%.

Soil Ingestion:

Beyer *et al.* (1994) provides a value of 2.8% for the red fox, which was considered appropriate for the arctic fox.

Based on a dry weight FI of 215 g/d this corresponds to approximately 6 g/d, which represents 0.8% of the wet weight FI of 716 g/d.

Water Intake Rate:

Allometric equation for mammals (U.S. EPA 1993): $WI (L/day) = 0.099\ Wt^{0.9} (kg)$

Based on a body weight of 4 kg the WI is 0.3 L/d. This value is taken as the mode of a triangular distribution with maximum and minimum values of +/- 50%.

Summary Table:

Exposure Characteristics		
Body Weight (kg)	4	NatureServe 2007
Food Intake Rate (g ww/d)	TRI(501, 716, 931)	U.S. EPA 1993 (allometric scaling)
Soil Ingestion Rate (g dw/d)	2.3	Beyer <i>et al.</i> 1994
Water Intake Rate (L/d)	TRI(0.2, 0.3, 0.5)	U.S. EPA 1993 (allometric scaling)
Fraction of time in area	1	Assumed
Fractional Composition of Diet		
Soil	0.008	Fraction of wet weight diet (Beyer <i>et al.</i> 1994)
Small mammals:		Based on information from CWS 1993, NatureServe 2007, Middlebrook 1999
Lemming	0.247	
Arctic Ground Squirrel	0.247	
Shrew	0.247	
Birds:		
Ptarmigan	0.125	
Merganser	0.125	

Note: TRI = triangular distribution (minimum, mode, maximum)

References:

- Alaska Department of Fish & Game (ADF&G) 1994. Wildlife Notebook Series: Arctic Fox. Accessed September 19, 2007 at: <http://www.adfg.state.ak.us/pubs/notebook/furbear/arcfox.php>
- Beyer, W. N., E. Connor, and S. Gerould. 1994. *Survey of Soil Ingestion by Wildlife*. Journal of Wildlife Management 58:375-382.
- Canadian Wildlife Service (CWS) 1990. *Hinterland Who's Who. Mammal Fact Sheet: Arctic Fox*. Available at: <http://www.hww.ca/hww2.asp?id=81>
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Wolverine



The wolverine (*Gulo gulo*) is known by a variety of descriptive names, such as the skunk-bear. It is generally found in remote areas, far away from humans and development. However, specific characteristics of the wilderness that make a habitat desirable for a wolverine are not yet known. The wolverine was formerly distributed throughout the taiga and boreal regions of North America, but the range has receded substantially from most of the eastern United States and Canada. Wolverines require dens so

that the female may give birth and raise her kits. In tundra regions, these dens consist of a complex of snow tunnels associated with boulders or rocks. Although the wolverine belongs to the weasel family, it is built more like a small bear than a weasel. (CWS 2001, ADF&G)

Size:

Approximately the size of a medium-sized dog; males weight 12 to 18 kg, while females weight 8 to 12 kg (CWS 2001)

Male has a mass of 7 to 32 kg (average 15 kg), while females are approximately 30% less in mass (5 to 22 kg, average 10.5 kg) (NatureServe 2009)

Males weight 11 to 18 kg, while females weigh 6-12 kg (ADF&G 1994)

Based on the above information a typical wolverine is expected to weigh 13 kg, as the average of all reported ranges above (CWS 2001, NatureServe 2009, ADF&G 1994).

Home Range:

Wolverines travel extensively in search of food and males tend to have larger home ranges than do females, while females without kits have larger home ranges than females with kits. The home range size and use changes seasonally. Male home range sizes tend to be between 500 and 700 km² (200 to 260 square miles), while females have an upper home range size of 300 km² (115 square miles) (ADF&G 1994).

The male may range up to 1,000 km², while the female with young will generally only range from 73 to 416 km² (NatureServe 2009).

The home range of an adult wolverine extends from less than 100 km² for females to over 1,000 km² for males (CWS 2001).

Feeding Habits:

The wolverine is an opportunistic carnivore and is more of a scavenger than a hunter, depending on carrion from large mammal kills by other carnivores such as wolves. In absence of other food, the wolverine will revisit old kills to consume frozen bones and pelts to kill the animals for it. Some individuals can become good hunters and will kill young and adult caribou or moose in poor physical condition or in heavy snow. Wolverines, especially females with kits, will rely on birds and small and medium-sized mammals such as marmots, ground squirrels and snowshoe hares. (CWS 2001, NatureServe 2009)

Based on the available information the fox is assumed to consume small mammals (70%), birds (15%), large mammals (13.5%) and soil (1.5%, as discussed below).

Food Consumption Rate:

Allometric equation for mammals (U.S. EPA 1993): $FI (g\ dw/day) = 0.235\ Wt^{0.822} (g)$

Based on a body weight of 13,000 g the FI is 566 g dw/d or 1886 g ww/d (moisture content of 70% based on dietary characteristics as described below). The wet weight value is taken as the mode of a triangular distribution with maximum and minimum values of +/- 30%.

Soil Ingestion:

No specific information is available, therefore the general value for all mammals of 5% based on the information provided Beyer *et al.* (1994) was used.

Based on a dry weight FI of 566 g/d this corresponds to approximately 28 g dw/d, which represents 1.5% of the wet weight FI of 1886 g/d.

Water Intake Rate:

Allometric equation for mammals (U.S. EPA 1993): $WI (L/day) = 0.099\ Wt^{0.9} (kg)$

Based on a body weight of 13 kg the WI is 1.0 L/d. This value is taken as the mode of a triangular distribution with maximum and minimum values of +/- 50%.

Summary Table:

Exposure Characteristics		
Body Weight (kg)	13	CWS 2001, NatureServe 2009, ADF&G 1994
Food Intake Rate (g ww/d)	TRI(1320, 1886, 2452)	U.S. EPA 1993 (allometric scaling)
Soil Ingestion Rate (g dw/d)	28	Beyer <i>et al.</i> 1994
Water Intake Rate (L/d)	TRI(0.5, 1, 1.5)	U.S. EPA 1993 (allometric scaling)
Fraction of time in area	0.5-1	Assumed
Fractional Composition of Diet		
Soil	0.015	Fraction of wet weight diet (Beyer <i>et al.</i> 1994)
Small mammals: Lemming	0.35	Based on information from CWS 2001, NatureServe 2009
Arctic Ground Squirrel	0.35	
Birds (ptarmigan)	0.15	
Large mammals Caribou	0.0675	
Muskox	0.0675	

Note: TRI = triangular distribution (minimum, mode, maximum)

References:

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ATTACHMENT E MEASURED CONCENTRATION COMPARISON

E.1 FISH CONCENTRATIONS

Predicted average fish concentrations are summarized in Table E.1-1 with the measured average and geometric mean fish concentrations. Site-specific fish transfer factors were calculated and pooled with transfer factor data from other sites.

Table E.1-1 Comparison of Measured Fish Concentrations with Model Predicted Values

Constituent	Units	Fish Concentrations		
		Measured		Model Predicted Avg
		Avg	GM	
Uranium	ug/g ww	0.007	0.001	0.002
Thorium-230	Bq/g ww	0.0004	0.0002	0.0004
Lead-210	Bq/g ww	0.0027	0.0010	0.0012
Radium-226	Bq/g ww	0.0002	0.0001	0.0005
Polonium-210	Bq/g ww	0.0004	0.0003	0.0025
Arsenic	ug/g ww	0.03	0.02	0.08
Cadmium	ug/g ww	0.0012	0.0011	0.03
Cobalt	ug/g ww	0.006	0.005	0.006
Copper	ug/g ww	0.32	0.29	0.26
Lead	ug/g ww	0.003	0.002	0.035
Molybdenum	ug/g ww	0.010	0.010	0.022
Nickel	ug/g ww	0.020	0.014	0.016
Selenium	ug/g ww	0.28	0.27	0.43
Zinc	ug/g ww	6.4	6.0	7.0
Notes:				
Avg = average.				
GM = geometric mean; GSD = geometric standard deviation.				
ug/g = micrograms per gram; Bq/g = Bequerels per gram; ww = wet weight basis				
Source for measured data: AREVA (2011), data from 2007, 2008, and 2009; data reported as less than the method detection limit was treated as equal to ½ the method detection limit. For shoots and roots combined.				

E.2 AQUATIC VEGETATION CONCENTRATIONS

Predicted average aquatic vegetation concentrations are summarized in Table E.2-1 with the measured average and geometric mean aquatic vegetation concentrations. All thorium-230 concentrations were reported as below detection limit in the measured data.

Table E.2-1 Comparison of Measured Aquatic Vegetation Concentrations with Model Predicted Values

Constituent	Units	Aquatic Vegetation Concentrations		
		Measured		Model Predicted Avg
		Avg ^a	GM ^a	
Uranium	ug/g ww	0.032	0.009	0.01
Thorium-230	Bq/g ww	0.0002	0.0001	0.0046
Lead-210	Bq/g ww	0.017	0.012	0.010
Radium-226	Bq/g ww	0.002	0.001	0.001
Polonium-210	Bq/g ww	0.012	0.009	0.012
Arsenic	ug/g ww	1.1	0.16	2.0
Cadmium	ug/g ww	0.030	0.013	0.04
Cobalt	ug/g ww	0.21	0.07	0.17
Copper	ug/g ww	1.5	1.2	2.0
Lead	ug/g ww	0.25	0.07	0.2
Molybdenum	ug/g ww	0.18	0.14	0.19
Nickel	ug/g ww	0.40	0.26	0.6
Selenium	ug/g ww	0.011	0.008	0.02
Zinc	ug/g ww	6.3	6.0	7.1
Notes: Avg = average. GM = geometric mean; GSD = geometric standard deviation. ug/g = micrograms per gram; Bq/g = Bequerels per gram; ww = wet weight basis a = converted from dry weight basis (dw) using an assumed moisture content of 76% Source for measured data: AREVA (2011), data from 2007, 2008, and 2009; data reported as less than the method detection limit was treated as equal to ½ the method detection limit. For shoots and roots combined.				

E.3 BENTHIC INVERTEBRATE AND INSECT CONCENTRATIONS

Predicted average benthic invertebrate concentrations are summarized in Table E.3-1 with the measured average and geometric mean insect concentrations from the site. Benthic invertebrate transfer factors were taken from the McClean Lake site, and insect concentrations were not used for calibration.

Table E.3-1 Comparison of Measured Insect Concentrations with Model Predicted Values

Constituent	Units	Insect Concentrations		
		Measured		Model Predicted Avg
		Avg	GM	
Uranium	ug/g ww	0.03	0.02	0.09
Thorium-230	Bq/g ww	0.045 ^a	0.045 ^a	0.001
Lead-210	Bq/g ww	0.011 ^a	0.011 ^a	0.004
Radium-226	Bq/g ww	0.009 ^a	0.009 ^a	0.006
Polonium-210	Bq/g ww	0.015 ^a	0.015 ^a	0.012
Arsenic	ug/g ww	0.042	0.038	0.24
Cadmium	ug/g ww	1.1	1.1	0.10
Cobalt	ug/g ww	0.08	0.07	0.06
Copper	ug/g ww	27.9	27.7	5.0
Lead	ug/g ww	0.43	0.35	0.02
Molybdenum	ug/g ww	0.76	0.74	0.01
Nickel	ug/g ww	0.97	0.69	0.36
Selenium	ug/g ww	0.70	0.69	0.11
Zinc	ug/g ww	278	204	41
Notes: Avg = average. GM = geometric mean; GSD = geometric standard deviation. ug/g = micrograms per gram; Bq/g = Bequerels per gram; ww = wet weight basis a = converted from dry weight basis (dw) using an assumed moisture content of 70% (Gray and Bradley, 2005)				
Source for measured data: AREVA (2011), data from 2007, 2008, and 2009; data reported as less than the method detection limit was treated as equal to ½ the method detection limit. For shoots and roots combined.				

E.4 TERRESTRIAL VEGETATION CONCENTRATIONS

Predicted average browse concentrations are summarized in Table E.4-1 with the measured average and geometric mean browse concentrations from the site. Only one sample concentration was reported above the detection limit for arsenic in browse (0.13 ug/g ww) and the model predicted average concentration matches this value. Only four samples (out of 18) for molybdenum were reported above the detection limit and the 95th percentile concentration of the measured data was 0.52 ug/g ww.

Table E.4-1 Comparison of Measured Browse Concentrations with Model Predicted Values

Constituent	Units	Browse Concentrations		
		Measured		Model Predicted Avg
		Avg	GM	
Uranium	ug/g ww	0.005	0.005	0.001
Thorium-230	Bq/g ww	0.0003 ^a	0.0002 ^a	0.0003
Lead-210	Bq/g ww	0.05 ^a	0.05 ^a	0.04
Radium-226	Bq/g ww	0.002 ^a	0.002 ^a	0.0014
Polonium-210	Bq/g ww	0.04 ^a	0.04 ^a	0.04
Arsenic	ug/g ww	0.03	0.03	0.19
Cadmium	ug/g ww	1.2	0.62	0.42
Cobalt	ug/g ww	0.42	0.30	0.48
Copper	ug/g ww	6.8	6.5	6.6
Lead	ug/g ww	0.11	0.09	0.22
Molybdenum	ug/g ww	0.12	0.08	0.58
Nickel	ug/g ww	1.8	1.6	1.5
Selenium	ug/g ww	0.025	0.025	0.01
Zinc	ug/g ww	132	104	157
Notes: Avg = average. GM = geometric mean; GSD = geometric standard deviation. ug/g = micrograms per gram; Bq/g = Bequerels per gram; ww = wet weight basis a = converted from dry weight basis (dw) using an assumed moisture content of 53% Source for measured data: AREVA (2010), data from 2007, 2008, and 2009 for willow, bog birch, and blueberry vegetation; data reported as less than the method detection limit was treated as equal to ½ the method detection limit.				

Predicted average forage concentrations are summarized in Table E.4-2 with the measured average and geometric mean forage concentrations from the site.

Table E.4-2 Comparison of Measured Forage Concentrations with Model Predicted Values

Constituent	Units	Forage Concentrations		
		Measured		Model Predicted Avg
		Avg	GM	
Uranium	ug/g ww	0.4	0.02	0.07
Thorium-230	Bq/g ww	0.003 ^a	0.001 ^a	0.005
Lead-210	Bq/g ww	0.10 ^a	0.08 ^a	0.12
Radium-226	Bq/g ww	0.005 ^a	0.002 ^a	0.007
Polonium-210	Bq/g ww	0.08 ^a	0.06 ^a	0.08
Arsenic	ug/g ww	0.05	0.03	0.06
Cadmium	ug/g ww	0.05	0.04	0.08
Cobalt	ug/g ww	0.16	0.09	0.21
Copper	ug/g ww	2.2	2.0	2.9
Lead	ug/g ww	0.23	0.14	0.35
Molybdenum	ug/g ww	0.57	0.29	0.76
Nickel	ug/g ww	1.1	0.74	1.3
Selenium	ug/g ww	0.18	0.13	0.19
Zinc	ug/g ww	22.2	18.0	21.4
Notes: Avg = average. GM = geometric mean; GSD = geometric standard deviation. ug/g = micrograms per gram; Bq/g = Bequerels per gram; ww = wet weight basis a = converted from dry weight basis (dw) using an assumed moisture content of 53% Source for measured data: AREVA (2010), data from 2007, 2008, and 2009 for Carex sp. and sedge; data reported as less than the method detection limit was treated as equal to ½ the method detection limit.				

Predicted average berry concentrations are summarized in Table E.4-3 with the measured average and geometric mean berry concentrations from the site. Only one sample concentration was reported above the detection limit for arsenic in berry (0.026 ug/g ww) and the model predicted average concentration matches this value. All selenium concentrations were reported as less than the detection limit, so the measured data does not provide any information for comparison.

Table E.4-3 Comparison of Measured Berry Concentrations with Model Predicted Values

Constituent	Units	Berry Concentrations		
		Measured		Model Predicted Avg
		Avg	GM	
Uranium	ug/g ww	0.002	0.001	0.002
Thorium-230	Bq/g ww	0.0002 ^a	0.0002 ^a	0.0019
Lead-210	Bq/g ww	0.0017 ^a	0.0009 ^a	0.0021
Radium-226	Bq/g ww	0.0002 ^a	0.00012 ^a	0.0002
Polonium-210	Bq/g ww	0.0009 ^a	0.0008 ^a	0.0008
Arsenic	ug/g ww	0.009	0.007	0.02
Cadmium	ug/g ww	0.04	0.01	0.02
Cobalt	ug/g ww	0.02	0.01	0.04
Copper	ug/g ww	1.3	0.92	1.5
Lead	ug/g ww	0.012	0.011	0.06
Molybdenum	ug/g ww	0.09	0.04	0.08
Nickel	ug/g ww	0.49	0.27	0.66
Selenium	ug/g ww	0.09	0.08	0.004
Zinc	ug/g ww	17.0	11.0	16.6
Notes: Avg = average. GM = geometric mean; GSD = geometric standard deviation. ug/g = micrograms per gram; Bq/g = Bequerels per gram; ww = wet weight basis a = converted from dry weight basis (dw) using an assumed moisture content of 87% Source for measured data: AREVA (2010), data from 2007, 2008, and 2009 for blueberry and other berries; data reported as less than the method detection limit was treated as equal to ½ the method detection limit.				

Predicted average lichen concentrations are summarized in Table E.4-4 with the measured average and geometric mean lichen concentrations from the site.

Table E.4-4 Comparison of Measured Lichen Concentrations with Model Predicted Values

Constituent	Units	Lichen Concentrations		
		Measured		Model Predicted Avg
		Avg	GM	
Uranium	ug/g ww	0.05	0.02	0.02
Thorium-230	Bq/g ww	0.002 ^a	0.001 ^a	0.0018
Lead-210	Bq/g ww	0.31 ^a	0.30 ^a	0.40
Radium-226	Bq/g ww	0.003 ^a	0.002 ^a	0.003
Polonium-210	Bq/g ww	0.28 ^a	0.27 ^a	0.35
Arsenic	ug/g ww	0.08	0.07	0.08
Cadmium	ug/g ww	0.11	0.10	0.12
Cobalt	ug/g ww	0.18	0.11	0.14
Copper	ug/g ww	1.9	1.7	2.1
Lead	ug/g ww	0.61	0.49	0.64
Molybdenum	ug/g ww	0.23	0.11	0.13
Nickel	ug/g ww	1.1	0.76	0.97
Selenium	ug/g ww	0.27	0.18	0.21
Zinc	ug/g ww	26.2	24.7	29.8
Notes: Avg = average. GM = geometric mean; GSD = geometric standard deviation. ug/g = micrograms per gram; Bq/g = Bequerels per gram; ww = wet weight basis a = converted from dry weight basis (dw) using an assumed moisture content of 34% Source for measured data: AREVA (2010), data from 2007, 2008, and 2009; data reported as less than the method detection limit was treated as equal to ½ the method detection limit. Sample Kig4-3 collected in 2008 was removed as an outlier from the database and was not included in the summary statistics.				

E.5 TERRESTRIAL ANIMAL CONCENTRATIONS

Predicted average Lapland longspur concentrations are summarized in Table E.5-1 with the measured average and geometric mean sparrow concentrations from the site.

Table E.5-1 Comparison of Measured Sparrow Concentrations with Model Predicted Values

Constituent	Units	Sparrow Concentrations		
		Measured		Model Predicted Avg ^a
		Avg	GM	
Uranium	ug/g ww	0.001	0.001	0.001
Thorium-230	Bq/g ww	0.001	0.001	0.0007
Lead-210	Bq/g ww	0.044	0.037	0.036
Radium-226	Bq/g ww	0.002	0.002	0.002
Polonium-210	Bq/g ww	0.015	0.013	0.013
Arsenic	ug/g ww	0.010	0.010	0.010
Cadmium	ug/g ww	0.013	0.011	0.002
Cobalt	ug/g ww	0.022	0.020	0.021
Copper	ug/g ww	2.5	2.5	2.5
Lead	ug/g ww	0.023	0.023	0.022
Molybdenum	ug/g ww	0.10	0.09	0.08
Nickel	ug/g ww	0.11	0.10	0.10
Selenium	ug/g ww	0.24	0.20	0.20
Zinc	ug/g ww	22.0	21.5	24.4
Notes: Avg = average. GM = geometric mean; GSD = geometric standard deviation. ug/g = micrograms per gram; Bq/g = Bequerels per gram; ww = wet weight basis a = model results for Lapland Longspur (similar to sparrow)				
Source for measured data: AREVA (2010), data from 2007, 2008, and 2009; data reported as less than the method detection limit was treated as equal to ½ the method detection limit.				

Predicted average lemming concentrations are summarized in Table E.5-2 with the measured average and geometric mean lemming concentrations from the site.

Table E.5-2 Comparison of Measured Lemming Concentrations with Model Predicted Values

Constituent	Units	Lemming Concentrations		
		Measured		Model Predicted Avg ^a
		Avg	GM	
Uranium	ug/g ww	0.05	0.003	0.003
Thorium-230	Bq/g ww	0.001	0.001	0.001
Lead-210	Bq/g ww	0.07	0.05	0.05
Radium-226	Bq/g ww	0.037	0.001	0.002
Polonium-210	Bq/g ww	0.010	0.006	0.006
Arsenic	ug/g ww	0.02	0.02	0.02
Cadmium	ug/g ww	0.06	0.04	0.04
Cobalt	ug/g ww	0.10	0.08	0.07
Copper	ug/g ww	2.3	2.3	2.3
Lead	ug/g ww	0.07	0.05	0.06
Molybdenum	ug/g ww	0.27	0.12	0.12
Nickel	ug/g ww	0.20	0.18	0.18
Selenium	ug/g ww	0.06	0.05	0.05
Zinc	ug/g ww	27.7	27.1	26.6
Notes: Avg = average. GM = geometric mean; GSD = geometric standard deviation. ug/g = micrograms per gram; Bq/g = Bequerels per gram; ww = wet weight basis a = model results for lemming				
Source for measured data: AREVA (2010), data from 2007, 2008, and 2009; data reported as less than the method detection limit was treated as equal to ½ the method detection limit.				

Predicted average caribou concentrations are summarized in Table E.5-3 with the measured average and geometric mean caribou concentrations from the site.

Table E.5-3 Comparison of Measured Caribou Concentrations with Model Predicted Values

Constituent	Units	Caribou Concentrations		
		Measured		Model Predicted Avg ^a
		Avg	GM	
Uranium	ug/g ww	0.013	0.003	0.003
Thorium-230	Bq/g ww	0.0001	0.0001	0.00004
Lead-210	Bq/g ww	0.001	0.001	0.001
Radium-226	Bq/g ww	0.00011	0.00009	0.00009
Polonium-210	Bq/g ww	0.027	0.025	0.024
Arsenic	ug/g ww	0.035	0.031	0.029
Cadmium	ug/g ww	0.010	0.007	0.006
Cobalt	ug/g ww	0.008	0.006	0.007
Copper	ug/g ww	2.4	2.2	2.2
Lead	ug/g ww	0.016	0.012	0.012
Molybdenum	ug/g ww	0.05	0.02	0.02
Nickel	ug/g ww	0.032	0.019	0.020
Selenium	ug/g ww	0.17	0.17	0.17
Zinc	ug/g ww	40.4	37.7	36.8
Notes: Avg = average. GM = geometric mean; GSD = geometric standard deviation. ug/g = micrograms per gram; Bq/g = Bequerels per gram; ww = wet weight basis a = model results for caribou Source for measured data: AREVA (2010), data from 2009; data reported as less than the method detection limit was treated as equal to ½ the method detection limit.				

ATTACHMENT F PREDICTED INTAKES

F.1 ECOLOGICAL RECEPTORS

Table F.1-1 summarizes the predicted intakes for ecological receptors for non-radiological constituents. Attachment I summarizes the predicted intakes for ecological receptors for radiological constituents.

F.2 HUMAN RECEPTORS

Table F.2-1 summarizes the predicted intakes for human receptors for non-radiological constituents for the maximum year of exposure. Table F.2-2 summarizes the predicted doses for human receptors for radiological constituents.

Table F.1-1

Predicted Non-Radionuclide Intakes for Ecological Receptors

LSA										
Bear-5	Base		Year 10 of Operation		Year 5 of Final Closure		Year 15 of Final Closure		Year 5 of Post Closure	
(mg/kg d)	Avg	95th	Avg	95th	Avg	95th	Avg	95th	Avg	95th
Arsenic	0.006	0.018	0.006	0.018	0.006	0.018	0.006	0.018	0.006	0.018
Cadmium	0.009	0.024	0.009	0.024	0.009	0.024	0.009	0.024	0.009	0.024
Cobalt	0.011	0.029	0.011	0.029	0.011	0.029	0.011	0.029	0.011	0.029
Copper	0.18	0.38	0.18	0.38	0.18	0.38	0.18	0.38	0.18	0.38
Lead	0.009	0.017	0.009	0.017	0.009	0.017	0.009	0.017	0.009	0.017
Molybdenum	0.013	0.037	0.013	0.037	0.013	0.037	0.013	0.037	0.013	0.037
Nickel	0.047	0.100	0.047	0.100	0.047	0.100	0.047	0.100	0.047	0.100
Selenium	0.008	0.014	0.008	0.014	0.008	0.014	0.008	0.014	0.008	0.014
Uranium	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Zinc	3.7	8.0	3.7	8.0	3.7	8.0	3.7	8.0	3.7	8.0
LSA										
Caribou-5	Base		Year 10 of Operation		Year 5 of Final Closure		Year 15 of Final Closure		Year 5 of Post Closure	
(mg/kg d)	Avg	95th	Avg	95th	Avg	95th	Avg	95th	Avg	95th
Arsenic	0.006	0.012	0.006	0.012	0.006	0.012	0.006	0.012	0.006	0.012
Cadmium	0.008	0.015	0.009	0.018	0.008	0.015	0.008	0.015	0.008	0.015
Cobalt	0.011	0.021	0.011	0.022	0.011	0.021	0.011	0.021	0.011	0.021
Copper	0.13	0.25	0.13	0.25	0.13	0.25	0.13	0.25	0.13	0.25
Lead	0.034	0.063	0.034	0.063	0.034	0.063	0.034	0.063	0.034	0.063
Molybdenum	0.013	0.030	0.013	0.030	0.013	0.030	0.013	0.030	0.013	0.030
Nickel	0.059	0.121	0.059	0.122	0.059	0.121	0.059	0.121	0.059	0.121
Selenium	0.011	0.025	0.011	0.025	0.011	0.025	0.011	0.025	0.011	0.025
Uranium	0.002	0.004	0.005	0.011	0.002	0.004	0.002	0.004	0.002	0.004
Zinc	2.2	4.2	2.2	4.2	2.2	4.2	2.2	4.2	2.2	4.2
RSA										
Caribou-6	Base		Year 10 of Operation		Year 5 of Final Closure		Year 15 of Final Closure		Year 5 of Post Closure	
(mg/kg d)	Avg	95th	Avg	95th	Avg	95th	Avg	95th	Avg	95th
Arsenic	0.006	0.012	0.006	0.012	0.006	0.012	0.006	0.012	0.006	0.012
Cadmium	0.008	0.015	0.008	0.017	0.008	0.015	0.008	0.015	0.008	0.015
Cobalt	0.011	0.021	0.011	0.022	0.011	0.021	0.011	0.021	0.011	0.021
Copper	0.13	0.25	0.13	0.25	0.13	0.25	0.13	0.25	0.13	0.25
Lead	0.034	0.063	0.034	0.063	0.034	0.063	0.034	0.063	0.034	0.063
Molybdenum	0.013	0.030	0.013	0.030	0.013	0.030	0.013	0.030	0.013	0.030
Nickel	0.059	0.121	0.059	0.121	0.059	0.121	0.059	0.121	0.059	0.121
Selenium	0.011	0.025	0.011	0.025	0.011	0.025	0.011	0.025	0.011	0.025
Uranium	0.002	0.004	0.003	0.006	0.002	0.004	0.002	0.004	0.002	0.004
Zinc	2.2	4.2	2.2	4.2	2.2	4.2	2.2	4.2	2.2	4.2
LSA										
Falcon-5	Base		Year 10 of Operation		Year 5 of Final Closure		Year 15 of Final Closure		Year 5 of Post Closure	
(mg/kg d)	Avg	95th	Avg	95th	Avg	95th	Avg	95th	Avg	95th
Arsenic	0.004	0.008	0.004	0.008	0.004	0.008	0.004	0.008	0.004	0.008
Cadmium	0.003	0.008	0.004	0.010	0.003	0.008	0.003	0.008	0.003	0.008
Cobalt	0.008	0.014	0.008	0.014	0.008	0.014	0.008	0.014	0.008	0.014
Copper	0.25	0.64	0.25	0.65	0.25	0.65	0.25	0.65	0.25	0.65
Lead	0.013	0.019	0.013	0.019	0.013	0.019	0.013	0.019	0.013	0.019
Molybdenum	0.007	0.019	0.008	0.021	0.008	0.020	0.008	0.020	0.007	0.019
Nickel	0.014	0.023	0.014	0.023	0.014	0.023	0.014	0.023	0.014	0.023
Selenium	0.12	0.32	0.12	0.32	0.12	0.32	0.12	0.32	0.12	0.32
Uranium	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
Zinc	2.7	7.1	2.7	7.1	2.7	7.1	2.7	7.1	2.7	7.1
RSA										
Falcon-6	Base		Year 10 of Operation		Year 5 of Final Closure		Year 15 of Final Closure		Year 5 of Post Closure	
(mg/kg d)	Avg	95th	Avg	95th	Avg	95th	Avg	95th	Avg	95th
Arsenic	0.004	0.008	0.004	0.008	0.004	0.008	0.004	0.008	0.004	0.008
Cadmium	0.003	0.008	0.004	0.009	0.003	0.008	0.003	0.008	0.003	0.008
Cobalt	0.008	0.014	0.008	0.014	0.008	0.014	0.008	0.014	0.008	0.014
Copper	0.25	0.64	0.25	0.64	0.25	0.65	0.25	0.65	0.25	0.65
Lead	0.013	0.019	0.013	0.019	0.013	0.019	0.013	0.019	0.013	0.019
Molybdenum	0.007	0.019	0.008	0.021	0.008	0.020	0.008	0.020	0.007	0.019
Nickel	0.014	0.023	0.014	0.023	0.014	0.023	0.014	0.023	0.014	0.023
Selenium	0.12	0.32	0.12	0.32	0.12	0.32	0.12	0.32	0.12	0.32
Uranium	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
Zinc	2.7	7.1	2.7	7.1	2.7	7.1	2.7	7.1	2.7	7.1

Table F.1-1

Predicted Non-Radionuclide Intakes for Ecological Receptors

LSA										
Fox-5	Base		Year 10 of Operation		Year 5 of Final Closure		Year 15 of Final Closure		Year 5 of Post Closure	
(mg/kg d)	Avg	95th	Avg	95th	Avg	95th	Avg	95th	Avg	95th
Arsenic	0.005	0.013	0.005	0.015	0.005	0.017	0.005	0.016	0.005	0.013
Cadmium	0.005	0.014	0.012	0.030	0.006	0.014	0.006	0.014	0.005	0.014
Cobalt	0.009	0.026	0.010	0.027	0.010	0.026	0.009	0.026	0.009	0.026
Copper	0.37	0.92	0.37	0.92	0.38	0.92	0.38	0.92	0.38	0.92
Lead	0.011	0.021	0.011	0.021	0.011	0.021	0.011	0.021	0.011	0.021
Molybdenum	0.014	0.044	0.015	0.047	0.015	0.046	0.015	0.047	0.014	0.044
Nickel	0.022	0.060	0.023	0.062	0.022	0.060	0.022	0.060	0.022	0.060
Selenium	0.04	0.11	0.04	0.11	0.04	0.11	0.04	0.11	0.04	0.11
Uranium	0.001	0.002	0.003	0.006	0.001	0.002	0.001	0.002	0.001	0.002
Zinc	4.8	13.9	4.8	13.9	4.8	13.9	4.8	13.9	4.8	13.9
Rock Lake										
Lemming-1	Base		Year 10 of Operation		Year 5 of Final Closure		Year 15 of Final Closure		Year 5 of Post Closure	
(mg/kg d)	Avg	95th	Avg	95th	Avg	95th	Avg	95th	Avg	95th
Arsenic	0.025	0.083	0.025	0.084	0.025	0.083	0.025	0.083	0.025	0.083
Cadmium	0.030	0.069	0.063	0.146	0.030	0.069	0.030	0.069	0.030	0.069
Cobalt	0.07	0.19	0.07	0.20	0.07	0.19	0.07	0.19	0.07	0.19
Copper	0.93	2.1	0.94	2.1	0.94	2.1	0.94	2.1	0.94	2.1
Lead	0.16	0.35	0.16	0.35	0.16	0.35	0.16	0.35	0.16	0.35
Molybdenum	0.23	0.82	0.23	0.82	0.23	0.82	0.23	0.82	0.23	0.82
Nickel	0.42	1.0	0.43	1.0	0.42	1.0	0.42	1.0	0.42	1.0
Selenium	0.07	0.12	0.07	0.12	0.07	0.12	0.07	0.12	0.07	0.12
Uranium	0.02	0.08	0.11	0.27	0.02	0.08	0.02	0.08	0.02	0.08
Zinc	8.2	17.9	8.2	17.9	8.2	17.9	8.2	17.9	8.2	17.9
JSL @ Kigg										
Lemming-2	Base		Year 10 of Operation		Year 5 of Final Closure		Year 15 of Final Closure		Year 5 of Post Closure	
(mg/kg d)	Avg	95th	Avg	95th	Avg	95th	Avg	95th	Avg	95th
Arsenic	0.025	0.083	0.025	0.084	0.025	0.083	0.025	0.083	0.025	0.083
Cadmium	0.030	0.069	0.058	0.130	0.030	0.069	0.030	0.069	0.030	0.069
Cobalt	0.07	0.19	0.07	0.20	0.07	0.19	0.07	0.19	0.07	0.19
Copper	0.93	2.1	0.94	2.1	0.94	2.1	0.94	2.1	0.94	2.1
Lead	0.16	0.35	0.16	0.35	0.16	0.35	0.16	0.35	0.16	0.35
Molybdenum	0.23	0.82	0.23	0.82	0.23	0.82	0.23	0.82	0.23	0.82
Nickel	0.42	1.0	0.43	1.0	0.42	1.0	0.42	1.0	0.42	1.0
Selenium	0.07	0.12	0.07	0.12	0.07	0.12	0.07	0.12	0.07	0.12
Uranium	0.02	0.08	0.10	0.23	0.02	0.08	0.02	0.08	0.02	0.08
Zinc	8.2	17.9	8.2	17.9	8.2	17.9	8.2	17.9	8.2	17.9
Kigg Camp										
Lemming-3	Base		Year 10 of Operation		Year 5 of Final Closure		Year 15 of Final Closure		Year 5 of Post Closure	
(mg/kg d)	Avg	95th	Avg	95th	Avg	95th	Avg	95th	Avg	95th
Arsenic	0.025	0.083	0.030	0.088	0.025	0.083	0.025	0.083	0.025	0.083
Cadmium	0.030	0.069	0.290	0.820	0.030	0.069	0.030	0.069	0.030	0.069
Cobalt	0.07	0.19	0.09	0.23	0.07	0.19	0.07	0.19	0.07	0.19
Copper	0.93	2.1	0.94	2.1	0.94	2.1	0.94	2.1	0.94	2.1
Lead	0.16	0.35	0.17	0.36	0.16	0.35	0.16	0.35	0.16	0.35
Molybdenum	0.23	0.82	0.23	0.82	0.23	0.82	0.23	0.82	0.23	0.82
Nickel	0.42	1.0	0.49	1.1	0.42	1.0	0.42	1.0	0.42	1.0
Selenium	0.07	0.12	0.07	0.12	0.07	0.12	0.07	0.12	0.07	0.12
Uranium	0.02	0.08	1.62	3.94	0.03	0.08	0.03	0.08	0.03	0.08
Zinc	8.2	17.9	8.2	17.9	8.2	17.9	8.2	17.9	8.2	17.9
JSL @ Siss										
Lemming-4	Base		Year 10 of Operation		Year 5 of Final Closure		Year 15 of Final Closure		Year 5 of Post Closure	
(mg/kg d)	Avg	95th	Avg	95th	Avg	95th	Avg	95th	Avg	95th
Arsenic	0.025	0.083	0.026	0.085	0.025	0.083	0.025	0.083	0.025	0.083
Cadmium	0.030	0.069	0.103	0.270	0.030	0.069	0.030	0.069	0.030	0.069
Cobalt	0.07	0.19	0.08	0.20	0.07	0.19	0.07	0.19	0.07	0.19
Copper	0.93	2.1	0.94	2.1	0.94	2.1	0.94	2.1	0.94	2.1
Lead	0.16	0.35	0.16	0.35	0.16	0.35	0.16	0.35	0.16	0.35
Molybdenum	0.23	0.82	0.23	0.82	0.23	0.82	0.23	0.82	0.23	0.82
Nickel	0.42	1.0	0.46	1.1	0.42	1.0	0.42	1.0	0.42	1.0
Selenium	0.07	0.12	0.07	0.12	0.07	0.12	0.07	0.12	0.07	0.12
Uranium	0.02	0.08	0.19	0.47	0.02	0.08	0.02	0.08	0.02	0.08
Zinc	8.2	17.9	8.2	17.9	8.2	17.9	8.2	17.9	8.2	17.9

Table F.1-1

Predicted Non-Radionuclide Intakes for Ecological Receptors

Rock Lake											
Longspur-1											
Base		Year 10 of Operation		Year 5 of Final Closure		Year 15 of Final Closure		Year 5 of Post Closure			
(mg/kg d)	Avg	95th	Avg	95th	Avg	95th	Avg	95th	Avg	95th	
Arsenic	0.11	0.29	0.11	0.29	0.11	0.29	0.11	0.29	0.11	0.29	
Cadmium	0.06	0.13	0.06	0.13	0.06	0.13	0.06	0.13	0.06	0.13	
Cobalt	0.09	0.17	0.09	0.17	0.09	0.17	0.09	0.17	0.09	0.17	
Copper	3.8	8.0	3.8	8.0	3.8	8.0	3.8	8.0	3.8	8.0	
Lead	0.11	0.27	0.11	0.27	0.11	0.27	0.11	0.27	0.11	0.27	
Molybdenum	0.12	0.48	0.12	0.48	0.12	0.48	0.12	0.48	0.12	0.48	
Nickel	1.2	3.3	1.2	3.3	1.2	3.3	1.2	3.3	1.2	3.3	
Selenium	0.04	0.10	0.04	0.10	0.04	0.10	0.04	0.10	0.04	0.10	
Uranium	0.01	0.02	0.01	0.02	0.01	0.02	0.01	0.02	0.01	0.02	
Zinc	41.4	128.3	41.4	128.4	41.5	128.4	41.5	128.5	41.5	128.5	
JSL @ Kigg											
Longspur-2											
Base		Year 10 of Operation		Year 5 of Final Closure		Year 15 of Final Closure		Year 5 of Post Closure			
(mg/kg d)	Avg	95th	Avg	95th	Avg	95th	Avg	95th	Avg	95th	
Arsenic	0.12	0.29	0.13	0.33	0.13	0.32	0.12	0.31	0.12	0.29	
Cadmium	0.06	0.13	0.07	0.15	0.07	0.15	0.07	0.14	0.06	0.13	
Cobalt	0.09	0.17	0.09	0.18	0.09	0.18	0.09	0.18	0.09	0.17	
Copper	3.9	8.1	3.9	8.1	3.9	8.1	3.9	8.1	3.9	8.1	
Lead	0.11	0.27	0.11	0.27	0.11	0.27	0.11	0.27	0.11	0.27	
Molybdenum	0.12	0.48	0.14	0.48	0.14	0.48	0.13	0.48	0.12	0.48	
Nickel	1.2	3.3	1.2	3.3	1.2	3.3	1.2	3.3	1.2	3.3	
Selenium	0.04	0.10	0.04	0.11	0.04	0.12	0.04	0.11	0.04	0.10	
Uranium	0.01	0.02	0.02	0.04	0.02	0.03	0.01	0.02	0.01	0.02	
Zinc	41.9	128.4	41.9	128.5	41.9	128.5	41.9	128.6	41.9	128.6	
Kigg Camp											
Longspur-3											
Base		Year 10 of Operation		Year 5 of Final Closure		Year 15 of Final Closure		Year 5 of Post Closure			
(mg/kg d)	Avg	95th	Avg	95th	Avg	95th	Avg	95th	Avg	95th	
Arsenic	0.11	0.28	0.11	0.28	0.11	0.28	0.11	0.28	0.11	0.28	
Cadmium	0.06	0.13	0.07	0.13	0.06	0.13	0.06	0.13	0.06	0.13	
Cobalt	0.09	0.17	0.09	0.17	0.09	0.17	0.09	0.17	0.09	0.17	
Copper	3.8	8.0	3.8	8.0	3.8	8.0	3.8	8.0	3.8	8.0	
Lead	0.11	0.27	0.11	0.27	0.11	0.27	0.11	0.27	0.11	0.27	
Molybdenum	0.12	0.48	0.12	0.48	0.12	0.48	0.12	0.48	0.12	0.48	
Nickel	1.2	3.3	1.2	3.3	1.2	3.3	1.2	3.3	1.2	3.3	
Selenium	0.04	0.10	0.04	0.10	0.04	0.10	0.04	0.10	0.04	0.10	
Uranium	0.00	0.01	0.05	0.11	0.00	0.01	0.00	0.01	0.00	0.01	
Zinc	41.3	128.3	41.3	128.3	41.3	128.4	41.3	128.4	41.3	128.5	
JSL @ Siss											
Longspur-4											
Base		Year 10 of Operation		Year 5 of Final Closure		Year 15 of Final Closure		Year 5 of Post Closure			
(mg/kg d)	Avg	95th	Avg	95th	Avg	95th	Avg	95th	Avg	95th	
Arsenic	0.11	0.29	0.12	0.32	0.12	0.29	0.11	0.29	0.11	0.29	
Cadmium	0.06	0.13	0.07	0.13	0.06	0.13	0.06	0.13	0.06	0.13	
Cobalt	0.09	0.17	0.09	0.17	0.09	0.17	0.09	0.17	0.09	0.17	
Copper	3.8	8.0	3.8	8.0	3.9	8.0	3.9	8.1	3.9	8.1	
Lead	0.11	0.27	0.11	0.27	0.11	0.27	0.11	0.27	0.11	0.27	
Molybdenum	0.12	0.48	0.13	0.48	0.13	0.48	0.12	0.48	0.12	0.48	
Nickel	1.2	3.3	1.2	3.3	1.2	3.3	1.2	3.3	1.2	3.3	
Selenium	0.04	0.10	0.04	0.10	0.04	0.10	0.04	0.10	0.04	0.10	
Uranium	0.01	0.02	0.03	0.06	0.02	0.04	0.01	0.02	0.01	0.02	
Zinc	41.6	128.3	41.6	128.4	41.6	128.5	41.6	128.5	41.6	128.5	
JSL @ Kigg											
Longtail-7											
Base		Year 10 of Operation		Year 5 of Final Closure		Year 15 of Final Closure		Year 5 of Post Closure			
(mg/kg d)	Avg	95th	Avg	95th	Avg	95th	Avg	95th	Avg	95th	
Arsenic	0.059	0.15	0.069	0.18	0.068	0.17	0.065	0.17	0.059	0.15	
Cadmium	0.023	0.057	0.028	0.070	0.029	0.076	0.028	0.076	0.023	0.057	
Cobalt	0.018	0.041	0.019	0.047	0.020	0.049	0.019	0.044	0.018	0.041	
Copper	1.0	1.7	1.1	1.7	1.1	1.7	1.1	1.7	1.0	1.7	
Lead	0.013	0.024	0.013	0.025	0.013	0.024	0.013	0.025	0.013	0.024	
Molybdenum	0.004	0.007	0.018	0.048	0.019	0.050	0.016	0.041	0.004	0.007	
Nickel	0.08	0.27	0.09	0.28	0.09	0.28	0.09	0.28	0.08	0.27	
Selenium	0.06	0.11	0.06	0.12	0.06	0.12	0.06	0.12	0.06	0.11	
Uranium	0.007	0.011	0.013	0.024	0.011	0.019	0.007	0.012	0.007	0.011	
Zinc	8.6	29.5	8.6	29.5	8.6	29.5	8.6	29.5	8.6	29.5	

Table F.1-1

Predicted Non-Radionuclide Intakes for Ecological Receptors

JSL @ Siss Longtail-19 (mg/kg d)	Base		Year 10 of Operation		Year 5 of Final Closure		Year 15 of Final Closure		Year 5 of Post Closure	
	Avg	95th	Avg	95th	Avg	95th	Avg	95th	Avg	95th
Arsenic	0.059	0.15	0.064	0.16	0.062	0.16	0.060	0.16	0.059	0.15
Cadmium	0.023	0.058	0.024	0.060	0.024	0.060	0.024	0.060	0.023	0.058
Cobalt	0.018	0.041	0.018	0.042	0.018	0.042	0.018	0.042	0.018	0.041
Copper	1.1	1.7	1.1	1.7	1.1	1.7	1.1	1.7	1.1	1.7
Lead	0.013	0.024	0.013	0.025	0.013	0.024	0.013	0.024	0.013	0.024
Molybdenum	0.004	0.007	0.010	0.023	0.008	0.018	0.006	0.014	0.004	0.007
Nickel	0.08	0.27	0.08	0.27	0.08	0.27	0.08	0.27	0.08	0.27
Selenium	0.06	0.11	0.06	0.11	0.06	0.11	0.06	0.11	0.06	0.11
Uranium	0.007	0.011	0.019	0.038	0.014	0.025	0.007	0.012	0.007	0.011
Zinc	8.6	29.8	8.6	29.8	8.6	29.8	8.6	29.8	8.6	29.8
JSL @ Kigg Merganser-7 (mg/kg d)	Base		Year 10 of Operation		Year 5 of Final Closure		Year 15 of Final Closure		Year 5 of Post Closure	
	Avg	95th	Avg	95th	Avg	95th	Avg	95th	Avg	95th
Arsenic	0.021	0.056	0.021	0.056	0.021	0.056	0.021	0.056	0.021	0.056
Cadmium	0.006	0.021	0.006	0.021	0.006	0.021	0.006	0.021	0.006	0.021
Cobalt	0.004	0.005	0.004	0.006	0.004	0.006	0.004	0.006	0.004	0.006
Copper	0.07	0.13	0.07	0.13	0.07	0.13	0.07	0.13	0.07	0.13
Lead	0.011	0.037	0.011	0.037	0.011	0.037	0.011	0.037	0.011	0.037
Molybdenum	0.006	0.013	0.006	0.013	0.006	0.013	0.006	0.013	0.006	0.013
Nickel	0.008	0.013	0.008	0.013	0.008	0.013	0.008	0.013	0.008	0.013
Selenium	0.11	0.19	0.11	0.19	0.11	0.19	0.11	0.19	0.11	0.19
Uranium	0.001	0.002	0.001	0.002	0.001	0.002	0.001	0.002	0.001	0.002
Zinc	1.5	2.7	1.5	2.7	1.5	2.7	1.5	2.7	1.5	2.7
JSL @ Siss Merganser-19 (mg/kg d)	Base		Year 10 of Operation		Year 5 of Final Closure		Year 15 of Final Closure		Year 5 of Post Closure	
	Avg	95th	Avg	95th	Avg	95th	Avg	95th	Avg	95th
Arsenic	0.021	0.056	0.021	0.056	0.021	0.056	0.021	0.056	0.021	0.056
Cadmium	0.006	0.021	0.006	0.021	0.006	0.021	0.006	0.021	0.006	0.021
Cobalt	0.004	0.005	0.004	0.005	0.004	0.005	0.004	0.005	0.004	0.005
Copper	0.07	0.13	0.07	0.13	0.07	0.13	0.07	0.13	0.07	0.13
Lead	0.011	0.037	0.011	0.037	0.011	0.037	0.011	0.037	0.011	0.037
Molybdenum	0.006	0.013	0.006	0.013	0.006	0.013	0.006	0.013	0.006	0.013
Nickel	0.008	0.013	0.008	0.013	0.008	0.013	0.008	0.013	0.008	0.013
Selenium	0.11	0.19	0.11	0.19	0.11	0.19	0.11	0.19	0.11	0.19
Uranium	0.001	0.002	0.001	0.002	0.001	0.002	0.001	0.002	0.001	0.002
Zinc	1.5	2.7	1.5	2.7	1.5	2.7	1.5	2.7	1.5	2.7
JSL @ Kigg Muskox-2 (mg/kg d)	Base		Year 10 of Operation		Year 5 of Final Closure		Year 15 of Final Closure		Year 5 of Post Closure	
	Avg	95th	Avg	95th	Avg	95th	Avg	95th	Avg	95th
Arsenic	0.015	0.060	0.015	0.060	0.015	0.060	0.015	0.060	0.015	0.060
Cadmium	0.032	0.089	0.032	0.089	0.032	0.089	0.032	0.089	0.032	0.089
Cobalt	0.038	0.14	0.038	0.14	0.038	0.14	0.038	0.14	0.038	0.14
Copper	0.50	1.2	0.50	1.2	0.50	1.2	0.50	1.2	0.50	1.2
Lead	0.023	0.048	0.023	0.048	0.023	0.048	0.023	0.048	0.023	0.048
Molybdenum	0.05	0.17	0.05	0.17	0.05	0.17	0.05	0.17	0.05	0.17
Nickel	0.13	0.30	0.13	0.30	0.13	0.30	0.13	0.30	0.13	0.30
Selenium	0.003	0.005	0.003	0.005	0.003	0.005	0.003	0.005	0.003	0.005
Uranium	0.001	0.002	0.001	0.002	0.001	0.002	0.001	0.002	0.001	0.002
Zinc	11.8	29.0	11.8	29.0	11.8	29.0	11.8	29.0	11.8	29.0
JSL @ Siss Muskox-4 (mg/kg d)	Base		Year 10 of Operation		Year 5 of Final Closure		Year 15 of Final Closure		Year 5 of Post Closure	
	Avg	95th	Avg	95th	Avg	95th	Avg	95th	Avg	95th
Arsenic	0.015	0.060	0.015	0.060	0.015	0.060	0.015	0.060	0.015	0.060
Cadmium	0.032	0.089	0.032	0.089	0.032	0.089	0.032	0.089	0.032	0.089
Cobalt	0.038	0.14	0.038	0.14	0.038	0.14	0.038	0.14	0.038	0.14
Copper	0.50	1.2	0.50	1.2	0.50	1.2	0.50	1.2	0.50	1.2
Lead	0.023	0.048	0.023	0.048	0.023	0.048	0.023	0.048	0.023	0.048
Molybdenum	0.05	0.17	0.05	0.17	0.05	0.17	0.05	0.17	0.05	0.17
Nickel	0.13	0.30	0.13	0.30	0.13	0.30	0.13	0.30	0.13	0.30
Selenium	0.003	0.005	0.003	0.005	0.003	0.005	0.003	0.005	0.003	0.005
Uranium	0.001	0.002	0.001	0.002	0.001	0.002	0.001	0.002	0.001	0.002
Zinc	11.8	29.0	11.8	29.0	11.8	29.0	11.8	29.0	11.8	29.0

Table F.1-1

Predicted Non-Radionuclide Intakes for Ecological Receptors

JSL @ Kigg		Base		Year 10 of Operation		Year 5 of Final Closure		Year 15 of Final Closure		Year 5 of Post Closure	
Pintail-7		Avg	95th	Avg	95th	Avg	95th	Avg	95th	Avg	95th
(mg/kg d)											
Arsenic		0.46	1.6	0.55	1.9	0.53	1.9	0.51	1.8	0.46	1.6
Cadmium		0.011	0.029	0.014	0.037	0.014	0.036	0.013	0.036	0.011	0.029
Cobalt		0.04	0.19	0.05	0.22	0.05	0.22	0.05	0.21	0.04	0.20
Copper		0.59	1.3	0.59	1.3	0.59	1.3	0.59	1.3	0.59	1.3
Lead		0.05	0.19	0.05	0.20	0.05	0.19	0.05	0.19	0.05	0.19
Molybdenum		0.05	0.13	0.44	1.21	0.46	1.30	0.36	1.15	0.05	0.13
Nickel		0.15	0.45	0.16	0.47	0.16	0.45	0.16	0.45	0.15	0.45
Selenium		0.008	0.018	0.009	0.020	0.009	0.020	0.008	0.019	0.008	0.018
Uranium		0.002	0.005	0.004	0.008	0.003	0.007	0.003	0.006	0.002	0.005
Zinc		2.7	7.1	2.7	7.1	2.7	7.1	2.7	7.1	2.7	7.1
JSL @ Siss		Base		Year 10 of Operation		Year 5 of Final Closure		Year 15 of Final Closure		Year 5 of Post Closure	
Pintail-19		Avg	95th	Avg	95th	Avg	95th	Avg	95th	Avg	95th
(mg/kg d)											
Arsenic		0.47	1.6	0.50	1.8	0.48	1.7	0.47	1.6	0.47	1.6
Cadmium		0.011	0.030	0.012	0.031	0.012	0.031	0.012	0.031	0.011	0.030
Cobalt		0.04	0.20	0.04	0.20	0.04	0.20	0.04	0.20	0.04	0.20
Copper		0.59	1.3	0.59	1.3	0.59	1.3	0.59	1.3	0.59	1.3
Lead		0.05	0.19	0.05	0.19	0.05	0.19	0.05	0.19	0.05	0.19
Molybdenum		0.05	0.13	0.20	0.57	0.17	0.49	0.11	0.38	0.05	0.13
Nickel		0.15	0.45	0.15	0.45	0.15	0.45	0.15	0.45	0.15	0.45
Selenium		0.008	0.018	0.008	0.019	0.008	0.019	0.008	0.018	0.008	0.018
Uranium		0.002	0.005	0.006	0.012	0.004	0.010	0.002	0.006	0.002	0.005
Zinc		2.7	7.1	2.7	7.1	2.7	7.1	2.7	7.1	2.7	7.1
Rock Lake		Base		Year 10 of Operation		Year 5 of Final Closure		Year 15 of Final Closure		Year 5 of Post Closure	
Ptarmigan-1		Avg	95th	Avg	95th	Avg	95th	Avg	95th	Avg	95th
(mg/kg d)											
Arsenic		0.05	0.17	0.05	0.17	0.05	0.17	0.05	0.17	0.05	0.17
Cadmium		0.09	0.24	0.09	0.24	0.09	0.24	0.09	0.24	0.09	0.24
Cobalt		0.11	0.38	0.11	0.38	0.11	0.38	0.11	0.38	0.11	0.38
Copper		1.4	3.3	1.4	3.3	1.4	3.3	1.4	3.3	1.4	3.3
Lead		0.07	0.14	0.07	0.14	0.07	0.14	0.07	0.14	0.07	0.14
Molybdenum		0.12	0.42	0.12	0.42	0.12	0.42	0.12	0.42	0.12	0.42
Nickel		0.34	0.83	0.34	0.83	0.34	0.83	0.34	0.83	0.34	0.83
Selenium		0.006	0.014	0.006	0.014	0.006	0.014	0.006	0.014	0.006	0.014
Uranium		0.005	0.007	0.006	0.007	0.005	0.007	0.005	0.007	0.005	0.007
Zinc		32.4	84.3	32.5	84.3	32.5	84.3	32.5	84.3	32.5	84.3
JSL @ Kigg		Base		Year 10 of Operation		Year 5 of Final Closure		Year 15 of Final Closure		Year 5 of Post Closure	
Ptarmigan-2		Avg	95th	Avg	95th	Avg	95th	Avg	95th	Avg	95th
(mg/kg d)											
Arsenic		0.05	0.17	0.05	0.17	0.05	0.17	0.05	0.17	0.05	0.17
Cadmium		0.09	0.24	0.09	0.24	0.09	0.24	0.09	0.24	0.09	0.24
Cobalt		0.11	0.38	0.11	0.38	0.11	0.38	0.11	0.38	0.11	0.38
Copper		1.4	3.3	1.4	3.3	1.4	3.3	1.4	3.3	1.4	3.3
Lead		0.07	0.14	0.07	0.14	0.07	0.14	0.07	0.14	0.07	0.14
Molybdenum		0.12	0.42	0.12	0.42	0.12	0.42	0.12	0.42	0.12	0.42
Nickel		0.34	0.83	0.34	0.83	0.34	0.83	0.34	0.83	0.34	0.83
Selenium		0.006	0.014	0.006	0.014	0.006	0.015	0.006	0.014	0.006	0.014
Uranium		0.005	0.007	0.007	0.009	0.006	0.008	0.006	0.007	0.006	0.007
Zinc		32.5	84.4	32.5	84.4	32.5	84.4	32.6	84.4	32.6	84.4
Kigg Camp		Base		Year 10 of Operation		Year 5 of Final Closure		Year 15 of Final Closure		Year 5 of Post Closure	
Ptarmigan-3		Avg	95th	Avg	95th	Avg	95th	Avg	95th	Avg	95th
(mg/kg d)											
Arsenic		0.05	0.17	0.05	0.17	0.05	0.17	0.05	0.17	0.05	0.17
Cadmium		0.09	0.24	0.09	0.24	0.09	0.24	0.09	0.24	0.09	0.24
Cobalt		0.11	0.38	0.11	0.38	0.11	0.38	0.11	0.38	0.11	0.38
Copper		1.4	3.3	1.4	3.3	1.4	3.3	1.4	3.3	1.4	3.3
Lead		0.07	0.14	0.07	0.14	0.07	0.14	0.07	0.14	0.07	0.14
Molybdenum		0.12	0.42	0.12	0.42	0.12	0.42	0.12	0.42	0.12	0.42
Nickel		0.34	0.82	0.34	0.82	0.34	0.82	0.34	0.82	0.34	0.82
Selenium		0.005	0.013	0.005	0.013	0.005	0.013	0.005	0.013	0.005	0.013
Uranium		0.004	0.005	0.009	0.014	0.004	0.005	0.004	0.005	0.004	0.005
Zinc		32.4	84.2	32.4	84.2	32.5	84.2	32.5	84.2	32.5	84.2

Table F.1-1

Predicted Non-Radionuclide Intakes for Ecological Receptors

JSL @ Siss	Predicted Non-Radiionuclide Intakes for Ecological Receptors									
Ptarmigan-4	Base		Year 10 of Operation		Year 5 of Final Closure		Year 15 of Final Closure		Year 5 of Post Closure	
(mg/kg d)	Avg	95th	Avg	95th	Avg	95th	Avg	95th	Avg	95th
Arsenic	0.05	0.17	0.05	0.17	0.05	0.17	0.05	0.17	0.05	0.17
Cadmium	0.09	0.24	0.09	0.24	0.09	0.24	0.09	0.24	0.09	0.24
Cobalt	0.11	0.38	0.11	0.38	0.11	0.38	0.11	0.38	0.11	0.38
Copper	1.4	3.3	1.4	3.3	1.4	3.3	1.4	3.3	1.4	3.3
Lead	0.07	0.14	0.07	0.14	0.07	0.14	0.07	0.14	0.07	0.14
Molybdenum	0.12	0.42	0.12	0.42	0.12	0.42	0.12	0.42	0.12	0.42
Nickel	0.34	0.83	0.34	0.83	0.34	0.83	0.34	0.83	0.34	0.83
Selenium	0.006	0.014	0.006	0.014	0.006	0.014	0.006	0.014	0.006	0.014
Uranium	0.005	0.007	0.008	0.012	0.007	0.009	0.005	0.007	0.005	0.007
Zinc	32.5	84.3	32.5	84.3	32.5	84.3	32.5	84.3	32.5	84.3
JSL @ Kigg	Base		Year 10 of Operation		Year 5 of Final Closure		Year 15 of Final Closure		Year 5 of Post Closure	
Sandpiper-7	Avg	95th	Avg	95th	Avg	95th	Avg	95th	Avg	95th
(mg/kg d)	Avg	95th	Avg	95th	Avg	95th	Avg	95th	Avg	95th
Arsenic	0.27	0.60	0.31	0.71	0.30	0.66	0.29	0.70	0.27	0.60
Cadmium	0.09	0.24	0.11	0.30	0.11	0.30	0.11	0.29	0.09	0.24
Cobalt	0.15	0.24	0.16	0.26	0.16	0.27	0.16	0.26	0.15	0.24
Copper	4.3	7.0	4.3	7.0	4.3	7.0	4.3	7.0	4.3	7.0
Lead	0.12	0.16	0.12	0.17	0.12	0.17	0.12	0.16	0.12	0.16
Molybdenum	0.01	0.03	0.07	0.19	0.08	0.19	0.06	0.17	0.01	0.03
Nickel	0.45	1.2	0.46	1.2	0.46	1.2	0.45	1.2	0.45	1.2
Selenium	0.10	0.31	0.11	0.34	0.11	0.35	0.11	0.33	0.10	0.31
Uranium	0.04	0.06	0.06	0.11	0.06	0.09	0.04	0.06	0.04	0.06
Zinc	33.8	102.9	33.9	102.9	33.8	102.9	33.8	102.9	33.8	102.9
JSL @ Siss	Base		Year 10 of Operation		Year 5 of Final Closure		Year 15 of Final Closure		Year 5 of Post Closure	
Sandpiper-19	Avg	95th	Avg	95th	Avg	95th	Avg	95th	Avg	95th
(mg/kg d)	Avg	95th	Avg	95th	Avg	95th	Avg	95th	Avg	95th
Arsenic	0.27	0.60	0.29	0.63	0.28	0.61	0.27	0.61	0.27	0.60
Cadmium	0.09	0.24	0.10	0.26	0.10	0.25	0.09	0.25	0.09	0.24
Cobalt	0.15	0.24	0.15	0.24	0.15	0.24	0.15	0.24	0.15	0.24
Copper	4.4	7.0	4.4	7.0	4.4	7.0	4.4	7.0	4.4	7.0
Lead	0.12	0.16	0.12	0.16	0.12	0.16	0.12	0.16	0.12	0.16
Molybdenum	0.01	0.03	0.04	0.10	0.03	0.07	0.02	0.06	0.01	0.03
Nickel	0.45	1.2	0.45	1.2	0.45	1.2	0.45	1.2	0.45	1.2
Selenium	0.10	0.31	0.10	0.32	0.10	0.32	0.10	0.31	0.10	0.31
Uranium	0.04	0.06	0.09	0.17	0.07	0.12	0.04	0.06	0.04	0.06
Zinc	34.1	103.9	34.1	103.9	34.1	103.9	34.1	103.9	34.1	103.9
Rock Lake	Base		Year 10 of Operation		Year 5 of Final Closure		Year 15 of Final Closure		Year 5 of Post Closure	
Shrew-1	Avg	95th	Avg	95th	Avg	95th	Avg	95th	Avg	95th
(mg/kg d)	Avg	95th	Avg	95th	Avg	95th	Avg	95th	Avg	95th
Arsenic	0.12	0.30	0.12	0.30	0.12	0.30	0.12	0.30	0.12	0.30
Cadmium	0.05	0.12	0.09	0.19	0.05	0.13	0.05	0.13	0.05	0.13
Cobalt	0.04	0.08	0.05	0.09	0.04	0.08	0.04	0.08	0.04	0.08
Copper	2.3	3.9	2.3	3.9	2.3	3.9	2.3	3.9	2.3	3.9
Lead	0.07	0.12	0.07	0.13	0.07	0.12	0.07	0.12	0.07	0.12
Molybdenum	0.014	0.026	0.014	0.026	0.014	0.026	0.014	0.026	0.014	0.026
Nickel	0.24	0.61	0.25	0.63	0.24	0.62	0.24	0.62	0.24	0.62
Selenium	0.07	0.17	0.07	0.17	0.07	0.17	0.07	0.17	0.07	0.17
Uranium	0.04	0.07	0.13	0.25	0.04	0.07	0.04	0.07	0.04	0.07
Zinc	18.7	59.3	18.7	59.3	18.7	59.3	18.7	59.3	18.7	59.3
JSL @ Kigg	Base		Year 10 of Operation		Year 5 of Final Closure		Year 15 of Final Closure		Year 5 of Post Closure	
Shrew-2	Avg	95th	Avg	95th	Avg	95th	Avg	95th	Avg	95th
(mg/kg d)	Avg	95th	Avg	95th	Avg	95th	Avg	95th	Avg	95th
Arsenic	0.13	0.33	0.17	0.48	0.17	0.48	0.16	0.41	0.13	0.33
Cadmium	0.06	0.14	0.11	0.27	0.09	0.22	0.08	0.21	0.06	0.14
Cobalt	0.04	0.09	0.06	0.12	0.05	0.12	0.05	0.11	0.04	0.09
Copper	2.6	4.4	2.6	4.4	2.6	4.4	2.6	4.4	2.6	4.4
Lead	0.07	0.13	0.07	0.13	0.07	0.13	0.07	0.13	0.07	0.13
Molybdenum	0.014	0.027	0.082	0.22	0.086	0.21	0.070	0.19	0.014	0.027
Nickel	0.25	0.66	0.28	0.70	0.26	0.71	0.26	0.66	0.25	0.66
Selenium	0.07	0.18	0.08	0.21	0.09	0.22	0.08	0.20	0.07	0.18
Uranium	0.05	0.08	0.14	0.26	0.06	0.12	0.05	0.08	0.05	0.08
Zinc	20.8	67.1	20.8	67.1	20.8	67.1	20.8	67.1	20.8	67.1

Table F.1-1

Predicted Non-Radionuclide Intakes for Ecological Receptors

Kigg Camp		Base		Year 10 of Operation		Year 5 of Final Closure		Year 15 of Final Closure		Year 5 of Post Closure	
Shrew-3		Avg	95th	Avg	95th	Avg	95th	Avg	95th	Avg	95th
(mg/kg d)											
Arsenic		0.11	0.28	0.11	0.28	0.11	0.28	0.11	0.28	0.11	0.28
Cadmium		0.05	0.12	0.31	0.81	0.05	0.12	0.05	0.12	0.05	0.12
Cobalt		0.04	0.08	0.06	0.14	0.04	0.08	0.04	0.08	0.04	0.08
Copper		2.2	3.8	2.2	3.8	2.2	3.8	2.2	3.8	2.2	3.8
Lead		0.07	0.12	0.08	0.15	0.07	0.12	0.07	0.12	0.07	0.12
Molybdenum		0.013	0.025	0.015	0.029	0.013	0.025	0.013	0.025	0.013	0.025
Nickel		0.22	0.57	0.30	0.68	0.22	0.57	0.22	0.57	0.22	0.57
Selenium		0.06	0.16	0.06	0.16	0.06	0.16	0.06	0.16	0.06	0.16
Uranium		0.00	0.01	1.62	3.74	0.00	0.01	0.00	0.01	0.00	0.01
Zinc		18.0	57.6	18.1	57.6	18.0	57.6	18.0	57.6	18.0	57.6
JSL @ Siss		Base		Year 10 of Operation		Year 5 of Final Closure		Year 15 of Final Closure		Year 5 of Post Closure	
Shrew-4		Avg	95th	Avg	95th	Avg	95th	Avg	95th	Avg	95th
(mg/kg d)											
Arsenic		0.12	0.30	0.15	0.42	0.13	0.35	0.12	0.32	0.12	0.30
Cadmium		0.05	0.13	0.13	0.29	0.06	0.14	0.06	0.14	0.05	0.13
Cobalt		0.04	0.09	0.05	0.10	0.04	0.09	0.04	0.09	0.04	0.09
Copper		2.4	4.1	2.4	4.1	2.4	4.1	2.4	4.1	2.4	4.1
Lead		0.07	0.12	0.07	0.13	0.07	0.12	0.07	0.12	0.07	0.12
Molybdenum		0.014	0.026	0.051	0.13	0.043	0.09	0.029	0.07	0.014	0.026
Nickel		0.24	0.61	0.28	0.63	0.24	0.62	0.24	0.61	0.24	0.61
Selenium		0.07	0.17	0.07	0.17	0.07	0.17	0.07	0.17	0.07	0.17
Uranium		0.04	0.07	0.29	0.55	0.08	0.17	0.04	0.07	0.04	0.07
Zinc		19.3	61.9	19.3	61.9	19.3	61.9	19.3	61.9	19.3	61.9
Rock Lake		Base		Year 10 of Operation		Year 5 of Final Closure		Year 15 of Final Closure		Year 5 of Post Closure	
Squirrel-1		Avg	95th	Avg	95th	Avg	95th	Avg	95th	Avg	95th
(mg/kg d)											
Arsenic		0.01	0.04	0.01	0.04	0.01	0.04	0.01	0.04	0.01	0.04
Cadmium		0.01	0.03	0.01	0.03	0.01	0.03	0.01	0.03	0.01	0.03
Cobalt		0.03	0.09	0.03	0.09	0.03	0.09	0.03	0.09	0.03	0.09
Copper		0.5	1.2	0.5	1.2	0.5	1.2	0.5	1.2	0.5	1.2
Lead		0.06	0.16	0.06	0.16	0.06	0.16	0.06	0.16	0.06	0.16
Molybdenum		0.10	0.33	0.10	0.33	0.10	0.33	0.10	0.33	0.10	0.33
Nickel		0.22	0.53	0.22	0.53	0.22	0.53	0.22	0.53	0.22	0.53
Selenium		0.02	0.04	0.02	0.04	0.02	0.04	0.02	0.04	0.02	0.04
Uranium		0.01	0.03	0.01	0.03	0.01	0.03	0.01	0.03	0.01	0.03
Zinc		4.7	11.9	4.7	11.9	4.7	11.9	4.7	11.9	4.7	11.9
JSL @ Kigg		Base		Year 10 of Operation		Year 5 of Final Closure		Year 15 of Final Closure		Year 5 of Post Closure	
Squirrel-2		Avg	95th	Avg	95th	Avg	95th	Avg	95th	Avg	95th
(mg/kg d)											
Arsenic		0.01	0.04	0.01	0.04	0.01	0.04	0.01	0.04	0.01	0.04
Cadmium		0.01	0.03	0.01	0.03	0.01	0.03	0.01	0.03	0.01	0.03
Cobalt		0.03	0.09	0.03	0.09	0.03	0.09	0.03	0.09	0.03	0.09
Copper		0.5	1.2	0.5	1.2	0.5	1.2	0.5	1.2	0.5	1.2
Lead		0.06	0.16	0.06	0.16	0.06	0.16	0.06	0.16	0.06	0.16
Molybdenum		0.10	0.33	0.10	0.33	0.10	0.33	0.10	0.33	0.10	0.33
Nickel		0.22	0.53	0.22	0.53	0.22	0.53	0.22	0.53	0.22	0.53
Selenium		0.02	0.04	0.02	0.04	0.02	0.04	0.02	0.04	0.02	0.04
Uranium		0.01	0.03	0.01	0.03	0.01	0.03	0.01	0.03	0.01	0.03
Zinc		4.7	11.9	4.7	11.9	4.7	11.9	4.7	11.9	4.7	11.9
Kigg Camp		Base		Year 10 of Operation		Year 5 of Final Closure		Year 15 of Final Closure		Year 5 of Post Closure	
Squirrel-3		Avg	95th	Avg	95th	Avg	95th	Avg	95th	Avg	95th
(mg/kg d)											
Arsenic		0.01	0.04	0.01	0.04	0.01	0.04	0.01	0.04	0.01	0.04
Cadmium		0.01	0.03	0.01	0.03	0.01	0.03	0.01	0.03	0.01	0.03
Cobalt		0.03	0.09	0.03	0.09	0.03	0.09	0.03	0.09	0.03	0.09
Copper		0.5	1.2	0.5	1.2	0.5	1.2	0.5	1.2	0.5	1.2
Lead		0.06	0.16	0.06	0.16	0.06	0.16	0.06	0.16	0.06	0.16
Molybdenum		0.10	0.33	0.10	0.33	0.10	0.33	0.10	0.33	0.10	0.33
Nickel		0.22	0.53	0.22	0.53	0.22	0.53	0.22	0.53	0.22	0.53
Selenium		0.02	0.04	0.02	0.04	0.02	0.04	0.02	0.04	0.02	0.04
Uranium		0.01	0.03	0.02	0.05	0.01	0.03	0.01	0.03	0.01	0.03
Zinc		4.7	11.9	4.7	11.9	4.7	11.9	4.7	11.9	4.7	11.9

Table F.1-1

Predicted Non-Radionuclide Intakes for Ecological Receptors

JSL @ Siss	Predicted Non-Radiionuclide Intakes for Ecological Receptors									
Squirrel-4	Base		Year 10 of Operation		Year 5 of Final Closure		Year 15 of Final Closure		Year 5 of Post Closure	
(mg/kg d)	Avg	95th	Avg	95th	Avg	95th	Avg	95th	Avg	95th
Arsenic	0.01	0.04	0.01	0.04	0.01	0.04	0.01	0.04	0.01	0.04
Cadmium	0.01	0.03	0.01	0.03	0.01	0.03	0.01	0.03	0.01	0.03
Cobalt	0.03	0.09	0.03	0.09	0.03	0.09	0.03	0.09	0.03	0.09
Copper	0.5	1.2	0.5	1.2	0.5	1.2	0.5	1.2	0.5	1.2
Lead	0.06	0.16	0.06	0.16	0.06	0.16	0.06	0.16	0.06	0.16
Molybdenum	0.10	0.33	0.10	0.33	0.10	0.33	0.10	0.33	0.10	0.33
Nickel	0.22	0.53	0.22	0.53	0.22	0.53	0.22	0.53	0.22	0.53
Selenium	0.02	0.04	0.02	0.04	0.02	0.04	0.02	0.04	0.02	0.04
Uranium	0.01	0.03	0.01	0.03	0.01	0.03	0.01	0.03	0.01	0.03
Zinc	4.7	11.9	4.7	11.9	4.7	11.9	4.7	11.9	4.7	11.9
LSA	Base		Year 10 of Operation		Year 5 of Final Closure		Year 15 of Final Closure		Year 5 of Post Closure	
Wolf-5	Avg	95th	Avg	95th	Avg	95th	Avg	95th	Avg	95th
(mg/kg d)	Avg	95th	Avg	95th	Avg	95th	Avg	95th	Avg	95th
Arsenic	0.008	0.025	0.008	0.025	0.008	0.025	0.008	0.025	0.008	0.025
Cadmium	0.003	0.008	0.003	0.008	0.003	0.008	0.003	0.008	0.003	0.008
Cobalt	0.003	0.008	0.003	0.008	0.003	0.008	0.003	0.008	0.003	0.008
Copper	0.9	3.2	0.9	3.2	0.9	3.2	0.9	3.2	0.9	3.2
Lead	0.005	0.007	0.005	0.007	0.005	0.007	0.005	0.007	0.005	0.007
Molybdenum	0.010	0.033	0.010	0.033	0.010	0.033	0.010	0.033	0.010	0.033
Nickel	0.007	0.020	0.007	0.020	0.007	0.020	0.007	0.020	0.007	0.020
Selenium	0.014	0.044	0.014	0.044	0.014	0.044	0.014	0.044	0.014	0.044
Uranium	0.001	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001
Zinc	19.3	56.8	19.3	56.8	19.3	56.8	19.3	56.8	19.3	56.8
RSA	Base		Year 10 of Operation		Year 5 of Final Closure		Year 15 of Final Closure		Year 5 of Post Closure	
Wolf-6	Avg	95th	Avg	95th	Avg	95th	Avg	95th	Avg	95th
(mg/kg d)	Avg	95th	Avg	95th	Avg	95th	Avg	95th	Avg	95th
Arsenic	0.008	0.025	0.008	0.025	0.008	0.025	0.008	0.025	0.008	0.025
Cadmium	0.003	0.008	0.003	0.008	0.003	0.008	0.003	0.008	0.003	0.008
Cobalt	0.003	0.008	0.003	0.008	0.003	0.008	0.003	0.008	0.003	0.008
Copper	0.9	3.2	0.9	3.2	0.9	3.2	0.9	3.2	0.9	3.2
Lead	0.005	0.007	0.005	0.007	0.005	0.007	0.005	0.007	0.005	0.007
Molybdenum	0.010	0.033	0.010	0.033	0.010	0.033	0.010	0.033	0.010	0.033
Nickel	0.007	0.020	0.007	0.020	0.007	0.020	0.007	0.020	0.007	0.020
Selenium	0.014	0.044	0.014	0.044	0.014	0.044	0.014	0.044	0.014	0.044
Uranium	0.001	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001
Zinc	19.3	56.8	19.3	56.8	19.3	56.8	19.3	56.8	19.3	56.8
LSA	Base		Year 10 of Operation		Year 5 of Final Closure		Year 15 of Final Closure		Year 5 of Post Closure	
Wolverine-5	Avg	95th	Avg	95th	Avg	95th	Avg	95th	Avg	95th
(mg/kg d)	Avg	95th	Avg	95th	Avg	95th	Avg	95th	Avg	95th
Arsenic	0.004	0.009	0.004	0.009	0.004	0.009	0.004	0.009	0.004	0.009
Cadmium	0.004	0.011	0.006	0.019	0.004	0.011	0.004	0.011	0.004	0.011
Cobalt	0.010	0.024	0.010	0.026	0.010	0.024	0.010	0.024	0.010	0.024
Copper	0.4	0.9	0.4	0.9	0.4	0.9	0.4	0.9	0.4	0.9
Lead	0.012	0.021	0.012	0.021	0.012	0.021	0.012	0.021	0.012	0.021
Molybdenum	0.013	0.041	0.014	0.042	0.014	0.042	0.014	0.042	0.013	0.042
Nickel	0.022	0.064	0.022	0.066	0.022	0.064	0.022	0.064	0.022	0.064
Selenium	0.006	0.017	0.006	0.017	0.006	0.017	0.006	0.017	0.006	0.017
Uranium	0.001	0.002	0.002	0.004	0.001	0.002	0.001	0.002	0.001	0.002
Zinc	5.9	16.2	5.9	16.2	5.9	16.2	5.9	16.2	5.9	16.2
RSA	Base		Year 10 of Operation		Year 5 of Final Closure		Year 15 of Final Closure		Year 5 of Post Closure	
Wolverine-6	Avg	95th	Avg	95th	Avg	95th	Avg	95th	Avg	95th
(mg/kg d)	Avg	95th	Avg	95th	Avg	95th	Avg	95th	Avg	95th
Arsenic	0.004	0.009	0.004	0.009	0.004	0.009	0.004	0.009	0.004	0.009
Cadmium	0.004	0.011	0.005	0.015	0.004	0.011	0.004	0.011	0.004	0.011
Cobalt	0.010	0.024	0.010	0.025	0.010	0.024	0.010	0.024	0.010	0.024
Copper	0.4	0.9	0.4	0.9	0.4	0.9	0.4	0.9	0.4	0.9
Lead	0.012	0.021	0.012	0.021	0.012	0.021	0.012	0.021	0.012	0.021
Molybdenum	0.013	0.041	0.014	0.042	0.014	0.042	0.014	0.042	0.013	0.042
Nickel	0.022	0.064	0.022	0.065	0.022	0.064	0.022	0.064	0.022	0.064
Selenium	0.006	0.017	0.006	0.017	0.006	0.017	0.006	0.017	0.006	0.017
Uranium	0.002	0.002	0.002	0.003	0.002	0.002	0.002	0.002	0.002	0.002
Zinc	5.9	16.2	5.9	16.2	5.9	16.2	5.9	16.2	5.9	16.2

Table F.2-1
Predicted Non-Radionuclide Intakes for Human Receptors

Summary of Mean Intakes by Pathway
Kiggavik Project

Uranium	Total Intake (mg/(kg d))				Mean Intake by Pathway (mg/(kg d))								
	5th	50th	Mean	95th	Water	Inhalation	Berry	Fish	Soil	Caribou	Squirrel	Ptarmigan	L Tea
1 - JSL Adult Hunter	<0.0001	<0.0001	<0.0001	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
2 - JSL Child Hunter	<0.0001	<0.0001	<0.0001	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0
3 - JSL Toddler Hunter	<0.0001	<0.0001	<0.0001	0.0002	0	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0
4 - Non-NEW Worker	<0.0001	<0.0001	<0.0001	<0.0001	0	<0.0001	<0.0001	0	<0.0001	0	0	0	0
5 - Baker Lake Adult	<0.0001	<0.0001	<0.0001	<0.0001	0	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
6 - Baker Lake Child	<0.0001	<0.0001	<0.0001	0.0001	0	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0
7 - Baker Lake Toddler	<0.0001	<0.0001	<0.0001	0.0001	0	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0

	% Contribution by Pathway for Mean Intake								
	Water	Inhalation	Berry	Fish	Soil	Caribou	Squirrel	Ptarmigan	L Tea
1 - JSL Adult Hunter	9.1%	0.1%	0.6%	8.0%	0.3%	79.6%	1.6%	0.6%	0.0%
2 - JSL Child Hunter	2.0%	0.1%	5.3%	6.3%	15.9%	68.8%	1.2%	0.5%	0.0%
3 - JSL Toddler Hunter	0.0%	0.0%	1.9%	7.0%	14.9%	74.1%	1.4%	0.6%	0.0%
4 - Non-NEW Worker	0.0%	42.1%	55.5%	0.0%	2.4%	0.0%	0.0%	0.0%	0.0%
5 - Baker Lake Adult	0.0%	0.0%	0.3%	14.6%	0.6%	81.1%	2.8%	0.6%	0.0%
6 - Baker Lake Child	0.0%	0.0%	2.0%	9.8%	24.9%	61.0%	1.8%	0.5%	0.0%
7 - Baker Lake Toddler	0.0%	0.0%	2.7%	10.0%	21.3%	63.5%	1.9%	0.5%	0.0%

Note: The intakes shown in the table are from baseline levels of contaminants in the environment and inputs from the Kiggavik Project. The total intakes do not include off-site contributions, such as market foods.

Table F.2-1
Predicted Non-Radionuclide Intakes for Human Receptors

Summary of Mean Intakes by Pathway
Kiggavik Project

Arsenic

	Total Intake (mg/(kg d))				Mean Intake by Pathway (mg/(kg d))								
	5th	50th	Mean	95th	Water	Inhalation	Berry	Fish	Soil	Caribou	Squirrel	Ptarmigan	L Tea
1 - JSL Adult Hunter	<0.0001	0.0002	0.0002	0.0008	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
2 - JSL Child Hunter	<0.0001	0.0002	0.0002	0.0007	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0
3 - JSL Toddler Hunter	<0.0001	0.0002	0.0003	0.0010	<0.0001	<0.0001	<0.0001	0.0002	<0.0001	0.0001	<0.0001	<0.0001	0
4 - Non-NEW Worker	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0	<0.0001	0	0	0	0
5 - Baker Lake Adult	<0.0001	0.0002	0.0002	0.0007	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
6 - Baker Lake Child	<0.0001	0.0002	0.0002	0.0007	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0
7 - Baker Lake Toddler	<0.0001	0.0002	0.0003	0.0010	<0.0001	<0.0001	<0.0001	0.0002	<0.0001	0.0001	<0.0001	<0.0001	0

	% Contribution by Pathway for Mean Intake								
	Water	Inhalation	Berry	Fish	Soil	Caribou	Squirrel	Ptarmigan	L Tea
1 - JSL Adult Hunter	3.7%	0.0%	0.3%	58.8%	0.1%	34.4%	1.5%	0.8%	0.5%
2 - JSL Child Hunter	2.8%	0.0%	3.3%	53.9%	4.6%	33.0%	1.7%	0.8%	0.0%
3 - JSL Toddler Hunter	2.2%	0.0%	3.9%	54.7%	3.3%	33.3%	1.5%	1.0%	0.0%
4 - Non-NEW Worker	86.1%	0.2%	11.2%	0.0%	2.5%	0.0%	0.0%	0.0%	0.0%
5 - Baker Lake Adult	2.3%	0.0%	0.3%	59.3%	0.1%	35.2%	1.4%	0.9%	0.5%
6 - Baker Lake Child	2.3%	0.0%	3.4%	54.1%	4.7%	33.1%	1.7%	0.7%	0.0%
7 - Baker Lake Toddler	2.3%	0.0%	3.9%	54.7%	3.3%	33.3%	1.5%	1.0%	0.0%

Note: The intakes shown in the table are from baseline levels of contaminants in the environment and inputs from the Kiggavik Project. The total intakes do not include off-site contributions, such as market foods.

Table F.2-1
Predicted Non-Radionuclide Intakes for Human Receptors

Summary of Mean Intakes by Pathway
Kiggavik Project

Cadmium	Total Intake (mg/(kg d))				Mean Intake by Pathway (mg/(kg d))								
	5th	50th	Mean	95th	Water	Inhalation	Berry	Fish	Soil	Caribou	Squirrel	Ptarmigan	L Tea
1 - JSL Adult Hunter	<0.0001	<0.0001	0.0001	0.0004	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
2 - JSL Child Hunter	<0.0001	<0.0001	0.0001	0.0004	0	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0
3 - JSL Toddler Hunter	<0.0001	0.0001	0.0002	0.0004	0	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0
4 - Non-NEW Worker	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0	<0.0001	0	0	0	0
5 - Baker Lake Adult	<0.0001	<0.0001	<0.0001	0.0003	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
6 - Baker Lake Child	<0.0001	<0.0001	0.0001	0.0003	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0
7 - Baker Lake Toddler	<0.0001	<0.0001	0.0001	0.0004	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0

	% Contribution by Pathway for Mean Intake								
	Water	Inhalation	Berry	Fish	Soil	Caribou	Squirrel	Ptarmigan	L Tea
1 - JSL Adult Hunter	2.2%	0.0%	0.5%	59.4%	0.1%	22.3%	5.3%	7.4%	2.7%
2 - JSL Child Hunter	0.0%	0.0%	5.5%	53.8%	3.5%	23.0%	4.6%	8.1%	0.0%
3 - JSL Toddler Hunter	0.0%	0.0%	6.3%	51.7%	2.9%	23.0%	5.9%	8.9%	0.0%
4 - Non-NEW Worker	58.2%	5.2%	34.0%	0.0%	2.5%	0.0%	0.0%	0.0%	0.0%
5 - Baker Lake Adult	1.5%	0.0%	0.5%	48.1%	0.1%	29.0%	6.4%	11.0%	3.4%
6 - Baker Lake Child	1.4%	0.0%	6.3%	47.4%	4.2%	25.8%	5.4%	9.5%	0.0%
7 - Baker Lake Toddler	1.5%	0.0%	7.4%	44.6%	3.5%	25.7%	6.9%	10.3%	0.0%

Note: The intakes shown in the table are from baseline levels of contaminants in the environment and inputs from the Kiggavik Project. The total intakes do not include off-site contributions, such as market foods.

Table F.2-1
Predicted Non-Radionuclide Intakes for Human Receptors

Summary of Mean Intakes by Pathway
Kiggavik Project

Cobalt	Total Intake (mg/(kg d))				Mean Intake by Pathway (mg/(kg d))								
	5th	50th	Mean	95th	Water	Inhalation	Berry	Fish	Soil	Caribou	Squirrel	Ptarmigan	L Tea
1 - JSL Adult Hunter	<0.0001	<0.0001	<0.0001	0.0003	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
2 - JSL Child Hunter	<0.0001	<0.0001	<0.0001	0.0003	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0
3 - JSL Toddler Hunter	<0.0001	0.0001	0.0001	0.0003	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0
4 - Non-NEW Worker	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0	<0.0001	0	0	0	0
5 - Baker Lake Adult	<0.0001	<0.0001	<0.0001	0.0003	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
6 - Baker Lake Child	<0.0001	<0.0001	<0.0001	0.0003	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0
7 - Baker Lake Toddler	<0.0001	0.0001	0.0001	0.0003	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0

	% Contribution by Pathway for Mean Intake								
	Water	Inhalation	Berry	Fish	Soil	Caribou	Squirrel	Ptarmigan	L Tea
1 - JSL Adult Hunter	3.3%	0.0%	1.6%	18.1%	0.4%	32.8%	19.6%	19.2%	5.0%
2 - JSL Child Hunter	2.1%	0.0%	14.0%	13.8%	18.1%	23.2%	13.2%	15.7%	0.0%
3 - JSL Toddler Hunter	1.9%	0.0%	15.6%	14.4%	14.3%	27.5%	14.0%	12.2%	0.0%
4 - Non-NEW Worker	53.0%	0.7%	38.7%	0.0%	7.6%	0.0%	0.0%	0.0%	0.0%
5 - Baker Lake Adult	2.3%	0.0%	1.4%	14.9%	0.3%	34.2%	21.9%	19.4%	5.4%
6 - Baker Lake Child	1.8%	0.0%	14.5%	11.5%	18.7%	23.6%	13.7%	16.2%	0.0%
7 - Baker Lake Toddler	2.0%	0.0%	16.2%	11.8%	14.8%	28.1%	14.5%	12.6%	0.0%

Note: The intakes shown in the table are from baseline levels of contaminants in the environment and inputs from the Kiggavik Project. The total intakes do not include off-site contributions, such as market foods.

Table F.2-1
Predicted Non-Radionuclide Intakes for Human Receptors

Summary of Mean Intakes by Pathway
Kiggavik Project

Copper

	Total Intake (mg/(kg d))				Mean Intake by Pathway (mg/(kg d))								
	5th	50th	Mean	95th	Water	Inhalation	Berry	Fish	Soil	Caribou	Squirrel	Ptarmigan	L Tea
1 - JSL Adult Hunter	0.0010	0.0058	0.0112	0.0404	<0.0001	<0.0001	<0.0001	0.0005	<0.0001	0.0094	0.0006	0.0005	<0.0001
2 - JSL Child Hunter	0.0011	0.0056	0.0098	0.0336	<0.0001	<0.0001	0.0005	0.0005	<0.0001	0.0078	0.0005	0.0004	0
3 - JSL Toddler Hunter	0.0019	0.0074	0.0148	0.0654	<0.0001	<0.0001	0.0008	0.0006	<0.0001	0.0119	0.0008	0.0006	0
4 - Non-NEW Worker	<0.0001	<0.0001	<0.0001	0.0002	<0.0001	<0.0001	<0.0001	0	<0.0001	0	0	0	0
5 - Baker Lake Adult	0.0011	0.0051	0.0111	0.0488	<0.0001	<0.0001	<0.0001	0.0005	<0.0001	0.0093	0.0006	0.0005	<0.0001
6 - Baker Lake Child	0.0011	0.0055	0.0098	0.0335	<0.0001	<0.0001	0.0005	0.0005	<0.0001	0.0078	0.0005	0.0004	0
7 - Baker Lake Toddler	0.0019	0.0073	0.0148	0.0654	<0.0001	<0.0001	0.0008	0.0006	<0.0001	0.0119	0.0008	0.0006	0

	% Contribution by Pathway for Mean Intake								
	Water	Inhalation	Berry	Fish	Soil	Caribou	Squirrel	Ptarmigan	L Tea
1 - JSL Adult Hunter	0.2%	0.0%	0.4%	4.5%	0.0%	84.1%	5.8%	4.7%	0.4%
2 - JSL Child Hunter	0.2%	0.1%	4.9%	4.9%	0.2%	80.3%	5.0%	4.4%	0.0%
3 - JSL Toddler Hunter	0.2%	0.1%	5.1%	4.3%	0.2%	80.7%	5.2%	4.2%	0.0%
4 - Non-NEW Worker	29.6%	4.3%	65.8%	0.0%	0.4%	0.0%	0.0%	0.0%	0.0%
5 - Baker Lake Adult	0.2%	0.0%	0.4%	4.5%	0.0%	83.9%	5.8%	4.8%	0.4%
6 - Baker Lake Child	0.2%	0.1%	4.9%	4.9%	0.2%	80.4%	5.0%	4.3%	0.0%
7 - Baker Lake Toddler	0.2%	0.1%	5.1%	4.3%	0.2%	80.7%	5.2%	4.2%	0.0%

Note: The intakes shown in the table are from baseline levels of contaminants in the environment and inputs from the Kiggavik Project. The total intakes do not include off-site contributions, such as market foods.

Table F.2-1
Predicted Non-Radionuclide Intakes for Human Receptors

Summary of Mean Intakes by Pathway
Kiggavik Project

Lead	Total Intake (mg/(kg d))				Mean Intake by Pathway (mg/(kg d))								
	5th	50th	Mean	95th	Water	Inhalation	Berry	Fish	Soil	Caribou	Squirrel	Ptarmigan	L Tea
1 - JSL Adult Hunter	<0.0001	<0.0001	0.0001	0.0004	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
2 - JSL Child Hunter	<0.0001	0.0001	0.0002	0.0006	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0
3 - JSL Toddler Hunter	<0.0001	0.0002	0.0003	0.0007	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0
4 - Non-NEW Worker	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0	<0.0001	0	0	0	0
5 - Baker Lake Adult	<0.0001	<0.0001	0.0002	0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
6 - Baker Lake Child	<0.0001	0.0001	0.0002	0.0006	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0
7 - Baker Lake Toddler	<0.0001	0.0002	0.0003	0.0007	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0

	% Contribution by Pathway for Mean Intake								
	Water	Inhalation	Berry	Fish	Soil	Caribou	Squirrel	Ptarmigan	L Tea
1 - JSL Adult Hunter	2.5%	0.2%	1.1%	45.3%	0.5%	34.0%	8.6%	6.5%	1.2%
2 - JSL Child Hunter	1.5%	0.4%	9.0%	28.6%	23.3%	27.6%	5.8%	3.8%	0.0%
3 - JSL Toddler Hunter	1.4%	0.3%	11.3%	31.9%	18.5%	26.9%	5.4%	4.2%	0.0%
4 - Non-NEW Worker	45.8%	8.8%	34.1%	0.0%	11.3%	0.0%	0.0%	0.0%	0.0%
5 - Baker Lake Adult	1.8%	0.2%	1.0%	42.7%	0.5%	36.0%	11.8%	5.0%	1.1%
6 - Baker Lake Child	1.3%	0.4%	9.0%	28.3%	23.5%	27.8%	5.9%	3.8%	0.0%
7 - Baker Lake Toddler	1.5%	0.3%	11.4%	31.5%	18.6%	27.1%	5.4%	4.2%	0.0%

Note: The intakes shown in the table are from baseline levels of contaminants in the environment and inputs from the Kiggavik Project. The total intakes do not include off-site contributions, such as market foods.

Table F.2-1
Predicted Non-Radionuclide Intakes for Human Receptors

Summary of Mean Intakes by Pathway
Kiggavik Project

Molybdenum	Total Intake (mg/(kg d))				Mean Intake by Pathway (mg/(kg d))								
	5th	50th	Mean	95th	Water	Inhalation	Berry	Fish	Soil	Caribou	Squirrel	Ptarmigan	L Tea
1 - JSL Adult Hunter	<0.0001	0.0002	0.0002	0.0007	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
2 - JSL Child Hunter	<0.0001	0.0003	0.0004	0.0011	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0
3 - JSL Toddler Hunter	0.0001	0.0004	0.0006	0.0017	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	0
4 - Non-NEW Worker	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0	<0.0001	0	0	0	0
5 - Baker Lake Adult	<0.0001	0.0001	0.0002	0.0009	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
6 - Baker Lake Child	<0.0001	0.0003	0.0004	0.0011	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0
7 - Baker Lake Toddler	0.0001	0.0004	0.0006	0.0017	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	0

	% Contribution by Pathway for Mean Intake								
	Water	Inhalation	Berry	Fish	Soil	Caribou	Squirrel	Ptarmigan	L Tea
1 - JSL Adult Hunter	24.3%	0.0%	1.0%	18.0%	0.0%	32.5%	10.7%	12.3%	1.3%
2 - JSL Child Hunter	8.0%	0.1%	12.7%	18.7%	1.8%	34.0%	11.5%	13.1%	0.0%
3 - JSL Toddler Hunter	1.3%	0.1%	14.6%	17.0%	1.3%	38.6%	12.0%	15.2%	0.0%
4 - Non-NEW Worker	42.2%	2.5%	54.5%	0.0%	0.9%	0.0%	0.0%	0.0%	0.0%
5 - Baker Lake Adult	1.4%	0.0%	0.9%	20.1%	0.0%	45.8%	15.5%	14.6%	1.6%
6 - Baker Lake Child	1.4%	0.1%	13.7%	20.1%	2.0%	36.7%	12.4%	13.6%	0.0%
7 - Baker Lake Toddler	1.3%	0.1%	14.7%	17.0%	1.3%	38.8%	12.0%	14.9%	0.0%

Note: The intakes shown in the table are from baseline levels of contaminants in the environment and inputs from the Kiggavik Project. The total intakes do not include off-site contributions, such as market foods.

Table F.2-1
Predicted Non-Radionuclide Intakes for Human Receptors

Summary of Mean Intakes by Pathway
Kiggavik Project

Nickel	Total Intake (mg/(kg d))				Mean Intake by Pathway (mg/(kg d))								
	5th	50th	Mean	95th	Water	Inhalation	Berry	Fish	Soil	Caribou	Squirrel	Ptarmigan	L Tea
1 - JSL Adult Hunter	<0.0001	0.0002	0.0002	0.0007	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
2 - JSL Child Hunter	<0.0001	0.0003	0.0004	0.0011	<0.0001	<0.0001	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0
3 - JSL Toddler Hunter	0.0001	0.0004	0.0006	0.0017	<0.0001	<0.0001	0.0003	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	0
4 - Non-NEW Worker	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0	<0.0001	0	0	0	0
5 - Baker Lake Adult	<0.0001	0.0001	0.0002	0.0009	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
6 - Baker Lake Child	<0.0001	0.0003	0.0004	0.0011	<0.0001	<0.0001	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0
7 - Baker Lake Toddler	0.0001	0.0004	0.0006	0.0017	<0.0001	<0.0001	0.0003	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	0

	% Contribution by Pathway for Mean Intake								
	Water	Inhalation	Berry	Fish	Soil	Caribou	Squirrel	Ptarmigan	L Tea
1 - JSL Adult Hunter	9.2%	0.0%	8.0%	12.8%	0.2%	41.5%	13.8%	9.5%	4.9%
2 - JSL Child Hunter	4.4%	0.0%	48.8%	6.7%	7.0%	20.2%	8.5%	4.4%	0.0%
3 - JSL Toddler Hunter	4.1%	0.0%	48.9%	6.8%	5.3%	20.6%	9.7%	4.5%	0.0%
4 - Non-NEW Worker	43.9%	0.3%	54.7%	0.0%	1.1%	0.0%	0.0%	0.0%	0.0%
5 - Baker Lake Adult	6.7%	0.0%	6.7%	12.0%	0.2%	41.7%	20.0%	7.8%	4.9%
6 - Baker Lake Child	4.0%	0.0%	49.0%	6.8%	7.0%	20.2%	8.6%	4.4%	0.0%
7 - Baker Lake Toddler	4.1%	0.0%	49.0%	6.8%	5.3%	20.5%	9.7%	4.5%	0.0%

Note: The intakes shown in the table are from baseline levels of contaminants in the environment and inputs from the Kiggavik Project. The total intakes do not include off-site contributions, such as market foods.

Table F.2-1
Predicted Non-Radionuclide Intakes for Human Receptors

Summary of Mean Intakes by Pathway
Kiggavik Project

Selenium	Total Intake (mg/(kg d))				Mean Intake by Pathway (mg/(kg d))								
	5th	50th	Mean	95th	Water	Inhalation	Berry	Fish	Soil	Caribou	Squirrel	Ptarmigan	L Tea
1 - JSL Adult Hunter	0.0002	0.0010	0.0015	0.0042	<0.0001	<0.0001	<0.0001	0.0009	<0.0001	0.0006	<0.0001	<0.0001	<0.0001
2 - JSL Child Hunter	0.0002	0.0009	0.0014	0.0042	<0.0001	<0.0001	<0.0001	0.0008	<0.0001	0.0005	<0.0001	<0.0001	0
3 - JSL Toddler Hunter	0.0003	0.0013	0.0019	0.0051	<0.0001	<0.0001	<0.0001	0.0011	<0.0001	0.0007	<0.0001	<0.0001	0
4 - Non-NEW Worker	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0	<0.0001	0	0	0	0
5 - Baker Lake Adult	0.0002	0.0009	0.0014	0.0043	<0.0001	<0.0001	<0.0001	0.0008	<0.0001	0.0006	<0.0001	<0.0001	<0.0001
6 - Baker Lake Child	0.0002	0.0008	0.0013	0.0038	<0.0001	<0.0001	<0.0001	0.0007	<0.0001	0.0005	<0.0001	<0.0001	0
7 - Baker Lake Toddler	0.0003	0.0012	0.0018	0.0051	<0.0001	<0.0001	<0.0001	0.0010	<0.0001	0.0007	<0.0001	<0.0001	0

	% Contribution by Pathway for Mean Intake								
	Water	Inhalation	Berry	Fish	Soil	Caribou	Squirrel	Ptarmigan	L Tea
1 - JSL Adult Hunter	0.3%	0.0%	0.0%	57.0%	0.0%	41.1%	0.5%	1.2%	0.0%
2 - JSL Child Hunter	0.2%	0.0%	0.1%	58.2%	0.2%	39.7%	0.4%	1.2%	0.0%
3 - JSL Toddler Hunter	0.2%	0.0%	0.1%	58.2%	0.2%	39.5%	0.5%	1.4%	0.0%
4 - Non-NEW Worker	93.8%	0.4%	4.5%	0.0%	1.4%	0.0%	0.0%	0.0%	0.0%
5 - Baker Lake Adult	0.2%	0.0%	0.0%	55.4%	0.0%	42.9%	0.4%	1.1%	0.0%
6 - Baker Lake Child	0.2%	0.0%	0.1%	56.5%	0.2%	41.4%	0.4%	1.1%	0.0%
7 - Baker Lake Toddler	0.2%	0.0%	0.1%	56.7%	0.2%	41.0%	0.5%	1.3%	0.0%

Note: The intakes shown in the table are from baseline levels of contaminants in the environment and inputs from the Kiggavik Project. The total intakes do not include off-site contributions, such as market foods.

Table F.2-1
Predicted Non-Radionuclide Intakes for Human Receptors

Summary of Mean Intakes by Pathway
Kiggavik Project

Zinc

Zinc	Total Intake (mg/(kg d))					Mean Intake by Pathway (mg/(kg d))								
	5th	50th	Mean	95th		Water	Inhalation	Berry	Fish	Soil	Caribou	Squirrel	Ptarmigan	L Tea
1 - JSL Adult Hunter	0.0187	0.0971	0.1670	0.5880		0.0001	<0.0001	0.0005	0.0138	<0.0001	0.1338	0.0070	0.0106	0.0011
2 - JSL Child Hunter	0.0132	0.0936	0.1618	0.6044		0.0001	<0.0001	0.0071	0.0123	<0.0001	0.1257	0.0057	0.0108	0
3 - JSL Toddler Hunter	0.0262	0.1354	0.2271	0.7865		0.0002	<0.0001	0.0088	0.0177	<0.0001	0.1738	0.0088	0.0177	0
4 - Non-NEW Worker	0.0001	0.0003	0.0006	0.0016		0.0001	<0.0001	0.0005	0	<0.0001	0	0	0	0
5 - Baker Lake Adult	0.0164	0.0977	0.1649	0.5456		0.0001	<0.0001	0.0004	0.0128	<0.0001	0.1345	0.0064	0.0096	0.0012
6 - Baker Lake Child	0.0131	0.0934	0.1611	0.6035		0.0001	<0.0001	0.0071	0.0115	<0.0001	0.1257	0.0057	0.0108	0
7 - Baker Lake Toddler	0.0261	0.1340	0.2259	0.7836		0.0002	<0.0001	0.0088	0.0165	<0.0001	0.1738	0.0088	0.0177	0

		% Contribution by Pathway for Mean Intake								
		Water	Inhalation	Berry	Fish	Soil	Caribou	Squirrel	Ptarmigan	L Tea
1 - JSL Adult Hunter		0.1%	0.0%	0.3%	8.3%	0.0%	80.1%	4.2%	6.4%	0.7%
2 - JSL Child Hunter		0.1%	0.0%	4.4%	7.6%	0.1%	77.7%	3.5%	6.7%	0.0%
3 - JSL Toddler Hunter		0.1%	0.0%	3.9%	7.8%	0.0%	76.6%	3.9%	7.8%	0.0%
4 - Non-NEW Worker		17.9%	0.3%	81.6%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%
5 - Baker Lake Adult		0.1%	0.0%	0.3%	7.7%	0.0%	81.6%	3.9%	5.8%	0.7%
6 - Baker Lake Child		0.1%	0.0%	4.4%	7.2%	0.1%	78.0%	3.5%	6.7%	0.0%
7 - Baker Lake Toddler		0.1%	0.0%	3.9%	7.3%	0.0%	77.0%	3.9%	7.8%	0.0%

Note: The intakes shown in the table are from baseline levels of contaminants in the environment and inputs from the Kiggavik Project. The total intakes do not include off-site contributions, such as market foods.

Table F.2-2
Predicted Radionuclide Doses for Human Receptors

Arithmetic Mean		Dose from Groundshine (µSv/yr)			Dose from Water (µSv/yr)			Dose from Inhalation (µSv/yr)			Dose from Berries (µSv/yr)			Dose from Fish (µSv/yr)			Dose from Soil (µSv/yr)			Dose from Caribou (µSv/yr)			Dose from Squirrel (µSv/yr)			Dose from Ptarmigan (µSv/yr)			Dose from Labrador Tea (µSv/yr)			Dose from Radon (µSv/yr)			Total Dose (µSv/yr)		
Baseline	Baseline + Kiggavik	Incremental	Baseline	Baseline + Kiggavik	Incremental	Baseline	Baseline + Kiggavik	Incremental	Baseline	Baseline + Kiggavik	Incremental	Baseline	Baseline + Kiggavik	Incremental	Baseline	Baseline + Kiggavik	Incremental	Baseline	Baseline + Kiggavik	Incremental	Baseline	Baseline + Kiggavik	Incremental	Baseline	Baseline + Kiggavik	Incremental	Baseline	Baseline + Kiggavik	Incremental	Baseline	Baseline + Kiggavik	Incremental	Baseline	Baseline + Kiggavik	Incremental		
Year 1	1.31E-02	1.31E-02	0.00	1.41E+01	1.41E+01	0.00	5.95E+00	5.95E+00	0.00	2.10E+00	2.10E+00	0.00	2.08E+02	2.08E+02	0.00	1.17E-01	1.17E-01	0.00	2.27E+03	2.27E+03	0.00	1.06E+02	1.06E+02	0.00	8.93E+02	8.93E+02	0.00	1.42E+01	1.42E+01	0.00	3.81E+03	3.81E+03	0.00	7.33E+03	7.33E+03	0.00	
Year 2	1.75E-02	1.75E-02	0.00	1.41E+01	1.41E+01	0.00	5.95E+00	5.95E+00	0.00	2.10E+00	2.10E+00	0.00	2.08E+02	2.08E+02	0.00	1.17E-01	1.17E-01	0.00	2.27E+03	2.27E+03	0.00	1.06E+02	1.06E+02	0.00	8.93E+02	8.93E+02	0.00	1.42E+01	1.42E+01	0.00	3.81E+03	3.81E+03	0.00	7.33E+03	7.33E+03	0.00	
Year 3	2.18E-02	2.18E-02	0.00	1.41E+01	1.41E+01	0.00	5.95E+00	5.95E+00	0.00	2.10E+00	2.10E+00	0.00	2.08E+02	2.08E+02	0.00	1.17E-01	1.17E-01	0.00	2.27E+03	2.27E+03	0.00	1.06E+02	1.06E+02	0.00	8.93E+02	8.93E+02	0.00	1.42E+01	1.42E+01	0.00	3.81E+03	3.81E+03	0.00	7.33E+03	7.33E+03	0.00	
Year 4	2.61E-02	2.61E-02	0.00	1.41E+01	1.41E+01	0.00	5.95E+00	5.95E+00	0.00	2.10E+00	2.10E+00	0.00	2.08E+02	2.08E+02	0.00	1.17E-01	1.17E-01	0.00	2.27E+03	2.27E+03	0.00	1.06E+02	1.06E+02	0.00	8.93E+02	8.93E+02	0.00	1.42E+01	1.42E+01	0.00	3.81E+03	3.81E+03	0.00	7.33E+03	7.33E+03	0.00	
Year 5	3.03E-02	3.33E-02	0.00	1.41E+01	1.42E+01	0.11	5.95E+00	6.50E+00	0.55	2.10E+00	2.22E+00	0.12	2.08E+02	2.12E+02	3.88	1.17E-01	1.17E-01	0.00	2.27E+03	2.29E+03	16.10	1.06E+02	1.07E+02	0.11	8.93E+02	8.94E+02	0.66	1.42E+01	1.42E+01	0.01	3.81E+03	3.81E+03	0.00	7.33E+03	7.35E+03	21.54	
Year 6	3.46E-02	4.04E-02	0.01	1.41E+01	1.45E+01	0.40	5.95E+00	6.50E+00	0.55	2.10E+00	2.22E+00	0.12	2.08E+02	2.13E+02	5.24	1.17E-01	1.17E-01	0.00	2.27E+03	2.29E+03	16.10	1.06E+02	1.07E+02	0.12	8.93E+02	8.94E+02	0.73	1.42E+01	1.42E+01	0.01	3.81E+03	3.81E+03	0.00	7.33E+03	7.35E+03	23.28	
Year 7	3.88E-02	4.87E-02	0.01	1.41E+01	1.45E+01	0.40	5.95E+00	6.73E+00	0.78	2.10E+00	2.25E+00	0.15	2.08E+02	2.13E+02	5.69	1.17E-01	1.17E-01	0.00	2.27E+03	2.30E+03	25.30	1.06E+02	1.07E+02	0.15	8.93E+02	8.94E+02	0.86	1.42E+01	1.42E+01	0.01	3.81E+03	3.81E+03	0.00	7.33E+03	7.36E+03	33.36	
Year 8	4.30E-02	5.70E-02	0.01	1.41E+01	1.45E+01	0.42	5.95E+00	6.73E+00	0.78	2.10E+00	2.25E+00	0.15	2.08E+02	2.13E+02	5.57	1.17E-01	1.17E-01	0.00	2.27E+03	2.30E+03	25.30	1.06E+02	1.07E+02	0.14	8.93E+02	8.94E+02	0.87	1.42E+01	1.42E+01	0.01	3.81E+03	3.81E+03	0.00	7.33E+03	7.36E+03	33.26	
Year 9	4.72E-02	6.53E-02	0.02	1.41E+01	1.45E+01	0.42	5.95E+00	6.73E+00	0.78	2.10E+00	2.25E+00	0.15	2.08E+02	2.13E+02	5.27	1.17E-01	1.17E-01	0.00	2.27E+03	2.30E+03	25.30	1.06E+02	1.07E+02	0.15	8.93E+02	8.94E+02	0.90	1.42E+01	1.42E+01	0.01	3.81E+03	3.81E+03	0.00	7.33E+03	7.36E+03	33.00	
Year 10	5.14E-02	7.35E-02	0.02	1.41E+01	1.45E+01	0.43	5.95E+00	6.73E+00	0.78	2.10E+00	2.25E+00	0.15	2.08E+02	2.13E+02	5.44	1.17E-01	1.17E-01	0.00	2.27E+03	2.30E+03	25.30	1.07E+02	1.07E+02	0.15	8.93E+02	8.94E+02	0.92	1.42E+01	1.42E+01	0.01	3.81E+03	3.81E+03	0.00	7.33E+03	7.36E+03	33.20	
Year 11	5.55E-02	8.06E-02	0.03	1.41E+01	1.45E+01	0.42	5.95E+00	6.52E+00	0.57	2.10E+00	2.19E+00	0.09	2.08E+02	2.12E+02	4.65	1.17E-01	1.17E-01	0.00	2.27E+03	2.30E+03	24.50	1.07E+02	1.07E+02	0.09	8.93E+02	8.94E+02	0.63	1.42E+01	1.42E+01	0.01	3.81E+03	3.81E+03	0.00	7.33E+03	7.36E+03	30.98	
Year 12	5.96E-02	8.76E-02	0.03	1.41E+01	1.45E+01	0.41	5.95E+00	6.52E+00	0.57	2.10E+00	2.19E+00	0.09	2.08E+02	2.14E+02	6.17	1.17E-01	1.17E-01	0.00	2.27E+03	2.30E+03	24.50	1.07E+02	1.07E+02	0.09	8.94E+02	8.94E+02	0.77	1.42E+01	1.42E+01	0.01	3.81E+03	3.81E+03	0.00	7.33E+03	7.36E+03	32.64	
Year 13	6.37E-02	9.46E-02	0.03	1.41E+01	1.45E+01	0.42	5.95E+00	6.52E+00	0.57	2.10E+00	2.19E+00	0.09	2.08E+02	2.14E+02	5.87	1.17E-01	1.17E-01	0.00	2.27E+03	2.30E+03	24.50	1.07E+02	1.07E+02	0.09	8.94E+02	8.94E+02	0.60	1.42E+01	1.42E+01	0.01	3.81E+03	3.81E+03	0.00	7.33E+03	7.36E+03	32.18	
Year 14	6.78E-02	1.02E-01	0.03	1.41E+01	1.45E+01	0.41	5.95E+00	6.52E+00	0.57	2.10E+00	2.19E+00	0.09	2.08E+02	2.14E+02	6.69	1.17E-01	1.17E-01	0.00	2.27E+03	2.30E+03	24.50	1.07E+02	1.07E+02	0.09	8.94E+02	8.94E+02	0.65	1.42E+01	1.42E+01	0.01	3.81E+03	3.81E+03	0.00	7.33E+03	7.36E+03	33.04	
Year 15	7.19E-02	1.09E-01	0.04	1.41E+01	1.45E+01	0.42	5.95E+00	6.52E+00	0.57	2.10E+00	2.19E+00	0.09	2.08E+02	2.13E+02	5.19	1.17E-01	1.17E-01	0.00	2.27E+03	2.30E+03	24.50	1.07E+02	1.07E+02	0.09	8.94E+02	8.94E+02	0.67	1.42E+01	1.42E+01	0.01	3.81E+03	3.81E+03	0.00	7.33E+03	7.36E+03	31.57	
Year 16	7.60E-02	1.16E-01	0.04	1.41E+01	1.45E+01	0.40	5.95E+00	6.52E+00	0.57	2.10E+00	2.19E+00	0.09	2.08E+02	2.13E+02	5.36	1.18E-01	1.18E-01	0.00	2.27E+03	2.30E+03	24.50	1.07E+02	1.07E+02	0.09	8.94E+02	8.95E+02	0.67	1.42E+01	1.42E+01	0.01	3.81E+03	3.81E+03	0.00	7.33E+03	7.36E+03	31.73	
Year 17	8.00E-02	1.23E-01	0.04	1.41E+01	1.45E+01	0.40	5.95E+00	6.52E+00	0.57	2.10E+00	2.19E+00	0.09	2.08E+02	2.12E+02	4.27	1.18E-01	1.18E-01	0.00	2.27E+03	2.30E+03	24.50	1.07E+02	1.07E+02	0.09	8.94E+02	8.95E+02	0.64	1.42E+01	1.42E+01	0.01	3.81E+03	3.81E+03	0.00	7.33E+03	7.36E+03	30.62	
Year 18	8.40E-02	1.31E-01	0.05	1.41E+01	1.45E+01	0.41	5.95E+00	6.73E+00	0.78	2.10E+00	2.25E+00	0.15	2.08E+02	2.13E+02	4.60	1.18E-01	1.18E-01	0.00	2.27E+03	2.30E+03	25.30	1.07E+02	1.07E+02	0.15	8.94E+02	8.95E+02	0.92	1.42E+01	1.42E+01	0.01	3.81E+03	3.81E+03	0.00	7.33E+03	7.36E+03	32.37	
Year 19	8.81E-02	1.37E-01	0.05	1.41E+01	1.45E+01	0.40	5.95E+00	6.52E+00	0.57	2.10E+00	2.19E+00	0.09	2.08E+02	2.13E+02	5.65	1.18E-01	1.18E-01	0.00	2.27E+03	2.30E+03	24.50	1.07E+02	1.07E+02	0.09	8.94E+02	8.95E+02	0.70	1.42E+01	1.42E+01	0.01	3.81E+03	3.81E+03	0.00	7.33E+03	7.36E+03	32.06	
Year 20	9.20E-02	1.44E-01	0.05	1.41E+01	1.45E+01	0.40	5.95E+00	6.52E+00	0.57	2.10E+00	2.19E+00	0.09	2.08E+02	2.13E+02	5.71	1.18E-01	1.18E-01	0.00	2.27E+03	2.30E+03	24.50	1.07E+02	1.07E+02	0.09	8.94E+02	8.95E+02	0.61	1.42E+01	1.42E+01	0.01	3.81E+03	3.81E+03	0.00	7.33E+03	7.36E+03	32.04	
Year 21	9.60E-02	1.51E-01	0.06	1.41E+01	1.45E+01	0.40	5.95E+00	6.52E+00	0.57	2.10E+00	2.19E+00	0.09	2.08E+02	2.13E+02	5.76	1.18E-01	1.18E-01	0.00	2.27E+03	2.30E+03	24.50	1.07E+02	1.07E+02	0.09	8.94E+02	8.95E+02	0.75	1.42E+01	1.42E+01	0.01	3.81E+03	3.81E+03	0.00	7.33E+03	7.36E+03	32.22	
Year 22	1.00E-01	1.58E-01	0.06	1.41E+01	1.45E+01	0.41	5.95E+00	6.52E+00	0.57	2.10E+00	2.19E+00	0.09	2.08E+02	2.14E+02	6.39	1.18E-01	1.18E-01	0.00	2.27E+03	2.30E+03	24.50	1.07E+02	1.07E+02	0.09	8.94E+02	8.95E+02	0.72	1.42E+01	1.42E+01	0.01	3.81E+03	3.81E+03	0.00	7.33E+03	7.36E+03	32.84	
Year 23	1.04E-01	1.65E-01	0.06	1.41E+01	1.45E+01	0.42	5.95E+00	6.52E+00	0.57	2.10E+00	2.19E+00	0.09	2.08E+0																								

Table F.2-2
Predicted Radionuclide Doses for Human Receptors

Arithmetic Mean		Dose from Groundshine (µSv/yr)			Dose from Water (µSv/yr)			Dose from Inhalation (µSv/yr)			Dose from Berries (µSv/yr)			Dose from Fish (µSv/yr)			Dose from Soil (µSv/yr)			Dose from Caribou (µSv/yr)			Dose from Squirrel (µSv/yr)			Dose from Ptarmigan (µSv/yr)			Dose from Labrador Tea (µSv/yr)			Dose from Radon (µSv/yr)			Total Dose (µSv/yr)		
2 - JSL Child Hunter	Baseline	Baseline + Kiggavik	Incremental	Baseline	Baseline + Kiggavik	Incremental	Baseline	Baseline + Kiggavik	Incremental	Baseline	Baseline + Kiggavik	Incremental	Baseline	Baseline + Kiggavik	Incremental	Baseline	Baseline + Kiggavik	Incremental	Baseline	Baseline + Kiggavik	Incremental	Baseline	Baseline + Kiggavik	Incremental	Baseline	Baseline + Kiggavik	Incremental	Baseline	Baseline + Kiggavik	Incremental	Baseline	Baseline + Kiggavik	Incremental	Baseline	Baseline + Kiggavik	Incremental	
Year 1	1.13E-02	1.13E-02	0.00	1.75E+01	1.75E+01	0.00	1.09E+01	1.09E+01	0.00	3.26E+01	3.26E+01	0.00	3.00E+02	3.00E+02	0.00	8.25E+00	8.25E+00	0.00	3.71E+03	3.71E+03	0.00	1.61E+02	1.61E+02	0.00	1.30E+03	1.30E+03	0.00	0.00E+00	0.00E+00	0.00	5.87E+03	5.87E+03	0.00	1.14E+04	1.14E+04	0.00	
Year 2	1.50E-02	1.50E-02	0.00	1.75E+01	1.75E+01	0.00	1.09E+01	1.09E+01	0.00	3.26E+01	3.26E+01	0.00	3.00E+02	3.00E+02	0.00	8.25E+00	8.25E+00	0.00	3.71E+03	3.71E+03	0.00	1.61E+02	1.61E+02	0.00	1.30E+03	1.30E+03	0.00	0.00E+00	0.00E+00	0.00	5.87E+03	5.87E+03	0.00	1.14E+04	1.14E+04	0.00	
Year 3	1.87E-02	1.87E-02	0.00	1.75E+01	1.75E+01	0.00	1.09E+01	1.09E+01	0.00	3.26E+01	3.26E+01	0.00	3.00E+02	3.00E+02	0.00	8.25E+00	8.25E+00	0.00	3.71E+03	3.71E+03	0.00	1.61E+02	1.61E+02	0.00	1.30E+03	1.30E+03	0.00	0.00E+00	0.00E+00	0.00	5.87E+03	5.87E+03	0.00	1.14E+04	1.14E+04	0.00	
Year 4	2.24E-02	2.24E-02	0.00	1.75E+01	1.75E+01	0.00	1.09E+01	1.09E+01	0.00	3.26E+01	3.26E+01	0.00	3.00E+02	3.00E+02	0.00	8.25E+00	8.25E+00	0.00	3.71E+03	3.71E+03	0.00	1.61E+02	1.61E+02	0.00	1.30E+03	1.30E+03	0.00	0.00E+00	0.00E+00	0.00	5.87E+03	5.87E+03	0.00	1.14E+04	1.14E+04	0.00	
Year 5	2.61E-02	2.68E-02	0.00	1.75E+01	1.76E+01	0.04	1.09E+01	1.12E+01	0.31	3.26E+01	3.45E+01	1.87	3.00E+02	3.07E+02	6.27	8.25E+00	8.25E+00	0.00	3.71E+03	3.74E+03	26.00	1.61E+02	1.61E+02	0.15	1.30E+03	1.30E+03	1.00	0.00E+00	0.00E+00	0.00	5.87E+03	5.87E+03	0.00	1.14E+04	1.14E+04	35.64	
Year 6	2.97E-02	3.13E-02	0.00	1.75E+01	1.77E+01	0.15	1.09E+01	1.12E+01	0.31	3.26E+01	3.45E+01	1.87	3.00E+02	3.07E+02	6.39	8.25E+00	8.25E+00	0.00	3.71E+03	3.74E+03	26.00	1.61E+02	1.61E+02	0.15	1.30E+03	1.30E+03	1.10	0.00E+00	0.00E+00	0.00	5.87E+03	5.87E+03	0.00	1.14E+04	1.14E+04	35.97	
Year 7	3.33E-02	3.60E-02	0.00	1.75E+01	1.77E+01	0.15	1.09E+01	1.13E+01	0.44	3.26E+01	3.50E+01	2.37	3.00E+02	3.08E+02	7.26	8.25E+00	8.25E+00	0.00	3.71E+03	3.75E+03	40.70	1.61E+02	1.61E+02	0.19	1.30E+03	1.30E+03	1.30	0.00E+00	0.00E+00	0.00	5.87E+03	5.87E+03	0.00	1.14E+04	1.15E+04	52.42	
Year 8	3.70E-02	4.07E-02	0.00	1.75E+01	1.77E+01	0.15	1.09E+01	1.13E+01	0.44	3.26E+01	3.50E+01	2.37	3.00E+02	3.08E+02	7.57	8.25E+00	8.25E+00	0.00	3.71E+03	3.75E+03	40.70	1.61E+02	1.61E+02	0.18	1.30E+03	1.30E+03	1.40	0.00E+00	0.00E+00	0.00	5.87E+03	5.87E+03	0.00	1.14E+04	1.15E+04	52.82	
Year 9	4.06E-02	4.54E-02	0.00	1.75E+01	1.77E+01	0.15	1.09E+01	1.13E+01	0.44	3.26E+01	3.50E+01	2.37	3.00E+02	3.07E+02	6.99	8.25E+00	8.25E+00	0.00	3.71E+03	3.75E+03	40.70	1.61E+02	1.61E+02	0.18	1.30E+03	1.30E+03	1.30	0.00E+00	0.00E+00	0.00	5.87E+03	5.87E+03	0.00	1.14E+04	1.15E+04	52.14	
Year 10	4.41E-02	5.01E-02	0.01	1.75E+01	1.77E+01	0.16	1.09E+01	1.13E+01	0.44	3.26E+01	3.50E+01	2.37	3.00E+02	3.08E+02	7.38	8.25E+00	8.25E+00	0.00	3.71E+03	3.75E+03	40.70	1.61E+02	1.61E+02	0.19	1.30E+03	1.30E+03	1.30	0.00E+00	0.00E+00	0.00	5.87E+03	5.87E+03	0.00	1.14E+04	1.15E+04	52.55	
Year 11	4.77E-02	5.45E-02	0.01	1.75E+01	1.77E+01	0.16	1.09E+01	1.12E+01	0.35	3.26E+01	3.41E+01	1.43	3.00E+02	3.07E+02	6.93	8.26E+00	8.26E+00	0.00	3.71E+03	3.75E+03	39.40	1.61E+02	1.61E+02	0.11	1.30E+03	1.30E+03	1.00	0.00E+00	0.00E+00	0.00	5.87E+03	5.87E+03	0.00	1.14E+04	1.15E+04	49.38	
Year 12	5.12E-02	5.89E-02	0.01	1.75E+01	1.77E+01	0.15	1.09E+01	1.12E+01	0.35	3.26E+01	3.41E+01	1.43	3.00E+02	3.09E+02	8.32	8.26E+00	8.26E+00	0.00	3.71E+03	3.75E+03	39.40	1.61E+02	1.61E+02	0.11	1.30E+03	1.30E+03	1.10	0.00E+00	0.00E+00	0.00	5.87E+03	5.87E+03	0.00	1.14E+04	1.15E+04	50.87	
Year 13	5.48E-02	6.32E-02	0.01	1.75E+01	1.77E+01	0.16	1.09E+01	1.12E+01	0.35	3.26E+01	3.41E+01	1.43	3.00E+02	3.08E+02	7.66	8.26E+00	8.26E+00	0.00	3.71E+03	3.75E+03	39.40	1.61E+02	1.61E+02	0.12	1.30E+03	1.30E+03	0.90	0.00E+00	0.00E+00	0.00	5.87E+03	5.87E+03	0.00	1.14E+04	1.15E+04	50.02	
Year 14	5.83E-02	6.76E-02	0.01	1.75E+01	1.77E+01	0.15	1.09E+01	1.12E+01	0.35	3.26E+01	3.41E+01	1.43	3.00E+02	3.10E+02	9.88	8.26E+00	8.26E+00	0.00	3.71E+03	3.75E+03	39.40	1.61E+02	1.61E+02	0.11	1.30E+03	1.30E+03	1.00	0.00E+00	0.00E+00	0.00	5.87E+03	5.87E+03	0.00	1.14E+04	1.15E+04	52.33	
Year 15	6.18E-02	7.19E-02	0.01	1.75E+01	1.77E+01	0.16	1.09E+01	1.12E+01	0.35	3.26E+01	3.41E+01	1.43	3.00E+02	3.07E+02	6.94	8.26E+00	8.26E+00	0.00	3.71E+03	3.75E+03	39.40	1.61E+02	1.61E+02	0.11	1.30E+03	1.30E+03	1.00	0.00E+00	0.00E+00	0.00	5.87E+03	5.87E+03	0.00	1.14E+04	1.15E+04	49.39	
Year 16	6.53E-02	7.62E-02	0.01	1.75E+01	1.77E+01	0.15	1.09E+01	1.12E+01	0.35	3.27E+01	3.41E+01	1.43	3.00E+02	3.08E+02	8.00	8.26E+00	8.26E+00	0.00	3.71E+03	3.75E+03	39.40	1.61E+02	1.61E+02	0.12	1.30E+03	1.30E+03	1.00	0.00E+00	0.00E+00	0.00	5.87E+03	5.87E+03	0.00	1.14E+04	1.15E+04	50.46	
Year 17	6.88E-02	8.05E-02	0.01	1.75E+01	1.77E+01	0.15	1.09E+01	1.12E+01	0.35	3.27E+01	3.41E+01	1.43	3.00E+02	3.07E+02	6.66	8.26E+00	8.26E+00	0.00	3.71E+03	3.75E+03	39.40	1.61E+02	1.61E+02	0.12	1.30E+03	1.30E+03	1.00	0.00E+00	0.00E+00	0.00	5.87E+03	5.87E+03	0.00	1.14E+04	1.15E+04	49.12	
Year 18	7.22E-02	8.51E-02	0.01	1.75E+01	1.77E+01	0.15	1.09E+01	1.13E+01	0.44	3.27E+01	3.50E+01	2.37	3.00E+02	3.07E+02	6.17	8.26E+00	8.26E+00	0.00	3.71E+03	3.75E+03	40.70	1.61E+02	1.61E+02	0.19	1.30E+03	1.30E+03	1.40	0.00E+00	0.00E+00	0.00	5.87E+03	5.87E+03	0.00	1.14E+04	1.15E+04	51.44	
Year 19	7.57E-02	8.93E-02	0.01	1.75E+01	1.77E+01	0.15	1.09E+01	1.12E+01	0.35	3.27E+01	3.41E+01	1.43	3.00E+02	3.09E+02	8.36	8.26E+00	8.26E+00	0.00	3.71E+03	3.75E+03	39.40	1.61E+02	1.61E+02	0.12	1.30E+03	1.30E+03	1.10	0.00E+00	0.00E+00	0.00	5.87E+03	5.87E+03	0.00	1.14E+04	1.15E+04	50.92	
Year 20	7.91E-02	9.36E-02	0.01	1.75E+01	1.77E+01	0.15	1.09E+01	1.12E+01	0.35	3.27E+01	3.41E+01	1.43	3.00E+02	3.08E+02	7.48	8.26E+00	8.26E+00	0.00	3.71E+03	3.75E+03	39.40	1.61E+02	1.61E+02	0.12	1.30E+03	1.30E+03	0.90	0.00E+00	0.00E+00	0.00	5.87E+03	5.87E+03	0.00	1.14E+04	1.15E+04	49.94	
Year 21	8.25E-02	9.78E-02	0.02	1.75E+01	1.77E+01	0.15	1.09E+01	1.12E+01	0.35	3.27E+01	3.41E+01	1.43	3.00E+02	3.08E+02	7.27	8.26E+00	8.26E+00	0.00	3.71E+03	3.75E+03	39.40	1.61E+02	1.61E+02	0.11	1.30E+03	1.30E+03	1.00	0.00E+00	0.00E+00	0.00	5.87E+03	5.87E+03	0.00	1.14E+04	1.15E+04	49.72	
Year 22	8.59E-02	1.02E-01	0.02	1.75E+01	1.77E+01	0.16	1.09E+01	1.12E+01	0.35	3.27E+01	3.41E+01	1.43	3.00E+02	3.09E+02	8.61	8.26E+00	8.26E+00	0.00	3.71E+03	3.75E+03	39.40	1.61E+02	1.61E+02	0.12	1.30E+03	1.30E+03	1.00	0.00E+00	0.00E+00	0.00	5.87E+03	5.87E+03	0.00	1.14E+04	1.15E+04	51.08	
Year 23	8.93E-02	1.06E-01	0.02	1.75E+01	1.77E+01	0.16	1.09E+01	1.12E+01	0.35	3.27E+01	3.41E+01	1.43</																									

Table F.2-2
Predicted Radionuclide Doses for Human Receptors

Arithmetic Mean	3-JSL Toddler Hunter	Dose from Groundshine (µSv/yr)			Dose from Water (µSv/yr)			Dose from Inhalation (µSv/yr)			Dose from Berries (µSv/yr)			Dose from Fish (µSv/yr)			Dose from Soil (µSv/yr)			Dose from Caribou (µSv/yr)			Dose from Squirrel (µSv/yr)			Dose from Ptarmigan (µSv/yr)			Dose from Labrador Tea (µSv/yr)			Dose from Radon (µSv/yr)			Total Dose (µSv/yr)		
		Baseline	Baseline + Kiggavik	Incremental	Baseline	Baseline + Kiggavik	Incremental	Baseline	Baseline + Kiggavik	Incremental	Baseline	Baseline + Kiggavik	Incremental	Baseline	Baseline + Kiggavik	Incremental	Baseline	Baseline + Kiggavik	Incremental	Baseline	Baseline + Kiggavik	Incremental	Baseline	Baseline + Kiggavik	Incremental	Baseline	Baseline + Kiggavik	Incremental	Baseline	Baseline + Kiggavik	Incremental	Baseline	Baseline + Kiggavik	Incremental			
Year 1	1.13E-02	1.13E-02	0.00	2.10E+01	2.10E+01	0.00	1.19E+01	1.19E+01	0.00	4.64E+01	4.64E+01	0.00	3.94E+02	3.94E+02	0.00	7.02E+00	7.02E+00	0.00	4.96E+03	4.96E+03	0.00	1.89E+02	1.89E+02	0.00	1.75E+03	1.75E+03	0.00	0.00E+00	0.00E+00	0.00	7.71E+03	7.71E+03	0.00	1.51E+04	1.51E+04	0.00	
Year 2	1.50E-02	1.50E-02	0.00	2.10E+01	2.10E+01	0.00	1.19E+01	1.19E+01	0.00	4.64E+01	4.64E+01	0.00	3.94E+02	3.94E+02	0.00	7.02E+00	7.02E+00	0.00	4.96E+03	4.96E+03	0.00	1.89E+02	1.89E+02	0.00	1.75E+03	1.75E+03	0.00	0.00E+00	0.00E+00	0.00	7.71E+03	7.71E+03	0.00	1.51E+04	1.51E+04	0.00	
Year 3	1.87E-02	1.87E-02	0.00	2.10E+01	2.10E+01	0.00	1.19E+01	1.19E+01	0.00	4.64E+01	4.64E+01	0.00	3.94E+02	3.94E+02	0.00	7.02E+00	7.02E+00	0.00	4.96E+03	4.96E+03	0.00	1.89E+02	1.89E+02	0.00	1.75E+03	1.75E+03	0.00	0.00E+00	0.00E+00	0.00	7.71E+03	7.71E+03	0.00	1.51E+04	1.51E+04	0.00	
Year 4	2.24E-02	2.24E-02	0.00	2.10E+01	2.10E+01	0.00	1.19E+01	1.19E+01	0.00	4.64E+01	4.64E+01	0.00	3.94E+02	3.94E+02	0.00	7.02E+00	7.02E+00	0.00	4.96E+03	4.96E+03	0.00	1.89E+02	1.89E+02	0.00	1.75E+03	1.75E+03	0.00	0.00E+00	0.00E+00	0.00	7.71E+03	7.71E+03	0.00	1.51E+04	1.51E+04	0.00	
Year 5	2.61E-02	2.63E-02	0.00	2.10E+01	2.10E+01	0.00	1.19E+01	1.20E+01	0.09	4.64E+01	4.65E+01	0.07	3.94E+02	4.02E+02	8.06	7.02E+00	7.02E+00	0.00	4.96E+03	4.99E+03	32.10	1.89E+02	1.89E+02	0.16	1.75E+03	1.75E+03	1.30	0.00E+00	0.00E+00	0.00	7.71E+03	7.71E+03	0.00	1.51E+04	1.51E+04	41.78	
Year 6	2.97E-02	3.02E-02	0.00	2.10E+01	2.10E+01	0.00	1.19E+01	1.20E+01	0.09	4.64E+01	4.65E+01	0.07	3.94E+02	4.05E+02	10.43	7.02E+00	7.02E+00	0.00	4.96E+03	4.99E+03	32.10	1.89E+02	1.89E+02	0.16	1.75E+03	1.75E+03	1.50	0.00E+00	0.00E+00	0.00	7.71E+03	7.71E+03	0.00	1.51E+04	1.51E+04	44.35	
Year 7	3.34E-02	3.42E-02	0.00	2.10E+01	2.10E+01	0.00	1.19E+01	1.20E+01	0.13	4.64E+01	4.65E+01	0.10	3.94E+02	4.03E+02	8.79	7.02E+00	7.02E+00	0.00	4.96E+03	5.01E+03	50.30	1.89E+02	1.89E+02	0.20	1.75E+03	1.75E+03	1.50	0.00E+00	0.00E+00	0.00	7.72E+03	7.72E+03	0.00	1.51E+04	1.51E+04	61.02	
Year 8	3.70E-02	3.81E-02	0.00	2.10E+01	2.10E+01	0.00	1.19E+01	1.20E+01	0.13	4.64E+01	4.65E+01	0.10	3.94E+02	4.05E+02	10.62	7.02E+00	7.02E+00	0.00	4.96E+03	5.01E+03	50.30	1.89E+02	1.89E+02	0.20	1.75E+03	1.75E+03	1.70	0.00E+00	0.00E+00	0.00	7.72E+03	7.72E+03	0.00	1.51E+04	1.51E+04	63.06	
Year 9	4.06E-02	4.20E-02	0.00	2.10E+01	2.10E+01	0.00	1.19E+01	1.20E+01	0.13	4.64E+01	4.65E+01	0.10	3.94E+02	4.05E+02	10.94	7.02E+00	7.02E+00	0.00	4.96E+03	5.01E+03	50.30	1.89E+02	1.89E+02	0.20	1.75E+03	1.75E+03	1.80	0.00E+00	0.00E+00	0.00	7.72E+03	7.72E+03	0.00	1.51E+04	1.51E+04	63.48	
Year 10	4.42E-02	4.59E-02	0.00	2.10E+01	2.10E+01	0.00	1.19E+01	1.20E+01	0.13	4.64E+01	4.65E+01	0.10	3.94E+02	4.06E+02	11.73	7.02E+00	7.02E+00	0.00	4.96E+03	5.01E+03	50.30	1.89E+02	1.89E+02	0.20	1.75E+03	1.76E+03	1.80	0.00E+00	0.00E+00	0.00	7.72E+03	7.72E+03	0.00	1.51E+04	1.51E+04	64.26	
Year 11	4.77E-02	4.98E-02	0.00	2.10E+01	2.10E+01	0.00	1.19E+01	1.20E+01	0.12	4.64E+01	4.65E+01	0.10	3.94E+02	4.04E+02	9.89	7.02E+00	7.02E+00	0.00	4.96E+03	5.01E+03	48.70	1.89E+02	1.89E+02	0.12	1.75E+03	1.76E+03	1.30	0.00E+00	0.00E+00	0.00	7.72E+03	7.72E+03	0.00	1.51E+04	1.51E+04	60.23	
Year 12	5.13E-02	5.37E-02	0.00	2.10E+01	2.10E+01	0.00	1.19E+01	1.20E+01	0.12	4.64E+01	4.65E+01	0.10	3.94E+02	4.06E+02	11.66	7.02E+00	7.02E+00	0.00	4.96E+03	5.01E+03	48.70	1.89E+02	1.89E+02	0.12	1.75E+03	1.76E+03	1.50	0.00E+00	0.00E+00	0.00	7.72E+03	7.72E+03	0.00	1.51E+04	1.51E+04	62.20	
Year 13	5.48E-02	5.75E-02	0.00	2.10E+01	2.10E+01	0.00	1.19E+01	1.20E+01	0.12	4.64E+01	4.65E+01	0.10	3.94E+02	4.05E+02	10.59	7.02E+00	7.02E+00	0.00	4.96E+03	5.01E+03	48.70	1.89E+02	1.89E+02	0.12	1.75E+03	1.75E+03	1.30	0.00E+00	0.00E+00	0.00	7.72E+03	7.72E+03	0.00	1.51E+04	1.51E+04	60.93	
Year 14	5.84E-02	6.13E-02	0.00	2.10E+01	2.10E+01	0.00	1.19E+01	1.20E+01	0.12	4.64E+01	4.65E+01	0.10	3.94E+02	4.06E+02	12.13	7.02E+00	7.02E+00	0.00	4.96E+03	5.01E+03	48.70	1.89E+02	1.89E+02	0.12	1.75E+03	1.76E+03	1.30	0.00E+00	0.00E+00	0.00	7.72E+03	7.72E+03	0.00	1.51E+04	1.51E+04	62.47	
Year 15	6.19E-02	6.51E-02	0.00	2.10E+01	2.10E+01	0.00	1.19E+01	1.20E+01	0.12	4.64E+01	4.65E+01	0.10	3.94E+02	4.04E+02	10.37	7.03E+00	7.03E+00	0.00	4.96E+03	5.01E+03	48.70	1.89E+02	1.89E+02	0.12	1.75E+03	1.76E+03	1.40	0.00E+00	0.00E+00	0.00	7.72E+03	7.72E+03	0.00	1.51E+04	1.51E+04	60.81	
Year 16	6.53E-02	6.89E-02	0.00	2.10E+01	2.10E+01	0.00	1.19E+01	1.20E+01	0.12	4.64E+01	4.65E+01	0.10	3.94E+02	4.03E+02	9.13	7.03E+00	7.03E+00	0.00	4.96E+03	5.01E+03	48.70	1.89E+02	1.89E+02	0.12	1.75E+03	1.76E+03	1.30	0.00E+00	0.00E+00	0.00	7.72E+03	7.72E+03	0.00	1.51E+04	1.51E+04	59.47	
Year 17	6.88E-02	7.27E-02	0.00	2.10E+01	2.10E+01	0.00	1.19E+01	1.20E+01	0.12	4.64E+01	4.65E+01	0.10	3.94E+02	4.04E+02	9.48	7.03E+00	7.03E+00	0.00	4.96E+03	5.01E+03	48.70	1.89E+02	1.89E+02	0.13	1.75E+03	1.76E+03	1.30	0.00E+00	0.00E+00	0.00	7.72E+03	7.72E+03	0.00	1.51E+04	1.51E+04	59.83	
Year 18	7.23E-02	7.65E-02	0.00	2.10E+01	2.10E+01	0.00	1.19E+01	1.20E+01	0.13	4.64E+01	4.65E+01	0.10	3.94E+02	4.04E+02	10.10	7.03E+00	7.03E+00	0.00	4.96E+03	5.01E+03	50.30	1.89E+02	1.89E+02	0.20	1.75E+03	1.76E+03	1.70	0.00E+00	0.00E+00	0.00	7.72E+03	7.72E+03	0.00	1.51E+04	1.51E+04	62.54	
Year 19	7.57E-02	8.02E-02	0.00	2.10E+01	2.10E+01	0.00	1.19E+01	1.20E+01	0.12	4.64E+01	4.65E+01	0.10	3.94E+02	4.06E+02	11.71	7.03E+00	7.03E+00	0.00	4.96E+03	5.01E+03	48.70	1.89E+02	1.89E+02	0.12	1.75E+03	1.76E+03	1.40	0.00E+00	0.00E+00	0.00	7.72E+03	7.72E+03	0.00	1.51E+04	1.51E+04	62.15	
Year 20	7.92E-02	8.40E-02	0.00	2.10E+01	2.10E+01	0.00	1.19E+01	1.20E+01	0.12	4.64E+01	4.65E+01	0.10	3.94E+02	4.04E+02	9.80	7.03E+00	7.03E+00	0.00	4.96E+03	5.01E+03	48.70	1.89E+02	1.89E+02	0.13	1.75E+03	1.76E+03	1.20	0.00E+00	0.00E+00	0.00	7.72E+03	7.72E+03	0.00	1.51E+04	1.51E+04	60.05	
Year 21	8.26E-02	8.77E-02	0.01	2.10E+01	2.10E+01	0.00	1.19E+01	1.20E+01	0.12	4.64E+01	4.65E+01	0.10	3.94E+02	4.06E+02	12.06	7.03E+00	7.03E+00	0.00	4.96E+03	5.01E+03	48.70	1.89E+02	1.89E+02	0.13	1.75E+03	1.76E+03	1.40	0.00E+00	0.00E+00	0.00	7.72E+03	7.72E+03	0.00	1.51E+04	1.51E+04	62.52	
Year 22	8.60E-02	9.14E-02	0.01	2.10E+01	2.10E+01	0.00	1.19E+01	1.20E+01	0.12	4.64E+01	4.65E+01	0.10	3.94E+02	4.06E+02	12.01	7.03E+00	7.03E+00	0.00	4.96E+03	5.01E+03	48.70	1.89E+02	1.89E+02	0.12	1.76E+03	1.76E+03	1.40	0.00E+00	0.00E+00	0.00	7.72E+03	7.72E+03	0.00	1.51E+04	1.51E+04	62.46	
Year 23	8.94E-02	9.51E-02	0.01	2.10E+01	2.10E+01	0.00	1.19E+01	1.20E+01	0.12	4.64E+01	4.65E+01	0.10	3.94E+																								

Table F.2-2
Predicted Radionuclide Doses for Human Receptors

Arithmetic Mean				Dose from Groundshine (µSv/yr)			Dose from Water (µSv/yr)			Dose from Inhalation (µSv/yr)			Dose from Berries (µSv/yr)			Dose from Fish (µSv/yr)			Dose from Soil (µSv/yr)			Dose from Caribou (µSv/yr)			Dose from Squirrel (µSv/yr)			Dose from Ptarmigan (µSv/yr)			Dose from Labrador Tea (µSv/yr)			Dose from Radon (µSv/yr)			Total Dose (µSv/yr)		
Year	Baseline	Baseline + Kiggavik	Incremental	Baseline	Baseline + Kiggavik	Incremental	Baseline	Baseline + Kiggavik	Incremental	Baseline	Baseline + Kiggavik	Incremental	Baseline	Baseline + Kiggavik	Incremental	Baseline	Baseline + Kiggavik	Incremental	Baseline	Baseline + Kiggavik	Incremental	Baseline	Baseline + Kiggavik	Incremental	Baseline	Baseline + Kiggavik	Incremental	Baseline	Baseline + Kiggavik	Incremental	Baseline	Baseline + Kiggavik	Incremental	Baseline	Baseline + Kiggavik	Incremental			
Year 1	1.13E-02	1.13E-02	0.00	2.10E-01	2.10E-01	0.00	1.19E-01	1.19E-01	0.00	4.64E-01	4.64E-01	0.00	4.64E-01	4.64E-01	0.00	3.55E-02	3.55E-02	0.00	7.02E-02	7.02E-02	0.00	4.96E-03	4.96E-03	0.00	1.89E-02	1.89E-02	0.00	1.75E-03	1.75E-03	0.00	0.00E+00	0.00E+00	0.00	1.50E-04	1.50E-04	0.00			
Year 2	1.50E-02	1.50E-02	0.00	2.10E-01	2.10E-01	0.00	1.19E-01	1.19E-01	0.00	4.64E-01	4.64E-01	0.00	4.64E-01	4.64E-01	0.00	3.55E-02	3.55E-02	0.00	7.02E-02	7.02E-02	0.00	4.96E-03	4.96E-03	0.00	1.89E-02	1.89E-02	0.00	1.75E-03	1.75E-03	0.00	0.00E+00	0.00E+00	0.00	1.50E-04	1.50E-04	0.00			
Year 3	1.87E-02	1.87E-02	0.00	2.10E-01	2.10E-01	0.00	1.19E-01	1.19E-01	0.00	4.64E-01	4.64E-01	0.00	4.64E-01	4.64E-01	0.00	3.55E-02	3.55E-02	0.00	7.02E-02	7.02E-02	0.00	4.96E-03	4.96E-03	0.00	1.89E-02	1.89E-02	0.00	1.75E-03	1.75E-03	0.00	0.00E+00	0.00E+00	0.00	1.50E-04	1.50E-04	0.00			
Year 4	2.24E-02	2.24E-02	0.00	2.10E-01	2.10E-01	0.00	1.19E-01	1.19E-01	0.00	4.64E-01	4.64E-01	0.00	4.64E-01	4.64E-01	0.00	3.55E-02	3.55E-02	0.00	7.02E-02	7.02E-02	0.00	4.96E-03	4.96E-03	0.00	1.89E-02	1.89E-02	0.00	1.75E-03	1.75E-03	0.00	0.00E+00	0.00E+00	0.00	1.50E-04	1.50E-04	0.00			
Year 5	2.61E-02	2.63E-02	0.00	2.10E-01	2.10E-01	0.00	1.19E-01	1.20E-01	0.09	4.64E-01	4.65E-01	0.07	3.55E-02	3.55E-02	0.00	7.02E-02	7.02E-02	0.00	4.96E-03	4.97E-03	10.10	1.89E-02	1.89E-02	0.00	1.75E-03	1.75E-03	0.00	0.00E+00	0.00E+00	0.00	1.50E-04	1.50E-04	0.10	1.50E-04	1.50E-04	10.26			
Year 6	2.97E-02	3.02E-02	0.00	2.10E-01	2.10E-01	0.00	1.19E-01	1.20E-01	0.09	4.64E-01	4.65E-01	0.07	3.55E-02	3.55E-02	0.00	7.02E-02	7.02E-02	0.00	4.96E-03	4.97E-03	10.10	1.89E-02	1.89E-02	0.00	1.75E-03	1.75E-03	0.00	0.00E+00	0.00E+00	0.00	1.50E-04	1.50E-04	0.10	1.50E-04	1.50E-04	10.26			
Year 7	3.34E-02	3.42E-02	0.00	2.10E-01	2.10E-01	0.00	1.19E-01	1.20E-01	0.09	4.64E-01	4.65E-01	0.07	3.55E-02	3.55E-02	0.00	7.02E-02	7.02E-02	0.00	4.96E-03	4.97E-03	10.10	1.89E-02	1.89E-02	0.00	1.75E-03	1.75E-03	0.00	0.00E+00	0.00E+00	0.00	1.50E-04	1.50E-04	0.10	1.50E-04	1.50E-04	10.26			
Year 8	3.70E-02	3.81E-02	0.00	2.10E-01	2.10E-01	0.00	1.19E-01	1.20E-01	0.13	4.64E-01	4.65E-01	0.10	3.55E-02	3.55E-02	0.00	7.02E-02	7.02E-02	0.00	4.96E-03	4.98E-03	17.10	1.89E-02	1.89E-02	0.00	1.75E-03	1.75E-03	0.00	0.00E+00	0.00E+00	0.00	1.50E-04	1.50E-04	0.13	1.50E-04	1.50E-04	17.35			
Year 9	4.06E-02	4.20E-02	0.00	2.10E-01	2.10E-01	0.00	1.19E-01	1.20E-01	0.13	4.64E-01	4.65E-01	0.10	3.55E-02	3.55E-02	0.00	7.02E-02	7.02E-02	0.00	4.96E-03	4.98E-03	17.10	1.89E-02	1.89E-02	0.00	1.75E-03	1.75E-03	0.00	0.00E+00	0.00E+00	0.00	1.50E-04	1.50E-04	0.13	1.50E-04	1.50E-04	17.35			
Year 10	4.42E-02	4.59E-02	0.00	2.10E-01	2.10E-01	0.00	1.19E-01	1.20E-01	0.13	4.64E-01	4.65E-01	0.10	3.55E-02	3.55E-02	0.00	7.02E-02	7.02E-02	0.00	4.96E-03	4.98E-03	17.10	1.89E-02	1.89E-02	0.00	1.75E-03	1.75E-03	0.00	0.00E+00	0.00E+00	0.00	1.50E-04	1.50E-04	0.13	1.50E-04	1.50E-04	17.33			
Year 11	4.77E-02	4.9E-02	0.00	2.10E-01	2.10E-01	0.00	1.19E-01	1.20E-01	0.12	4.64E-01	4.65E-01	0.10	3.55E-02	3.55E-02	0.00	7.02E-02	7.02E-02	0.00	4.96E-03	4.98E-03	17.10	1.89E-02	1.89E-02	0.00	1.75E-03	1.75E-03	0.00	0.00E+00	0.00E+00	0.00	1.50E-04	1.50E-04	0.12	1.50E-04	1.50E-04	20.23			
Year 12	5.11E-02	5.37E-02	0.00	2.10E-01	2.10E-01	0.00	1.19E-01	1.20E-01	0.12	4.64E-01	4.65E-01	0.10	3.55E-02	3.55E-02	0.00	7.02E-02	7.02E-02	0.00	4.96E-03	4.98E-03	17.10	1.89E-02	1.89E-02	0.00	1.75E-03	1.75E-03	0.00	0.00E+00	0.00E+00	0.00	1.50E-04	1.50E-04	0.12	1.50E-04	1.50E-04	20.23			
Year 13	5.48E-02	5.75E-02	0.00	2.10E-01	2.10E-01	0.00	1.19E-01	1.20E-01	0.12	4.64E-01	4.65E-01	0.10	3.55E-02	3.55E-02	0.00	7.02E-02	7.02E-02	0.00	4.96E-03	4.98E-03	17.10	1.89E-02	1.89E-02	0.00	1.75E-03	1.75E-03	0.00	0.00E+00	0.00E+00	0.00	1.50E-04	1.50E-04	0.12	1.50E-04	1.50E-04	19.92			
Year 14	5.84E-02	6.13E-02	0.00	2.10E-01	2.10E-01	0.00	1.19E-01	1.20E-01	0.12	4.64E-01	4.65E-01	0.10	3.55E-02	3.55E-02	0.00	7.02E-02	7.02E-02	0.00	4.96E-03	4.98E-03	19.70	1.89E-02	1.89E-02	0.00	1.75E-03	1.75E-03	0.00	0.00E+00	0.00E+00	0.00	1.50E-04	1.50E-04	0.12	1.50E-04	1.50E-04	20.03			
Year 15	6.19E-02	6.51E-02	0.00	2.10E-01	2.10E-01	0.00	1.19E-01	1.20E-01	0.12	4.64E-01	4.65E-01	0.10	3.55E-02	3.55E-02	0.00	7.03E-02	7.03E-02	0.00	4.96E-03	4.98E-03	19.70	1.89E-02	1.89E-02	0.00	1.75E-03	1.75E-03	0.00	0.00E+00	0.00E+00	0.00	1.50E-04	1.50E-04	0.12	1.50E-04	1.50E-04	19.92			
Year 16	6.53E-02	6.89E-02	0.00	2.10E-01	2.10E-01	0.00	1.19E-01	1.20E-01	0.12	4.64E-01	4.65E-01	0.10	3.55E-02	3.55E-02	0.00	7.03E-02	7.03E-02	0.00	4.96E-03	4.98E-03	19.70	1.89E-02	1.89E-02	0.00	1.75E-03	1.75E-03	0.00	0.00E+00	0.00E+00	0.00	1.50E-04	1.50E-04	0.12	1.50E-04	1.50E-04	19.93			
Year 17	6.88E-02	7.27E-02	0.00	2.10E-01	2.10E-01	0.00	1.19E-01	1.20E-01	0.12	4.64E-01	4.65E-01	0.10	3.55E-02	3.55E-02	0.00	7.03E-02	7.03E-02	0.00	4.96E-03	4.98E-03	19.70	1.89E-02	1.89E-02	0.00	1.75E-03	1.75E-03	0.00	0.00E+00	0.00E+00	0.00	1.50E-04	1.50E-04	0.12	1.50E-04	1.50E-04	20.03			
Year 18	7.23E-02	7.62E-02	0.00	2.10E-01	2.10E-01	0.00	1.19E-01	1.20E-01	0.13	4.64E-01	4.65E-01	0.10	3.55E-02	3.55E-02	0.00	7.03E-02	7.03E-02	0.00	4.96E-03	4.98E-03	19.80	1.89E-02	1.89E-02	0.00	1.75E-03	1.75E-03	0.00	0.00E+00	0.00E+00	0.00	1.50E-04	1.50E-04	0.13	1.50E-04	1.50E-04	17.44			
Year 19	7.57E-02	8.02E-02	0.00	2.10E-01	2.10E-01	0.00	1.19E-01	1.20E-01	0.12	4.64E-01	4.65E-01	0.10	3.55E-02	3.55E-02	0.00	7.03E-02	7.03E-02	0.00	4.96E-03	4.98E-03	19.80	1.89E-02	1.89E-02	0.00	1.75E-03	1.75E-03	0.00	0.00E+00	0.00E+00	0.00	1.50E-04	1.50E-04	0.12	1.50E-04	1.50E-04	20.03			
Year 20	7.92E-02	8.40E-02	0.00	2.10E-01	2.10E-01	0.00	1.19E-01	1.20E-01	0.12	4.64E-01	4.65E-01	0.10	3.55E-02	3.55E-02	0.00	7.03E-02	7.03E-02	0.00	4.96E-03	4.98E-03	19.80	1.89E-02	1.89E-02	0.00	1.75E-03	1.75E-03	0.00	0.00E+00	0.00E+00	0.00	1.50E-04	1.50E-04	0.12	1.50E-04	1.50E-04	20.12			
Year 21	8.26E-02	8.77E-02	0.01	2.10E-01	2.10E-01	0.00	1.19E-01	1.20E-01	0.12	4.64E-01	4.65E-01	0.10	3.55E-02	3.55E-02	0.00	7.03E-02	7.03E-02	0.00	4.96E-03	4.98E-03	19.80	1.89E-02	1.89E-02	0.00	1.75E-03	1.75E-03	0.00	0.00E+00	0.00E+00	0.00	1.50E-04	1.50E-04	0.12	1.50E-04	1.50E-04	20.03			
Year 22	8.60E-02	9.14E-02	0.01	2.10E-01	2.10E-01	0.00	1.19E-01	1.20E-01	0.12	4.64E-01	4.65E-01	0.10	3.55E-02	3.55E-02	0.00	7.03E-02	7.03E-02	0.00	4.96E-03	4.98E-03	19.80	1.89E-02	1.89E-02	0.00	1.75E-03	1.75E-03	0.00	0.00E+00	0.00E+00	0.00	1.50E-04	1.50E-04	0.12	1.50E-04	1.50E-04	20.04			
Year 23	8.94E-02	9.51E-02	0.01	2.10E-01	2.10E-01	0.00	1.19E-01	1.20E-01	0.12	4.64E-01	4.65E-01	0.10	3.55E-02	3.55E-02	0.00	7.03E-02	7.03E-02	0.00	4.96E-03	4.98E-03	19.80	1.89E-02	1.89E-02	0.00	1.75E-03	1.75E-03	0.00	0.00E+00	0.00E+00	0.00	1.50E-04	1.50E-04	0.12	1.50E-04	1.50E-04	20.04			
Year 24	9.28E-02	9.88E-02	0.01	2.10E-01	2.10E-01	0.00	1.19E-01	1.20E-01	0.12	4.64E-01	4.65E-01	0.10	3.55E-02	3.55E-02	0.00	7.03E-02	7.03E-02	0.00	4.96E-03	4.98E-03	19.80	1.89E-02	1.89E-02	0.00	1.75E-03	1.75E-03	0.00	0.00E+00	0.00E+00	0.00	1.50E-04	1.50E-04	0.12	1.50E-04	1.50E-04	20.03			
Year 25	9.62E-02	1.02E-01	0.01	2.10E-01	2.10E-01	0.00	1.19E-01	1.20E-01	0.12	4.64E-01	4.65E-01	0.10	3.55E-02	3.55E-02	0.00	7.03E-02	7.03E-02	0.00	4.96E-03	4.98E-03	19.80	1.89E-02	1.89E-02	0.00	1.75E-03	1.75E-03	0.00	0.00E+00	0.00E+00	0.00	1.50E-04	1.50E-04	0.12	1.50E-04	1.50E-04	17.45			
Year 26	9.95E-02	1.06E-01	0.01	2.10E-01	2.10E-01	0.00	1.19E-01	1.20E-01	0.12	4.64E-01	4.65E-01	0.10	3.55E-02	3.55E-02	0.00	7.03E-02	7.03E-02	0.00	4.96E-03	4.98E-03	19.80	1.89E-02	1.89E-02	0.00	1.75E-03	1.75E-03	0.00	0.00E+00	0.00E+00	0.00	1.50E-04	1.50E-04	0.12	1.50E-04	1.50E-04	20.04			
Year 27	1.03E-01	1.10E-01	0.07	2.10E-01	2.10E-01	0.00	1.19E-01	1.20E-01	0.12	4.64E-01	4.65E-01	0.10	3.55E-02	3.55E-02	0.00	7.03E-02	7.03E-02	0.00	4.96E-03	4.98E-03	19.80	1.89E-02	1.89E-02	0.00	1.75E-03	1.75E-03	0.00	0.00E+00	0.00E+00	0.00	1.50E-04	1.50E-04	0.12	1.50E-04	1.50E-04	20.13			
Year 28	1.06E-01	1.13E-01	0.07	2.10E-01	2.10E-01	0.00	1.19E-01	1.20E-01	0.12																														

ATTACHMENT G TOXICITY BENCHMARK BACKGROUND

G.1 INTRODUCTION

This appendix provides all the background information that was used in the selection of the toxicity reference values (TRVs) for non-radionuclide and radionuclide COPC for the Project. The appendix describes the selection of the ecological TRVs including radiological biological Effectiveness (RBE) factors as well as reference dose limits for radiological COPC. TRVs that are protective of human health are also described.

G.2 AQUATIC ORGANISMS

G.2.1 *General*

The U.S. EPA ECOTOXicology database (ECOTOX) was used for selection of TRVs for aquatic biota. This database reports toxicity data for a wide range of aquatic species as well as laboratory and field studies. For most chemicals, ECOTOX includes toxicity data in literature from 1972 to the present. All data were quality assured according to EPA's criteria, and the system was updated quarterly (U.S. EPA 2000).

For the purpose of this review, the following principles were applied in the data selection:

- Endpoints involving growth, reproduction and survival were considered to be relevant to persistence of aquatic populations;
- Only freshwater toxicity studies were considered;
- Records without test duration, endpoint and exposure concentration were eliminated;
- Chronic toxicity data were preferred in the selection. When chronic data were not sufficient (minimum of 2), acute data were considered and converted to chronic values;
- Chronic EC₂₀ concentrations were preferred. If not reported, other endpoints were considered and adjusted to an estimated EC₂₀ value (Table G.2-1).
- If a selected TRV was lower than the CCME Guideline for Protection of Aquatic Life (CCME 1999), then the latter was used.

Table G.2-1**Procedure for Adjusting Test Endpoints to Chronic EC₂₀**

Test Endpoint	Adjustment to Chronic EC ₂₀ ^a
EC ₁₀	Chronic or acute EC ₁₀ multiplied by 2
EC ₂₅	Chronic EC ₂₅ multiplied by 4/5
EC ₃₀	Chronic EC ₃₀ multiplied by 2/3
EC ₅₀	Chronic or acute EC ₅₀ multiplied by 2/5
IC ₁₀	IC ₁₀ is treated as EC ₁₀ ; multiplied by 2
IC ₂₀	Treated as EC ₂₀ ; no adjustment
IC ₅₀	IC ₅₀ is treated as EC ₅₀ ; multiplied by 2/5
LC ₁₀	Chronic LC ₁₀ multiplied by 5/4; acute LC ₁₀ multiplied by 5/10
LC ₅₀	Chronic LC ₅₀ divided by 4; acute LC ₅₀ divided by 10
LD ₅₀	LD ₅₀ is treated as LC ₅₀ ; Chronic LC ₅₀ divided by 4 to get chronic EC ₂₀
MATC ^b	Treated as EC ₅₀ ; multiplied by 2/5
NR ^c	Treated as EC ₂₀ but suspect
Note: a-Acute data was only used in the absence of acceptable chronic data b-MATC records were only included in the derivation of the TRV in the absence of other acceptable EC, LC or IC data; if two or more chronic MATC records were available, they were used in preference of acute data c-NR records were only included in the derivation of the TRV in the absence of other acceptable chronic or acute data	

TRVs derived for aquatic biota included six taxonomic categories: forage fish, predator fish, zooplankton, benthic invertebrates, phytoplankton, and aquatic plants. If more than 20 chronic EC₂₀ values were available in each taxonomic group, a 5th percentile of the EC₂₀ distribution was used as a recommended TRV; if there were less than 20 chronic EC₂₀ values, the lowest EC₂₀ was used as a recommended TRV for the taxonomic category.

The lowest chronic EC₂₀ or 5th percentile of chronic EC₂₀ values derived from the above process were compared with widely used TRVs in ecological risk assessment as recommended by Suter & Tsao (1996), U.S. EPA, CCME or other government guideline documents. The more appropriate values were selected as the recommended TRVs for each taxonomic category in this review.

Basis for Adjustments to EC₂₀

The adjustment from acute LC₅₀ to chronic EC₂₀ (a 1/10 factor) was used by EC/HC (2003) based on review of aquatic toxicity literature for uranium. The adjustment from chronic LC₅₀ to chronic EC₂₀ (a ¼ factor) was based on an assumed linear chronic dose-response with zero response at EC₀ and 50% response at the EC₅₀ concentration.

There is considerable uncertainty around these generic factors when applied to a particular chemical. For example, acute chronic ratios (ACRs) for metals (used in U.S. EPA water quality criteria) range from 2 to 51, as compared to our generic value of 10. Suter & Tsao (1996)

examined the relationships between acute LC₅₀s and chronic values and found that the more toxic chemicals tend to have smaller ACRs. Dose-response curves are typically not linear, as assumed, but the simple linear assumption is conservative when adjusting to a lower response level, such as EC₅₀ to EC₂₀.

G.2.2 Arsenic

The TRVs for arsenic are all chronic adjusted EC₂₀ values and were selected based on information obtained from the U.S. EPA ECOTOX database. The data in the ECOTOX database pertained mainly to EC₅₀, LC₅₀ and NOEC and LOEC values, the latter two of which were not included in the derivation of the TRVs. All toxicity values were adjusted to chronic EC₂₀ values according to the guidelines outlined in Table G.2-1. If there were fewer than 20 toxicity values, then the minimum adjusted EC₂₀ value was selected as the TRV, as was the case for aquatic plants, zooplankton and forage fish. For benthic invertebrates and predator fish, more than 20 records were found suitable for derivation of both of the TRVs and so the TRVs were selected as the 5th percentile of the adjusted chronic EC₂₀ values. The selected TRVs are summarized in Table G.2-2 from which it can be seen that benthic invertebrates and forage fish are the most sensitive to arsenic exposure while predator fish are the least sensitive.

Table G.2-2

Recommended Chronic Arsenic TRVs for Aquatic Biota

Taxonomic Group	TRV (µg/L)	# of Estimated Chronic EC₂₀ Values	Rationale
Forage fish	123	2	Lowest estimated chronic EC ₂₀
Predator fish	630	50	5th percentile of estimated chronic EC ₂₀
Aquatic plants	252	8	Lowest estimated chronic EC ₂₀
Zooplankton	340	6	Lowest estimated chronic EC ₂₀
Benthic invertebrates	122	27	5 th percentile of estimated chronic EC ₂₀

G.2.3 Cadmium

The TRVs for cadmium are all chronic adjusted EC₂₀ values and were selected based on information obtained from the U.S. EPA ECOTOX database. The selected TRVs are summarized in Table G.2-3.

Table G.2-3**Recommended Chronic Cadmium TRVs for Aquatic Biota**

Taxonomic Group	TRV (µg/L)	Reference	Rationale
Forage fish	7.3		
Predator fish	0.6		
Aquatic plants	16	Naumann et al 2007	from U.S. EPA ECOTOX database; EC10 7-d; used as TRV
Zooplankton	0.23		
Benthic invertebrates	0.5		

G.2.4 Cobalt

The TRVs for cobalt are all adjusted chronic EC₂₀ values and were selected based on information obtained from the U.S. EPA ECOTOX database. The data in the ECOTOX database pertained mainly to EC₅₀, LC₅₀ and NOEC and LOEC values, the latter two of which were not included in the derivation of the TRVs. All toxicity values were adjusted to chronic EC₂₀ values according to the guidelines outlined in Table G.2-4. If there were fewer than 20 toxicity values, then the minimum adjusted EC₂₀ value was selected as the TRV. This was true for all aquatic biota for cobalt. The selected TRVs are summarized in Table , from which it can be seen that zooplankton and benthic invertebrates are the most sensitive to cobalt exposure while forage fish are the least sensitive.

Table G.2-4**Recommended Chronic Cobalt TRVs for Aquatic Biota**

Taxonomic Group	TRV (µg/L)	# of Estimated Chronic EC₂₀ Values	Rationale
Forage fish	203	2	Lowest estimated chronic EC ₂₀
Predator fish	118	50	Lowest estimated chronic EC ₂₀
Aquatic plants	54.3	8	Lowest estimated chronic EC ₂₀
Zooplankton	4.8	6	Lowest estimated chronic EC ₂₀
Benthic invertebrates	4	27	Lowest estimated chronic EC ₂₀

G.2.5 Copper

The TRVs for copper for three of the five aquatic biotas are adjusted chronic EC₂₀ values and were selected based on information obtained from the U.S. EPA ECOTOX database. The data in the ECOTOX database pertained mainly to EC₅₀, LC₅₀ and NOEC and LOEC values, the latter two of which were not included in the derivation of the TRVs. These toxicity values were adjusted to chronic EC₂₀ values according to the guidelines outlined in Table G.2-1. If there were fewer than 20 toxicity values, the minimum adjusted EC₂₀ value was selected as the TRV.

However, if there were more than 20 acceptable records then the 5th percentile value of the adjusted chronic EC₂₀ data was used, as was the case for aquatic plants, forage fish and predator fish. In the case of two of the aquatic biota (i.e. zooplankton and benthic invertebrates), the derived TRVs were lower than the existing CCME guideline values (CCME 1999) and so the CCME values were selected as the TRVs. The selected TRVs are summarized in Table G.2-5, from which it can be seen that zooplankton, benthic invertebrates, forage fish and predator fish are the most sensitive to copper exposure, while aquatic plants are the least sensitive. It should be noted that although the toxicity of copper is affected by water hardness, the values presented here have not been hardness-adjusted.

Table G.2-5

Recommended Chronic Copper TRVs for Aquatic Biota

Taxonomic Group	TRV (µg/L)	# of Estimated Chronic EC₂₀ Values	Rationale
Forage fish	6	237	5 th percentile of estimated chronic EC ₂₀
Predator fish	4	89	5 th percentile of estimated chronic EC ₂₀
Aquatic plants	38	28	5 th percentile of estimated chronic EC ₂₀
Zooplankton	4	117	Previously used value based on CCME (1999)
Benthic invertebrates	4	264	Previously used value based on CCME (1999)
Note: Values have not been adjusted for water hardness			

G.2.6 Lead

The TRVs for lead for four of the five aquatic biotas are adjusted chronic EC₂₀ values and were selected based on information obtained from the U.S. EPA ECOTOX database. The data in the ECOTOX database pertained mainly to EC₅₀, LC₅₀ and NOEC and LOEC values, the latter two of which were not included in the derivation of the TRVs. All toxicity values were adjusted to chronic EC₂₀ values according to the guidelines outlined in Table G.2-1. If there were fewer than 20 toxicity values, then the minimum adjusted EC₂₀ value was selected as the TRV. However, if there were more than 20 acceptable records then the 5th percentile value of the adjusted chronic EC₂₀ data was used. The derived TRV for benthic invertebrates was lower than the existing CCME guideline value (CCME 1999), and so the CCME value was selected as the TRV. The selected TRVs are summarized in Table G.2-6, from which it can be seen that benthic invertebrates are the most sensitive to lead exposure while aquatic plants are the least sensitive. It should be noted that although the toxicity of lead is affected by water hardness, the values presented here have not been hardness-adjusted.

Table G.2-6**Recommended Chronic Lead TRVs for Aquatic Biota**

Taxonomic Group	TRV (µg/L)	# of Estimated Chronic EC₂₀ Values	Rationale
Forage fish	132	3	Lowest estimated chronic EC ₂₀
Predator fish	14.2	25	5 th percentile of estimated chronic EC ₂₀
Aquatic plants	439	9	Lowest estimated chronic EC ₂₀
Zooplankton	40	5	Lowest estimated chronic EC ₂₀
Benthic invertebrates	1 ^a	12	CCME guideline (1999)
Note: Values have not been adjusted for water hardness a - CCME guideline values (1999) are as follows: 1 µg/L for water hardness of 0-60 mg/L; 2 µg/L for water hardness of 60-120 mg/L; 4 µg/L for water hardness of 120-180 mg/L; and 7 µg/L for water hardness greater than 180 mg/L			

G.2.7 Molybdenum

The TRVs for molybdenum for four of the five aquatic biotas are adjusted chronic EC₂₀ values and were selected based on information obtained from the U.S. EPA ECOTOX database. The data in the ECOTOX database pertained mainly to EC₅₀, LC₅₀ and NOEC and LOEC values, the latter two of which were not included in the derivation of the TRVs. All toxicity values were adjusted to chronic EC₂₀ values according to the guidelines outlined in Table G.2-1. If there were fewer than 20 toxicity values, then the minimum adjusted EC₂₀ value was selected as the TRV. For aquatic plants, only one study was available by Den Dooren De Jong (1965). The selected TRVs are summarized in Table G.2-7, from which it can be seen that predator fish are the most sensitive to molybdenum exposure while forage fish and aquatic plants are the least sensitive.

Table G.2-7**Recommended Chronic Molybdenum TRVs for Aquatic Biota**

Taxonomic Group	TRV (µg/L)	# of Estimated Chronic EC₂₀ Values	Rationale
Forage fish	5000	5	Lowest estimated chronic EC ₂₀
Predator fish	183	3	Lowest estimated chronic EC ₂₀
Aquatic plants	15000	-	LOEC, Den Dooren De Jong (1965)
Zooplankton	233	4	Lowest estimated chronic EC ₂₀
Benthic invertebrates	250	2	Lowest estimated chronic EC ₂₀

G.2.8 Nickel

The TRVs for nickel are all adjusted chronic EC₂₀ values and were selected based on information obtained from the U.S. EPA ECOTOX database. The data in the ECOTOX database pertained mainly to EC₅₀, LC₅₀ and NOEC and LOEC values, the latter two of which were not

included in the derivation of the TRVs. All toxicity values were adjusted to chronic EC₂₀ values according to the guidelines outlined in Table G.2-1. If there were fewer than 20 toxicity values, the minimum adjusted EC₂₀ value was selected as the TRV, as was the case for all aquatic biota except for benthic invertebrates. For benthic invertebrates, more than 20 records were found suitable for derivation of the TRV and so the TRV was selected as the 5th percentile of the adjusted chronic EC₂₀ values. The selected TRVs are summarized in Table G.2-8, from which it can be seen that zooplankton are the most sensitive to nickel exposure while forage fish are the least sensitive. It should be noted that although the toxicity of nickel is affected by water hardness, the values presented here have not been hardness-adjusted.

Table G.2-8

Recommended Chronic Nickel TRVs for Aquatic Biota

Taxonomic Group	TRV (µg/L)	# of Estimated Chronic EC₂₀ Values	Rationale
Forage fish	535	3	Lowest estimated chronic EC ₂₀
Predator fish	62	17	Lowest estimated chronic EC ₂₀
Aquatic plants	84	10	Lowest estimated chronic EC ₂₀
Zooplankton	38	12	Lowest estimated chronic EC ₂₀
Benthic invertebrates	53.5	47	5 th percentile of estimated chronic EC ₂₀
Note: Values have not been adjusted for water hardness			

G.2.9 Selenium

The TRVs for selenium are all adjusted chronic EC₂₀ values and were selected based on information obtained from the U.S. EPA ECOTOX database. The data in the ECOTOX database pertained mainly to EC₅₀, LC₅₀ and NOEC and LOEC values, the latter two of which were not included in the derivation of the TRVs. All toxicity values were adjusted to chronic EC₂₀ values according to the guidelines outlined in Table G.2-1. If there were fewer than 20 toxicity values, the minimum adjusted EC₂₀ value was selected as the TRV, but if there were more than 20 records the TRV was selected as the 5th percentile of the adjusted chronic EC₂₀ values. The selected TRVs are summarized in Table G.2-9.

For forage and predator fish, the TRV is a whole body fish concentration and the following paragraphs discuss the development of the number.

Hamilton (2003) provides a detailed review of tissue-based selenium concentrations for freshwater fish. Hamilton presents a list of selenium concentrations in tissues that have been associated with toxic effects in fish. The concentrations range from a low value of 2 µg/g dw (dry weight basis) associated with blood changes in rainbow trout to a maximum of about 16 µg/g dw in fathead minnows and bluegill sunfish associated with reproductive failure. Based on the information provided in the Hamilton paper, it has been suggested that a whole body selenium threshold of 4 µg/g dw in fish is an appropriate value to use. However, Hamilton (2004) used low values (from studies such as Hunn *et al.* 1987 and Hamilton *et al.* 1990) to derive the whole

body selenium threshold. These values were rejected by the U.S. EPA (2004) in deriving a final chronic value for selenium. Therefore, Hamilton's whole body selenium threshold value of 4 µg/g dw is not considered in this review.

The B.C. guideline for selenium is based on a proposed whole body toxicity threshold (EC₁₀) of 6 µg/g dw for Chinook salmon based on the 60-day exposure data by Brix *et al.* (2004) combined with Hamilton *et al.* (1990) (Nagpal and Howell 2001). They assumed 80% moisture content to develop a safe level for selenium on a wet weight (ww) basis of 1.2 µg Se/g ww (i.e. 6 µg Se/g dw). In this review, the EC₂₀ is selected as the preferred endpoint for the TRV, so the B.C. guideline value based on EC₁₀ for selenium is not recommended.

Muscatello *et al.* (2006) reported whole body Se EC₂₀s of 15.56 and 17.72 µg/g (dw), converted from fish egg and muscle concentrations respectively, which caused total fry deformities of northern pike (*Esox lucius*) exposed to uranium mining effluent. Further studies (Muscatello *et al.* 2008, Muscatello and Janz 2009) suggested that Se concentrations were elevated in aquatic biota by biomagnification factors of 1.5 to 6 between low and higher trophic levels downstream of uranium mining and milling operations. Fish tissue concentrations exceeded a 3 to 11 µg/g (dw) dietary toxicity threshold when water and sediment concentrations of Se were as low as 0.43 µg/L and 0.54 µg/g (dw), respectively. However, no adverse effects on the studied fish were identified in these more recent studies (Muscatello *et al.* 2008, Muscatello and Janz 2009).

A final chronic value (FCV) of 7.91 µg/g dw was recommended by the U.S. EPA in its 2004 Draft Aquatic Life Ambient Water Quality Criteria for Selenium, which is based on Lemly's (1993) study with juvenile bluegill sunfish (*Lepomis macrochirus*). Significantly elevated mortality (40%) was reported after exposure to the combination of low-level waterborne and dietary selenium for 180 days with temperatures decreasing from 20°C to 4°C.

The U.S. EPA conducted further studies of selenium effects on juvenile bluegill sunfish at reduced temperatures (McIntyre *et al.* 2008). That study suggested that the toxicity of selenium to juvenile bluegill was approximately 1.9 times less than that observed in the Lemly (1993) study. With similar test conditions, an EC₂₀ of 10.16 µg/g dw was reported for the survival of juvenile bluegill sunfish with the exposure temperature decreased from 20°C to near 4°C, while an EC₂₀ of 14.02 µg/g dw was reported for the survival of juvenile bluegill sunfish with the exposure temperature decreased from 20°C to 9°C. The results of the U.S. EPA (McIntyre *et al.* 2008) study are consistent with the results of Muscatello *et al.* (2006) for larval northern pike.

Therefore, the EC₂₀ of 10.16 µg/g dw from U.S. EPA (McIntyre *et al.* 2008) based on survival of juvenile bluegill sunfish exposed to a combination of low-level waterborne and dietary selenium and declining temperature is considered protective of forage fish, and is recommended as the TRV for forage and predator fish.

Table G.2-9**Recommended Chronic Selenium TRVs for Aquatic Biota**

Taxonomic Group	TRV (µg/L)	# of Estimated Chronic EC₂₀ Values	Rationale
Forage fish	10.2	-	McIntyre <i>et al.</i> 2008
Predator fish	10.2	-	McIntyre <i>et al.</i> 2008
Aquatic plants	680	7	Lowest estimated chronic EC ₂₀
Zooplankton	10	-	LOEC, Crane <i>et al.</i> 1992
Benthic invertebrates	10	-	LOEC, Crane <i>et al.</i> 1992

G.2.10 Uranium

There was limited data available in the ECOTOX database pertaining to the effects of uranium exposure on aquatic biota. Data were instead obtained from two reports which investigated the toxicity of uranium to aquatic biota in Northern Saskatchewan (VST 2004, Liber *et al.* 2007). From these reports, data was obtained for 12 organisms, 10 of which were tested under chronic exposure, 2 of which were tested under acute exposure and 1 of which was tested under both conditions. Acute exposure was defined as 72 hours (algae species) or 96 hours (fish species), while chronic exposure varied from 6 to 31 days. Details on the experimental methodologies are provided in the afore-mentioned reports (VST 2004, Liber *et al.* 2007).

The TRVs for uranium were all derived from chronic studies from two literature sources (VST 2004, Liber *et al.* 2007). The results are summarized in Table G.2-10 for a water hardness of 60 mg/L CaCO₃.

Table G.2-10**Recommended Chronic Uranium TRVs for Aquatic Biota**

Taxonomic Group	TRV (µg/L)	Hardness (mg/L CaCO₃)	Rationale
Forage fish	550	60	Lowest estimated chronic EC ₂₀
Predator fish	1500	60	Lowest estimated chronic EC ₂₀
Aquatic plants	5500	60	Geometric mean of 2 EC ₂₅ values
Zooplankton	60	60	Lowest estimated chronic EC ₂₀
Benthic invertebrates	270	60	Lowest estimated chronic EC ₂₀

G.2.11 Zinc

The TRVs for zinc for two of the five aquatic biotas are adjusted chronic EC₂₀ values and were selected based on information obtained from the U.S. EPA ECOTOX database. The data in the ECOTOX database pertained mainly to EC₅₀, LC₅₀ and NOEC and LOEC values, the latter two

of which were not included in the derivation of the TRVs. All toxicity values were adjusted to chronic EC₂₀ values according to the guidelines outlined in Table G.2-1. If there were fewer than 20 toxicity values, the minimum adjusted EC₂₀ value was selected as the TRV, as was the case for forage fish and aquatic plants. The derived TRVs for predator fish, zooplankton and benthic invertebrates were lower than the existing CCME guideline values (CCME 1999), and so the CCME values were selected as the TRVs. The selected TRVs are summarized in Table G.2-11, from which it can be seen that aquatic plants are less sensitive to zinc exposure than are the other four aquatic biota. It should be noted that although the toxicity of zinc is affected by water hardness, the values presented here have not been hardness-adjusted.

Table G.2-11

Recommended Chronic Zinc TRVs for Aquatic Biota

Taxonomic Group	TRVs (µg/L)	# of Estimated Chronic EC₂₀ Values	Rationale
Forage fish	35	15	Lowest estimated chronic EC ₂₀
Predator fish	30	39	CCME guideline (1999)
Aquatic plants	116	7	Lowest estimated chronic EC ₂₀
Zooplankton	30	9	CCME guideline (1999)
Benthic invertebrates	30	14	CCME guideline (1999)
Note: Values have not been adjusted for water hardness			

G.2.12 Un-ionized Ammonia

The TRVs for un-ionized ammonia are from the Environment Canada/Health Canada Priority Substance List Assessment document for Ammonia in the Aquatic Environment, as summarized in Table G.2-12.

Table G.2-11

Recommended Chronic Un-Ionized Ammonia TRVs for Aquatic Biota

Taxonomic Group	TRVs (µg/L)	Reference	Rationale
Forage fish	173	EC/HC PSL2 (2001)	EC ₂₀ study provided in PSL2 – reduction in growth or reproductive success
Predator fish	90	EC/HC PSL2 (2001)	EC ₂₀ study provided in PSL2 – reduction in growth or reproductive success
Aquatic plants	-		No data available
Zooplankton	160	EC/HC PSL2 (2001)	Acute LC ₅₀ reported as geometric mean of 12 studies; derived TRV using a factor of 10 based on an empirical relationship between an acute LC ₅₀ and an EC ₂₀
Benthic invertebrates	120	EC/HC PSL2 (2001)	Acute LC ₅₀ ; lowest value for invertebrate species; derived TRV using a factor of 10 based on an empirical relationship between an acute LC ₅₀ and an EC ₂₀

G.2.13 Chloride

The TRVs for chloride are summarized in Table G.2-13.

Table G.2-13

Recommended Chronic Chloride TRVs for Aquatic Biota

Taxonomic Group	TRVs (mg/L)	Reference	Rationale
Forage fish	220	Beak 1999	LC ₅₀ from chronic test (>7 days). Derived EC ₂₀ using a factor of 4 based on an empirical relationship between a chronic LC ₅₀ and EC ₅₀
Predator fish	360	Beak 1999	LC ₅₀ from chronic test (>7 days). Derived EC ₂₀ using a factor of 4 based on an empirical relationship between a chronic LC ₅₀ and EC ₅₀
Aquatic plants	1260	Buckley et al. 1996	EC ₅₀ on growth from chronic test (>7 days). Derived EC ₂₀ by linear extrapolation
Zooplankton	290	Degreave et al. 1985	EC ₅₀ for brood size from chronic test (>7 days). Derived EC ₂₀ by linear extrapolation
Benthic invertebrates	143	U.S. EPA ECOTOX	5 th percentile of estimated chronic EC ₂₀

G.3 TERRESTRIAL WILDLIFE

G.3.1 General

The U.S. EPA has developed a set of risk-based ecological soil screening levels (Eco-SSLs) for a number of chemicals that are of ecological concern at contaminated sites. The databases were developed and the Eco-SSLs derived in order to limit the need for the U.S. EPA and other risk assessors to perform repetitious toxicity data literature searches and evaluations for the same contaminants at every site. The derivation process and data gathering was a group effort involving federal, state, consulting, industry and academic participants.

There were four steps involved in the derivation of the Eco-SSLs. These were: i) conduct literature searches; ii) screen identified literature with exclusion and acceptability criteria; iii) extract, evaluate, and score results for applicability in deriving the Eco-SSL; and iv) derive the value.

The acceptability criteria that were used for the literature data for wildlife involved ensuring that the studies were related to the oral route of exposure and that at least two exposures (control and contaminant) were reported in the studies. The endpoints that were selected were behavioural, biochemical, growth, mortality, pathology, population, physiology, and reproduction. In addition, the studies needed to be chronic in duration (i.e. greater than 3 days exposure duration). The scoring was based on the various endpoints and was based on: the source of the data; the chemical form; measurement or no measurement in substrate; ability to calculate a dose; bounded vs. unbounded NOAEL/LOAEL (no/lowest observable adverse effects level); and, route of exposure, endpoint type, duration of exposure, statistical power and

adherence to test guidelines. Only studies that scored greater than 65% were used to derive a TRV. The TRV was generally equal to the geometric mean of the NOAEL values for growth and reproduction or the highest bounded NOAEL below the lowest bounded LOAEL for growth and reproduction.

Since the data used in the development of the Eco-SSLs underwent a rigorous screening process, it was felt that these data were appropriate to use in the derivation of NOAEL and LOAEL TRVs for this project.

In the derivation of the TRVs, a number of guiding principles were followed as outlined below:

- Studies were selected from the database where both NOAELs and LOAELs were reported as well as studies with only LOAELs. Studies that only reported NOAELs were not considered in the derivation of TRVs.
- TRVs were calculated as the geometric mean of the selected data for several species for both avian and mammalian wildlife. These species will serve as surrogates for various wildlife species that are similar in size and diet.
- NOAEL and LOAEL TRVs for each surrogate species were calculated as the geometric means of the NOAEL data for the NOAEL TRVs and LOAEL data for the LOAEL TRVs, pooling growth and reproduction endpoints
- A NOAEL TRV was only provided if there was an associated LOAEL TRV for the species; if only LOAEL data were available then only a LOAEL TRV was provided.

G.3.2 *Avian Species*

G.3.2.1 *Arsenic*

The data for growth and reproduction for avian species were obtained from the data presented in the Eco-SSL document for arsenic exposure (U.S. EPA 2005a). The data were based on only five studies with chickens and ducks; these species served as the surrogates for avian wildlife. The geometric means of the presented LOAEL data were calculated to derive the TRVs for each surrogate species. None of the studies presented in the Eco-SSL document for avian exposure to arsenic reported both LOAEL and NOAEL data and, as such, no NOAEL TRVs were calculated. The geometric means of the LOAELs for chickens and ducks are presented in Table G.3-1. In this assessment, the duck was used as the surrogate species for waterfowl. No appropriate surrogate species was available for the eagle and so the lowest LOAEL of 3.6 mg/kg-d for the chicken was used as a conservative TRV for the eagle.

Table G.3-1**Recommended Chronic Arsenic TRVs for Avian Species**

Species	TRV (mg/kg-d)			
	NOAEL	# of data	LOAEL	# of data
Mallard duck (<i>Anas platyrhynchos</i>)	-	-	5.1	2
Chicken (<i>Gallus domesticus</i>)	-	-	3.6	1

G.3.2.2 Cobalt

There were two species of birds represented in the Eco-SSL database with growth and reproduction endpoints, and with LOAEL only or LOAELs and NOAELs reported for exposure to cobalt (U.S. EPA 2005b). The geometric means of the NOAELs and LOAELs were calculated for the chicken and the duck, the results of which are presented in Table G.3-2. The geometric means of the NOAELs were 4.09 and 14.8 mg/kg-d for the chicken and duck, respectively while the geometric means of the LOAELs were 14.1 mg/kg-d and 148 mg/kg-d for the chicken and duck, respectively. In this assessment, the duck was used as the surrogate species for waterfowl based on the same family, and similar size and diet. No appropriate surrogate species was available for the eagle and so the lowest NOAEL and LOAEL values of 4.09 mg/kg-d and 14.1 mg/kg-d, respectively, were used as conservative TRVs for the eagle.

Table G.3-2**Recommended Chronic Cobalt TRVS for Avian species**

Species	TRV (mg/kg-d)			
	NOAEL	# of data	LOAEL	# of data
Chicken (<i>Gallus domesticus</i>)	4.09	3	14.13	8
Duck (<i>Anas</i> sp.)	14.8	1	148	1

G.3.2.3 Copper

The data for growth and reproduction for avian species were obtained from the data presented in the Eco-SSL document for copper exposure (U.S. EPA 2007a). The data were based on studies with chickens, ducks and turkeys; these species served as the surrogates for avian wildlife. The geometric means calculated from the presented LOAEL and NOAEL data were selected to serve as the TRVs for each of the three species and are presented in Table G.3-3. In this assessment, the duck was used as the surrogate species for waterfowl based on the same family and similar size and diet. No appropriate surrogate species was available for the eagle and so the lowest NOAEL and LOAEL values of 15.3 mg/kg-d and 27 mg/kg-d, respectively, were used as conservative TRVs for the eagle.

Table G.3-3**Recommended Chronic Copper TRVs for Avian Species**

Species	TRV (mg/kg-d)			
	NOAEL	# of data	LOAEL	# of data
Chicken (<i>Gallus domesticus</i>)	19.9	54	34.9	78
Mallard duck (<i>Anas platyrhynchos</i>)	24.1	2	75.2	3
Turkey (<i>Meleagris gallopavo</i>)	15.3	5	27	9

G.3.2.4 Lead

There were three species of birds represented in the Eco-SSL database with growth and reproduction endpoints for exposure to lead, and with LOAEL only or LOAEL plus NOAEL values reported (U.S. EPA 2005c). The geometric means of the NOAEL and LOAEL data were calculated for each species and are presented in Table G.3-4 for the chicken, Japanese quail and ringed turtle dove. In this assessment, since none of the test species is suitable as a surrogate for waterfowl or the eagle, the lowest LOAEL of 11.8 mg/kg-d was used as a conservative avian TRV for lead.

Table G.3-4**Recommended Chronic Lead TRVs for Avian Species**

Species	TRV (mg/kg-d)			
	NOAEL	# of data	LOAEL	# of data
Chicken (<i>Gallus domesticus</i>)	6.51	5	67.3	17
Japanese quail (<i>Coturnix japonica</i>)	6.83	9	27.68	14
Ringed turtle dove (<i>Streptopelia risoria</i>)	-	-	11.8	1

G.3.2.5 Molybdenum

There were two species of birds obtained from references with growth and reproduction endpoints, and with LOAEL data reported. Geometric means of the LOAEL data were calculated for both the chicken and the turkey, the results of which are presented in Table G.3-5. No NOAEL data was available and so no NOAEL TRVs were calculated. In this assessment, since none of the test species are suitable as a surrogate for waterfowl or the eagle, the lowest LOAEL of 20.83 mg/kg-d was used as a conservative avian TRV for molybdenum.

Table G.3-5**Recommended Chronic Molybdenum TRVs for Avian Species**

Species	TRV (mg/kg-d)			
	NOAEL	# of data	LOAEL	# of data
Chicken (<i>Gallus domesticus</i>)	-	-	38.6	3
Turkey (<i>Meleagris gallopavo</i>)	-	-	20.83	1

G.3.2.6 Nickel

There were two species of birds represented in the Eco-SSL database with growth and reproduction endpoints for nickel exposure, and with LOAEL only or LOAEL plus NOAEL data reported (U.S. EPA 2007b). Geometric means of the NOAEL and LOAEL data were calculated for each species, the results of which are presented in Table G.3-6 for the chicken and duck. In this assessment, since none of the test species is suitable as a surrogate for waterfowl or the eagle, the lowest NOAEL and LOAEL values of 14.6 mg/kg-d and 10.7 mg/kg-d, respectively, were used as conservative avian TRVs for nickel.

Table G.3-6**Recommended Chronic Nickel TRVS for Avian species**

Species	TRV (mg/kg-d)			
	NOAEL	# of data	LOAEL	# of data
Chicken (<i>Gallus domesticus</i>)	14.6	4	19.9	8
Mallard duck (<i>Meleagris gallopavo</i>)	-	-	10.7	1

G.3.2.7 Selenium

There were five species of birds represented in the Eco-SSL database with growth and reproduction endpoints for selenium exposure, and with LOAEL only or LOAEL plus NOAEL data reported (U.S. EPA 2007c). Geometric means of the NOAEL and LOAEL data were calculated for all five species, the results of which are presented in Table G.3-7. In this assessment, the duck was used as the surrogate species for waterfowl based on same family and similar size and diet, and the black-crowned night heron was used as the surrogate species for the eagle.

Table G.3-7

Recommended Chronic Selenium TRVS for Avian species

Species	TRV (mg/kg-d)			
	NOAEL	# of data	LOAEL	# of data
Black-crowned night heron (<i>Nycticorax nycticorax</i>)	-	-	0.68	1
Chicken (<i>Gallus domesticus</i>)	0.36	12	0.59	32
Mallard duck (<i>Anas platyrhynchos</i>)	1.18	10	1.37	20
Japanese quail (<i>Coturnix japonica</i>)	-	-	0.75	6
Owl (<i>Otus asio</i>)	-	-	4.49	1

G.3.2.8 Uranium

Previous risk assessments have used TRVs for avian exposure to uranium derived from the data of Sample *et al.* (1996) as shown in Table G.3-8. The Sample *et al.* data were based on a study by Haseltine and Sileo (1983) related to mortality, body weight, and liver and kidney effects in ducks. Sample *et al.* derived a NOAEL of 16 mg/kg/day, but no LOAEL, from the study. However, it should be noted that depleted metallic uranium is not readily available and thus this TRV may not be a true representation of uranium toxicity. In this assessment, the duck was used as the surrogate species for waterfowl and the eagle.

Table G.3-8

Recommended Chronic Uranium TRVs for Avian species

Species	TRV (mg/kg-d)			
	NOAEL	# of data	LOAEL	# of data
Black duck (<i>Anas rubripes</i>)	16	1	-	-

G.3.2.9 Zinc

The data for growth and reproduction for avian species were obtained from the data presented in the Eco-SSL document for zinc exposure (U.S. EPA 2007d). The data were based

predominantly on studies with chickens, with some studies with Japanese quails, mallard ducks and turkeys; these four species served as the surrogates for avian wildlife. The geometric means of the LOAEL and NOAEL data were selected to serve as the TRVs, calculated for each surrogate species from the presented LOAEL and NOAEL data. The values are presented in Table G.3-9. In this assessment, the duck was used as the surrogate species for waterfowl and the eagle.

Table G.3-9

Recommended Chronic Zinc TRVs for Avian species

Species	TRV (mg/kg-d)			
	NOAEL	# of data	LOAEL	# of data
Chicken (<i>Gallus domesticus</i>)	90.1	24	179	47
Mallard duck (<i>Anas platyrhynchos</i>)	-	-	62.7	2
Japanese quail (<i>Coturnix japonica</i>)	61.3	2	123	2
Turkey (<i>Meleagris gallopavo</i>)	148	1	297	1

G.3.3 Mammals

G.3.3.1 Arsenic

The data for growth and reproduction for mammalian species were obtained from the Eco-SSL document for arsenic exposure (U.S. EPA 2005a). The data were based on studies with dogs, goats, guinea pigs, mice, pigs, rabbits and rats; these species served as the surrogates for mammalian wildlife. The geometric means of the LOAEL and NOAEL data were selected to serve as the TRVs, calculated for each surrogate species from the presented LOAEL and NOAEL data. For mice and rats the geometric means of the NOAEL values were larger than the geometric means of the LOAEL values due to the larger data set for the LOAEL values. Therefore, for these two species, the LOAEL was derived only from the studies that presented both LOAEL and NOAEL values. The geometric means are provided in Table G.3-10. In this assessment, the rat LOAEL and NOAEL served as the surrogate TRVs for the muskrat and beaver, while the dog LOAEL and NOAEL served as the surrogate TRVs for the fox and mink. For the moose and caribou, the goat LOAEL was used as the surrogate TRV.

Table G.3-10**Recommended Chronic Arsenic TRVs for Mammalian Species**

Species	TRV (mg/kg-d)			
	NOAEL	# of data	LOAEL	# of data
Dog (<i>Canus familiaris</i>)	1.5	2	3.1	2
Goat (<i>Capra hircus</i>)	-	-	14.4	2
Guinea pig (<i>Cavia porcellus</i>)	-	-	0.8	1
Mouse (<i>Mus musculus</i>)	7.6	3	20.7	9
Pig (<i>Sus scrofa</i>)	-	-	9.4	1
Rabbit (<i>Oryctolagus cuniculus</i>)	0.8	1	3	1
Rat (<i>Rattus norvegicus</i>)	8.1	4	14.2	10

G.3.3.2 Cobalt

There were three mammalian species represented in the Eco-SSL database with growth or reproduction endpoints for cobalt exposure, and with LOAEL only or LOAEL plus NOAEL data reported (U.S. EPA 2005b). The geometric means are provided in Table G.3-11. In this assessment, the rat LOAEL and NOAEL served as the surrogate TRVs for the beaver, fox, mink and muskrat, while the pig LOAEL served as the surrogate TRV for the moose and caribou.

Table G.3-11**Recommended Chronic Cobalt TRVs for Mammalian Species**

Species	TRV (mg/kg-d)			
	NOAEL	# of data	LOAEL	# of data
Mouse (<i>Mus musculus</i>)	19.00	1	27.94	6
Pig (<i>Sus scrofa</i>)	-	-	20.20	1
Rat (<i>Rattus norvegicus</i>)	5.22	2	13.39	7

G.3.3.3 Copper

The data for growth and reproduction were obtained from the data presented in the Eco-SSL document for copper exposure (U.S. EPA 2007a). The data were based on studies with goats, minks, mice, pigs, rabbits, rats and sheep; these species served as the surrogates for mammalian wildlife. The geometric means of the LOAEL and NOAEL data are presented in Table G.3-12. In this assessment, the rat LOAEL and NOAEL served as the surrogate TRVs for the muskrat and beaver, the mink LOAEL and NOAEL served as the surrogate TRVs for the mink and fox, and the goat LOAEL served as the surrogate TRV for the moose and caribou.

Table G.3-12**Recommended Chronic Copper TRVs for Mammalian Species**

Species	TRV (mg/kg-d)			
	NOAEL	# of data	LOAEL	# of data
Goat (<i>Capra hircus</i>)	-	-	1.5	1
Mink (<i>Neovison vison</i>)	5.9	2	11.5	2
Mouse (<i>Mus musculus</i>)	442	8	917	8
Pig (<i>Sus scrofa</i>)	9.8	3	12.8	6
Rabbit (<i>Oryctolagus cuniculus</i>)	27.7	1	45.7	1
Rat (<i>Rattus norvegicus</i>)	100	8	194	17
Sheep (<i>Ovis aries</i>)	-	-	3	1

G.3.3.4 Lead

There were eight mammalian species represented in the Eco-SSL database with growth or reproduction endpoints for lead exposure, and with LOAEL only or LOAEL plus NOAEL values reported (U.S. EPA 2005c). The geometric means are presented in Table G.3-13 for cattle, cotton rats, dogs, shrews, mice, pigs, rabbits and rats. In this assessment, the rat (common) LOAEL and NOAEL served as the surrogate TRVs for the muskrat and beaver, the dog LOAEL served as the surrogate TRV for the mink and fox, and the cattle LOAEL served as the surrogate TRV for the moose and caribou.

Table G.3-13**Recommended Chronic Lead TRVs for Mammalian Species**

Species	TRV (mg/kg-d)			
	NOAEL	# of data	LOAEL	# of data
Cattle (<i>Bos taurus</i>)	-	-	15	1
Cotton rat (<i>Sigmodon hispidus</i>)	12.4	1	170	1
Dog (<i>Canis familiaris</i>)	-	-	50	1
Shrew (<i>Sorex araneus</i>)	-	-	61.5	1
Mouse (<i>Mus musculus</i>)	193	8	234	30
Pig (<i>Sus scrofa</i>)	-	-	173	1
Rabbit (<i>Oryctolagus cuniculus</i>)	10.7	1	50.4	1
Rat (<i>Rattus norvegicus</i>)	25.5	33	188	92

G.3.3.5 Molybdenum

There were five mammalian species from references with growth or reproduction endpoints, and with LOAEL only or LOAEL plus NOAEL values reported. The geometric means are presented in Table G.3-14 for mice, Holstein calves, rabbits, rats (common) and Holtzman rats. For the LOAEL, the common rat served as the surrogate species for the muskrat, mink, beaver and fox,

and the Holstein calf served as the surrogate species for the moose and caribou. No species served as surrogates for NOAELs.

Table G.3-14

Recommended Chronic Molybdenum TRVs for Mammalian Species

Species	TRV (mg/kg-d)			
	NOAEL	# of data	LOAEL	# of data
Mouse (<i>Mus musculus</i>)	0.26	1	2.6	1
Holstein calf	-	-	4.1	1
Rabbit (<i>Oryctolagus cuniculus</i>)	-	-	30	1
Rat (<i>Rattus norvegicus</i>)	-	-	1.9	1
Holtzman rat	-	-	7.5	1

G.3.3.6 Nickel

The data for growth and reproduction were obtained from the data presented in the Eco-SSL document for nickel exposure (U.S. EPA 2007b). The data were based on studies with cattle, dogs, meadow voles, mice and rats. The geometric means of the LOAEL and NOAEL data are presented in Table G.3-15. In this assessment, the rat served as the surrogate species for the muskrat and beaver, the dog served as the surrogate species for the mink and fox, and the cattle served as the surrogate species for the moose and caribou.

Table G.3-15

Recommended Chronic Nickel TRVs for Mammalian Species

Species	TRV (mg/kg-d)			
	NOAEL	# of data	LOAEL	# of data
Cattle (<i>Bos Taurus</i>)	3.4	2	9.8	2
Dog (<i>Canis familiaris</i>)	45	1	112	1
Meadow vole (<i>Microtus pennsylvanicus</i>)	29.4	1	309	1
Mouse (<i>Mus musculus</i>)	17.8	5	33.2	9
Rat (<i>Rattus norvegicus</i>)	6.2	7	11.6	14

G.3.3.7 Selenium

There were seven mammalian species represented in the Eco-SSL database with growth or reproduction endpoints for selenium exposure, and with LOAEL only or LOAEL plus NOAEL values reported (U.S. EPA 2007c). The geometric means are presented in Table G.3-16 for cattle, dogs, hamsters, mice, pigs, pronghorns and rats. In this assessment, the rat served as the surrogate species for the muskrat and beaver for both the NOAEL and LOAEL, the dog LOAEL served as the surrogate TRV for the mink and fox, and the cattle served as the surrogate species for the moose and caribou for both the NOAEL and the LOAEL.

Table G.3-16**Recommended Chronic Selenium TRVs for Mammalian Species**

Species	TRV (mg/kg-d)			
	NOAEL	# of data	LOAEL	# of data
Cattle (<i>Bos aures</i>)	0.17	1	0.33	1
Dog (<i>Canis familiaris</i>)	-	-	0.21	1
Hamster (<i>Mesocricetus auratus</i>)	0.54	5	0.77	7
Mouse (<i>Mus musculus</i>)	0.93	14	1.53	23
Pig (<i>Sus scrofa</i>)	0.17	9	0.33	21
Pronghorn (<i>Antilocapra americana</i>)	-	-	0.49	1
Rat (<i>Rattus norvegicus</i>)	0.33	23	0.63	69

G.3.3.8 Uranium

Previous risk assessments have used TRVs for mammalian exposure to uranium derived from the data of Sample *et al.* (1996) as shown in Table G.3-17. The Sample *et al.* data for mammalian species were based on a study by Paternain *et al.* (1989) related to reproduction in mice. Sample derived a NOAEL of 3.07 mg/kg/day and a LOAEL of 6.13 mg/kg/day from the study. These values were used in this risk assessment for all mammalian species.

Table G.3-17**Recommended Chronic Uranium TRVs for Mammalian Species**

Species	TRV mg/kg-d)			
	NOAEL	# of data	LOAEL	# of data
Mouse (<i>Mus musculus</i>)	3.07	1	6.13	1

G.3.3.9 Zinc

The data for growth and reproduction for mammalian species were obtained from the data presented in the Eco-SSL document for zinc exposure (U.S. EPA 2007d). The data were based on studies with cattle, mice, pigs, rats and sheep. The geometric means of the LOAEL and NOAEL data were calculated for each surrogate species from the presented LOAEL and NOAEL data and are summarized in Table G.3-18. In this assessment, the rat served as the surrogate species for the muskrat and beaver, the cattle served as the surrogate species for the moose and caribou, while the lowest LOAEL of 34.9 mg/kg-d for the sheep served as the surrogate TRV for the mink and fox.

Table G.3-18**Recommended Chronic Zinc TRVs for Mammalian Species**

Species	TRV (mg/kg-d)			
	NOAEL	# of data	LOAEL	# of data
Cattle (<i>Bos aures</i>)	37.9	1	75.9	1
Mouse (<i>Mus musculus</i>)	585	5	4395	5
Pig (<i>Sus scrofa</i>)	15.4	3	90	4
Rat (<i>Rattus norvegicus</i>)	215	17	249	3
Sheep (<i>Ovis aries</i>)	-	-	34.9	2

G.4 SURROGATE SPECIES SUMMARY

To assess the risk of adverse effects for avian and mammalian species, data was obtained from the U.S. EPA's risk-based ecological soil screening levels (Eco-SSLs). Only studies that scored greater than 65% based on the U.S. EPA's scoring system were used to derive a TRV in this assessment. The TRV was generally equal to the geometric mean of the NOAEL values for growth and reproduction or the highest bounded NOAEL below the lowest bounded LOAEL for growth and reproduction.

TRVs were calculated from the selected data for several species of avian and mammalian wildlife, such as mallard ducks, chickens, cattle, pigs, rats, dogs, etc. These species served as surrogates for the species considered in this assessment. When possible, a surrogate species was selected based on taxonomy (i.e. same or similar order or family), diet (i.e. carnivorous vs. herbivorous), or physical characteristics (i.e. similar size). In general, for mammalian species, the rat served as the surrogate species for the beaver and muskrat, the dog served as the surrogate species for the mink and fox, and the goat served as the surrogate species for the caribou and moose. For avian species, in general the mallard duck served as the surrogate for waterfowl and the chicken served as the surrogate species for the eagle. When no appropriate surrogate species could be identified, then the most sensitive test species (i.e. lowest LOAEL or NOAEL) was selected as the surrogate species.

The avian and mammalian NOAEL and LOAEL values selected as TRVs selected for use in this assessment are summarized in Table G.4-1. A summary of the surrogate species and the rationale for their selection is also provided.

Table G.4-1

Summary of Chronic TRVs and Surrogate Species Rationale

COPC	Test Species	TRV ¹		Choice of a Surrogate Test Species for Typical VECs				
		NOAEL mg/kg/d	LOAEL mg/kg/d	Taxonomy of test species: Order; Family	Diet of test species	Surrogate for these VECs	Rationale	Default to most sensitive test species ²
As	Mammal							
	Dog (Canus familiaris)	1.5	3.1	Carnivora; Canidae	Carnivore	Mink, Fox	same Order, similar diet	
	Goat (Capra hircus)	-	14.4	Artiodactyla; Bovidae	Herbivore	Caribou, Moose	same Order, similar diet	
	Rat (Rattus norvegicus)	8.1	14.2	Rodentia; Muridae	Omnivore	Beaver, Muskrat	same Order or Family	
	Bird							
	Mallard duck (Anas platyrhynchos)	-	5.1	Anseriformes; Anatidae	Herbivore, some invertebrates	Waterfowl	same Family, similar size and diet	
	Chicken (Gallus domesticus)	-	3.6	Galliformes; Phasianidae	Herbivore, some invertebrates		same Family, similar size and diet	Eagle
Co	Mammal							
	Pig (Sus scrofa)	-	20.20	Artiodactyla; Suidae	Omnivore	Caribou, Moose	Same Order	
	Rat (Rattus norvegicus)	5.22	13.39	Rodentia; Muridae	Omnivore	Beaver, Muskrat	same Order or Family	Mink, Wolf
	Bird							
	Chicken (Gallus domesticus)	4.09	14.13	Galliformes; Phasianidae	Herbivore, some invertebrates		same Family, similar size and diet	Eagle
Cu	Mallard duck (Anas platyrhynchos)	14.8	148	Anseriformes; Anatidae	Herbivore, some invertebrates	Waterfowl	same Family, similar size and diet	
	Mammal							
	Goat (Capra hircus)	-	1.50	Artiodactyla; Bovidae	Herbivore	Caribou, Moose	same Order, similar diet	
	Mink (Neovison vison)	5.90	11.50	Carnivora; Mustelidae	Carnivore	Mink, Fox	same Genus (mink) or Order, similar diet	
	Rat (Rattus norvegicus)	100.00	194.00	Rodentia; Muridae	Omnivore	Beaver, Muskrat	same Order or Family	
	Bird							
	Mallard duck (Anas platyrhynchos)	24.1	75.2	Anseriformes; Anatidae	Herbivore, some invertebrates	Waterfowl	same Family, similar size and diet	
	Turkey (Meleagris gallopavo)	15.3	27	Galliformes; Phasianidae	Herbivore, some invertebrates			Eagle

COPC	Test Species	TRV ¹		Choice of a Surrogate Test Species for Typical VECs				
		NOAEL mg/kg/d	LOAEL mg/kg/d	Taxonomy of test species: Order; Family	Diet of test species	Surrogate for these VECs	Rationale	Default to most sensitive test species ²
Pb	Mammal							
	Cattle (<i>Bos taurus</i>)	-	15	Artiodactyla; Bovidae	Herbivore	Caribou, Moose	same Order, similar diet	
	Dog (<i>Canis familiaris</i>)	-	50	Carnivora; Canidae	Carnivore	Mink, Fox	same Order, similar diet	
	Rat (<i>Rattus norvegicus</i>)	25.50	188	Rodentia; Muridae	Omnivore	Beaver, Muskrat	same Order or Family	
	Bird							
	Ringed turtle dove (<i>Streptopelia risoria</i>)	-	11.8	Columbiformes; Columbidae	Herbivore, rarely invertebrates			Waterfowl, Eagle
Mo	Mammal							
	Cow (<i>Bos taurus</i>)	-	4.1	Artiodactyla; Bovidae	Herbivore	Caribou, Moose	same Order, similar diet	
	Rat (<i>Rattus norvegicus</i>)	-	1.90	Rodentia; Muridae	Omnivore	Beaver, Muskrat	same Order or Family	Mink, Fox
	Bird							
	Turkey (<i>Meleagris gallopavo</i>)	-	20.83	Galliformes; Phasianidae	Herbivore, some invertebrates			Waterfowl
Ni	Mammal							
	Cattle (<i>Bos taurus</i>)	3.4	9.80	Artiodactyla; Bovidae	Herbivore	Caribou, Moose	same Order, similar diet	
	Dog (<i>Canis familiaris</i>)	45	112	Carnivora; Canidae	Carnivore	Mink, Fox	same Order, similar diet	
	Rat (<i>Rattus norvegicus</i>)	6.2	11.60	Rodentia; Muridae	Omnivore	Beaver, Muskrat	same Order or Family	
	Bird							
	Mallard duck (<i>Anas platyrhynchos</i>)	-	10.70	Anseriformes; Anatidae	Herbivore, some invertebrates	Waterfowl	same Family, similar size and diet	Eagle
Se	Mammal							
	Cattle (<i>Bos taurus</i>)	0.17	0.33	Artiodactyla; Bovidae	Herbivore	Moose, Caribou	same Order, similar diet	
	Dog (<i>Canis familiaris</i>)	-	0.21	Carnivora; Canidae	Carnivore	Mink, Fox	same Order, similar diet	
	Rat (<i>Rattus norvegicus</i>)	0.33	0.63	Rodentia; Muridae	Omnivore	Beaver, Muskrat	same Order or Family	

COPC	Test Species	TRV ¹		Choice of a Surrogate Test Species for Typical VECs				
		NOAEL mg/kg/d	LOAEL mg/kg/d	Taxonomy of test species: Order; Family	Diet of test species	Surrogate for these VECs	Rationale	Default to most sensitive test species ²
Se	Bird							
	Black-crowned night-heron (<i>Nycticorax nycticorax</i>)	-	0.68	Ciconiiformes ; Ardeidae	Carnivore, small vertebrates and invertebrates	Eagle	same Order, similar diet	
	Mallard duck (<i>Anas platyrhynchos</i>)	1.18	1.37	Anseriformes; Anatidae	Herbivore, some invertebrates	Waterfowl	same Family, similar size and diet	
U	Mammal							
	Mouse (<i>Mus musculus</i>)	3.07	6.13	Rodentia; Muridae	Omnivore	Beaver, Muskrat	same Order or Family	Mink, Fox, Caribou, Moose
	Bird							
	Black duck (<i>Anas rubripes</i>)	16		Anseriformes; Anatidae	Herbivore, some invertebrates	Waterfowl	same Family, similar size and diet	Eagle
Zn	Mammal							
	Cattle (<i>Bos taurus</i>)	37.9	75.9	Artiodactyla; Bovidae	Herbivore	Caribou, Moose	same Order, similar diet	
	Rat (<i>Rattus norvegicus</i>)	215	249	Rodentia; Muridae	Omnivore	Beaver, Muskrat	same Order or Family	
	Sheep (<i>Ovis aries</i>)	-	34.9	Artiodactyla; Bovidae	Herbivore			Mink, Fox
	Bird							
	Mallard duck (<i>Anas platyrhynchos</i>)		62.7	Anseriformes; Anatidae	Herbivore, some invertebrates	Waterfowl	same Family, similar size and diet	Eagle
Note: Taxonomy from IT IS (2009); Waterfowl includes mallard, scaup and merganser								
“-”- Data not available								
1 - See Sections G.3.2 and 0 for rationale on selection of TRVs.								
2 - The most sensitive test species is considered to be the species with the lowest LOAEL value.								

G.5 RADIOACTIVITY

The assessment of effects from exposure to radioactive constituents involves estimation of the combined (total) dose which a VEC may receive from radionuclides taken into the body as well as from exposure to radiation fields in the external environment. In addition, it is standard practice to take into account differences in the effects of alpha, beta and gamma radiation. These factors are discussed below.

G.5.1 *Relative Biological Effectiveness (RBE) Factors*

Radiation effects on biota depend not only on the absorbed dose, but also on the relative biological effectiveness (RBE) of the particular radiation (i.e. alpha, beta or gamma radiation). For example, alpha particles can produce observable damage at lower absorbed doses than gamma radiation. Thus, in order to estimate the potential harm to non-human biota from a given absorbed dose, the absorbed dose is multiplied by an appropriate radiation weighting factor. This in turn is derived from experimentally determined RBE. In this assessment, the terms “RBE” and “radiation weighting factor” are used interchangeably.

For the purposes of human radiological protection, each component of the absorbed dose to a tissue or organ is weighted according to the radiation quality. The appropriate relative biological effectiveness (RBE) value for biota is the subject of ongoing scientific discussion. Although an RBE of 20 is used for human radiation protection, according to the review by UNSCEAR (1996):

“In the case of wild organisms, however, it is likely to be deterministic effects that are of greatest significance, and for alpha radiation the experimental data for animals indicate that a lower weighting factor, perhaps 5, would be more appropriate; the weighting factors for beta and gamma radiation would remain unity.” (para. 18)

A review of the literature by Trivedi and Gentner (2000) concluded that:

“since the majority of studies report RBE values less than or equal to 10 for endpoints, and doses and dose rates that are more ecologically significant, a value of 10 might be appropriate for weighting doses to evaluate the impact of alpha emitters at the population level, if any”.

Also, the U.S. DOE (2000) reviewed the issue and recognized that the critical biological endpoint of concern in radiation exposures of biota appears to be deterministic, and that the radiation weighting factor for deterministic effects is substantially less than the corresponding average quality factor used in radiation protection of humans (i.e. 20). Based on this information, U.S. DOE concluded that the radiation weighting factor for deterministic effects appears to lie in the range of about 5 to 10. However, as interim guidance, they recommend the use of an RBE of 20 in the proposed standard (U.S. DOE 2000).

It should be noted that uncertainty remains concerning the most appropriate RBE values for assessing risks to non-human biota. The RBE values depend on the radiation quality, the biota under consideration, the endpoint being considered and the reference photon energies. The RBE values selected to develop protection criteria should correspond to the endpoint being protected (e.g. health of a population).

A wide range of RBE values for internally deposited alpha particles has been published. The PSL2 assessment (EC/HC 2003) suggests an RBE of 40. A report of the (former) Advisory

Committee on Radiological Protection suggested a nominal RBE value of 10 with a range of about 5 to 20 for non-human biota (ACRP 2002). A recent report of the European Community suggests using an RBE of 10 to illustrate the effect of alpha RBE. For the purposes of this assessment, uncertainty associated with the choices of RBE is acknowledged and a range of RBE values of 10 and 40 were used to illustrate the effects of this uncertainty.

G.5.2 Aquatic Radiation TRVs

For radioactivity, the International Atomic Energy Agency (IAEA 1992) suggests a dose rate of 10 mGy/d as the reference dose level below which population effects to aquatic biota would not be expected (IAEA 1992). This value is also suggested in UNSCEAR (1996) and has been used in recent northern Saskatchewan assessments (Cameco 2005, Cameco 2004, COGEMA 2000, 2001, 2002). The following paragraphs outline the rationale for using 10 mGy/d and indicate that there is ongoing debate on the appropriate dose rate limit.

The NCRP (National Council on Radiation Protection and Measurements) in Report 109 (NCRP 1991) recommends 0.4 mGy/h (9.6 mGy/d) for the protection of aquatic biota. The NCRP state that a chronic dose rate of no more than 0.4 mGy/h (9.6 mGy/d) to the maximally exposed individual in a population would ensure protection of the population. The NCRP report also includes recommendations that if modelling and/or dosimetric measurements indicate a dose level of 0.1 mGy/h (2.4 mGy/d), then a more detailed evaluation of the potential ecological consequences to the endemic population should be conducted. The 1992 review by the IAEA (Technical Report No. 332) also concluded that limiting the dose rate to individuals in an aquatic population to a maximum of 10 mGy/d would provide adequate protection for the population.

A number of reviews on the effects of radiation on aquatic organisms were published prior to the publication of NCRP 109 (i.e. Anderson and Harrison 1966, Polikarpov 1966, Templeton *et al.* 1971, Chipman 1972, IAEA 1976, Blaylock and Trabalka 1978, Egami 1980, NRCC 1983, Woodhead 1984). In those reviews, deleterious effects of chronic irradiation were not observed in natural populations at dose rates of 0.4 mGy/h (9.6 mGy/d) or less, over the entire history of exposure to ionizing radiation. Taking into consideration the combined results from laboratory and field studies, it appears that reproductive and early developmental systems of vertebrates are most sensitive to chronic irradiation in both aquatic and terrestrial environments. Invertebrates appear to be relatively radioresistant. Effects on aquatic organisms, not necessarily detrimental when evaluated in the context of population dynamics, were detected at dose rates in the range of 1 to 10 mGy/d.

The U.S. DOE (2000) concluded that applying the aquatic dose limits suggested by the NCRP (1991) and IAEA (1992) would ensure protection of aquatic populations. UNSCEAR (1996) suggests that chronic dose rates of up to 400 μ Gy/h (10 mGy/d) to individuals in aquatic populations are unlikely to have a detrimental effect at the population level.

The CNSC has recommended that a dose limit value of 0.6 mGy/d be used for fish, a value of 3 mGy/d be used for aquatic plants (algae and macrophytes) and a value of 6 mGy/d be applied

for benthic invertebrates (Bird *et al.* 2002, EC/HC 2003). The dose limit value for fish was based on a reproductive effects study in carp in the Chernobyl cooling pond (Makeyeva *et al.* 1995). A value of 0.6 mGy/d was found to be in the range where both effects and no effects were observed. The aquatic plant TRV was based on information related to terrestrial plants (conifers), which are considered to be sensitive to the effects of radiation. Reproductive effects in polychaete worms were used to derive the dose limit for benthic invertebrates.

As indicated by the brief reviews of the literature cited above, the selection of reference dose levels for aquatic biota is a topic of ongoing discussion. In light of this, it is proposed that the following reference dose levels be used in this current assessment:

- fish – 0.6 mGy/d and 10 mGy/d;
- aquatic plants (algae and macrophytes) – 3 mGy/d and 10 mGy/d; and
- benthic invertebrates – 6 mGy/d and 10 mGy/d.

G.5.3 Terrestrial Wildlife Radiation TRVs

A level of 1 mGy/d is generally used as an acceptable level for terrestrial biota. In 1992, the IAEA (1992) published the results of an assessment of the effects of acute and chronic radiation on terrestrial populations and communities. They reached several general conclusions regarding chronic radiation: reproduction is likely to be the most limiting endpoint in terms of population maintenance, and irradiation at chronic dose rates of 1 mGy/d or less does not appear likely to cause observable changes in terrestrial animal populations. Also, they concluded that irradiation at chronic dose rates of 10 mGy/d or less does not appear likely to cause observable changes in terrestrial plant populations. However, reproductive effects in long-lived species with low reproductive capacity may require further consideration. The U.S. DOE (2000) has suggested that applying the terrestrial dose limits suggested by IAEA (1992) would be protective of terrestrial species populations. UNSCEAR (1996) suggests that chronic dose rates below 400 µG/h (10 mGy/d) would not likely produce any significant effects in natural plant communities; that for terrestrial mammals, dose rates below 400 µG/h (10 mGy/d) to the most exposed animal are unlikely to affect mortality in the population and that dose rates below 40 µG/h (1 mGy/d) are unlikely to cause a loss of reproductive capacity.

The CNSC has provided a dose rate guideline of 3 mGy/d as an appropriate limit for small mammals and terrestrial plants (Bird *et al.* 2002, EC/HC 2003). This limit is based on reproductive endpoints for small mammals. In the absence of data for avian species, the CNSC suggest that the dose limit for small mammals should also apply.

From the above discussion, it is recognized that the selection of reference dose levels is a topic of ongoing debate; therefore, dose limits of 1 mGy/d and 3 mGy/d were selected for the assessment of impacts on terrestrial biota.

G.6 HUMAN HEALTH

The TRVs for humans are intended to protect the most sensitive individuals (i.e., the elderly, pregnant women and children). For COPC that have non-carcinogenic effects, the TRVs are based on threshold effects concentrations. For COPC that have carcinogenic effects (i.e., those COPC that can cause cancer), the TRVs are based on non-threshold effects.

For many non-carcinogenic effects, 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. These TRVs are generally referred to as reference doses (RfDs) or tolerable daily intakes (TDIs), but may also be referred to as minimum risk levels (MRLs). They are generally derived by regulatory agencies such as Health Canada and the United States Environmental Protection Agency (U.S. EPA). These TRVs are usually expressed as the quantity of a chemical per unit of body weight per unit of time, or mg/(kg-day), and have generally been derived for sensitive individuals in the public using the most sensitive endpoint available. Additionally, these factors involve the incorporation of "safety factors" by regulatory agencies to provide additional protection for members of the public. Non-carcinogens are often referred to as "systemic toxicants" because of their effects on the function of various organ systems.

Carcinogenesis is generally assumed to be a "non-threshold" type phenomenon whereby any level of exposure to a carcinogen is assumed to pose a finite probability of generating a carcinogenic response. Carcinogenic TRVs are generally referred to as slope factors and are used to estimate an upper-bound lifetime probability of an individual developing cancer as a result of exposure to a particular level of a potential carcinogen. The carcinogenic slope factor is, therefore, the lifetime cancer risk per unit of dose.

The COPC selected for this report are, for the most part, considered to be non-classifiable with respect to human carcinogenicity, meaning that there are insufficient human or animal data to indicate that they are carcinogens. The exception to this is arsenic, which is considered to have both carcinogenic and non-carcinogenic endpoints.

There are several regulatory sources that report TRVs (i.e. RfDs, TDIs, MRLs, slope factors). Some of the most frequently used sources are Health Canada, the U.S. EPA Integrated Risk Information System (IRIS) database, the U.S. EPA National Center for Environmental Assessment (NCEA), the World Health Organization (WHO), and the Agency for Toxic Substances and Disease Registry (ATSDR). Given that this assessment is within a Canadian jurisdiction, values provided by Health Canada were generally preferentially selected as TRVs for evaluation of the health impacts on human receptors. The Toxicology Evaluation Section of the Health Products and Food Branch of Health Canada has published TDIs for a number of trace elements found in foodstuff. These values were also considered for use in this assessment. The other above-mentioned sources were used to infill data gaps in the Health Canada database.

Table G.6-1 provides a summary of the TRVs selected for use in the assessment for oral exposure. The TRVs, toxicological endpoints and reference sources for each TRV are provided in the table. A discussion of the rationale for selecting the oral TRVs is provided below.

G.6.1 Arsenic

Oral TRVs for non-carcinogenic effects are reported by the U.S. EPA, HC and the ATSDR. The U.S. EPA (2009, last updated 1993) provides an RfD of 0.0003 mg/kg-d for chronic oral exposure to arsenic in well water in a Taiwanese study (Tseng *et al.* 1968, Tseng 1977). The toxicological endpoint is hyperpigmentation, keratosis and possible vascular complications. The ATSDR (2007) provides this same value of 0.0003 mg/kg-d as an MRL, derived from the same study. The Health Canada Food Directorate (HC 2002) has adopted the provisional tolerable weekly intake (pTWI) of 15 µg/kg determined by the Joint FAO/WHO Expert Committee on Food Additives (JECFA) in 1988 (WHO 1989), with an additional safety factor of 2 to account for uncertainty in the epidemiological studies. This is equivalent to a TDI of 0.001 mg/kg-d. The toxicological rationale for the selection of this TRV, including the endpoint, is not clear but it is meant for chronic exposure as it is derived from a WHO TDI. In conclusion, a TDI of 0.001 mg/kg-d was adopted for the current assessment.

Health Canada and the U.S. EPA have designated arsenic as a known human carcinogen. A slope factor of $2.8 \text{ (mg/(kg-d))}^{-1}$ has previously been derived by Health Canada (2004a) based on the incidence of skin cancers in the epidemiological studies by Tseng *et al.* (1968) and Tseng (1977). In a more recent evaluation Health Canada considered new data that have become available that suggest that the risk of internal cancers due to ingestion of drinking water is greater than previously believed (HC 2009). The cancer risk models based on the Taiwanese data have been updated (Morales *et al.* 2000), and an evaluation was completed by Health Canada of the cancer potency indices for liver, lung and bladder cancers. An oral slope factor of $1.8 \text{ (mg/(kg-d))}^{-1}$ was derived.

The U.S. EPA (2009, last updated 1998) provides an oral slope factor of $1.5 \text{ (mg/(kg-d))}^{-1}$ for skin cancer based on the same study as that used in the derivation of the RfD. The Health Canada (2009) oral slope factor of $1.8 \text{ (mg/(kg-d))}^{-1}$ was selected over the U.S. EPA value as it is based on an assessment that considered internal cancers. Thus a slope factor of $1.8 \text{ (mg/(kg-d))}^{-1}$ is used in this assessment.

G.6.2 Cadmium

Cadmium has been designated as a probable carcinogen via inhalation only and can also result in non-carcinogenic toxicity (Health Canada 2004, Health Canada 2009, U.S. EPA 2009). Rodent and occupational studies have demonstrated that the critical carcinogenic endpoint for cadmium is lung cancer. Based on occupational studies, it has been shown that the critical non-carcinogenic effect endpoint for cadmium is significant proteinuria (U.S. EPA 2009). Proteinuria involves large amounts of protein in the urine, and often results from damage to the kidneys.

Both the U.S. EPA (2009 – updated in 1994) and Health Canada (2009) have derived an oral TRV for non-carcinogenic effects of 0.001 mg/kg-d. The TRV is derived based on an epidemiological study of occupational exposure.

G.6.3 Cobalt

The U.S. EPA and Health Canada do not provide exposure limits for non-cancer health effects resulting from oral exposure to cobalt. The ATSDR (2004a) provides an oral MRL of 0.01 mg/kg-d. This is based on a LOAEL of 1 mg/kg-d for haematological effects, 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. This value was used in the assessment.

G.6.4 Copper

The U.S. EPA (2009) does not provide an oral RfD for copper or copper compounds, with the exception of copper cyanide. The ATSDR (2004b) provides an oral MRL for acute and intermediate duration exposure, does not provide a chronic copper MRL, citing an inadequate database. Health Canada (2009) suggests the use of a chronic TDI of 0.09 mg/kg-d (although age-dependent values were derived the values were similar thus the lowest TRV was selected). The value is based on the assessment conducted by the Institute of Medicine and is based on hepatotoxicity and gastrointestinal effects following excess intake from food and supplements.

G.6.5 Lead

Neither the U.S. EPA nor the ATSDR provide non-carcinogenic oral TRVs for chronic exposure to lead. The 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 2000). This is equivalent to an RfD of 0.0035 mg/kg-d. Health Canada (2004a) provides a very similar oral TDI of 0.0036 mg/kg-d; however, the toxicological rationale and endpoint are not explicitly stated. The Ontario Ministry of the Environment and Energy (MOEE 1994a, b) developed an Intake of Concern (IOC) for lead exposure for neurological effects. To determine the IOC, an uptake of 0.21 µg/dL per µg/d was used in conjunction with a 10 µg/dL blood lead level to provide an individual IOC (IOC_{ind}) of 47.6 µg/d, or 3.6 µg/(kg-d) for a 13 kg child (0.5 to 4 years of age). To derive an IOC for the population (IOC_{pop}), the Ontario Ministry of Energy and Environment applied an uncertainty factor of 2 to the IOC_{ind}, resulting in an IOC_{pop} of 1.85 µg/(kg-d). The Health Canada derived value of 0.0036 mg/kg-d (3.6 µg/(kg-d)) is used in this assessment.

G.6.6 Molybdenum

The U.S. EPA (2009, last updated 1993) provides an oral RfD of 0.005 mg/kg-d based on a LOAEL of 0.14 mg/kg-d for increased uric acid levels in people following oral exposure to molybdenum. This value was derived from data from a cross sectional epidemiological study, using an uncertainty factor of 30. The overall confidence in the RfD is medium. Health Canada

(2009) provides a TRV of 0.023 mg/kg-d (although age-dependent values were derived the values were similar thus the lowest TRV was selected). The value is based on the assessment conducted by the Institute of Medicine and is based on a reproductive endpoint. It is based on a subchronic study on rats exposed to molybdenum in drinking water. An uncertainty of 30 was applied; a factor of 10 for interspecies variability and a factor of 3 for intraspecies variability. As the U.S. EPA value is more conservative it was retained for use in the assessment.

G.6.7 Nickel

The U.S. EPA (2009, last updated 1996) provides an oral RfD of 0.02 mg/kg-d for soluble nickel salts based on decreased body and organ weights in rats after being fed nickel in the diet for 2 years. An uncertainty factor of 10 is used for interspecies extrapolation and 10 to protect sensitive populations. An additional uncertainty factor of 3 is used to account for inadequacies in the reproductive studies. The overall confidence in the RfD is medium. The ATSDR does not provide oral MRLs for acute, intermediate, or chronic duration exposure to nickel. Health Canada (2004a) provides an oral non-carcinogenic TDI of 0.0013 mg/kg-d for nickel chloride and 0.05 mg/kg-d for nickel sulphate, based on the Priority Substances List for nickel (EC/HC 1994). The toxicological rationale for the selection of these TDIs, including the endpoints, is not clear. In the Health Canada PQRA model the TRV for nickel is 0.011 mg/kg-d which is consistent with the update for soil quality (Health Canada 2009). This value is based on a 2-generation reproductive toxicity test on rats. An uncertainty factor of 100 is applied (a factor of 10 for each intra- and interspecies variability). The Health Canada of 0.011 mg/kg-d was selected as the primary TRV for nickel.

G.6.8 Selenium

The U.S. EPA (2009, last updated 1991) provides an oral RfD of 0.005 mg/kg-d, based on a NOAEL of 0.015 mg/kg-d from a study of clinical and biochemical signs of selenium intoxication in individuals living in an area of China with unusually high environmental concentrations of selenium (Yang and Zhou 1994, as cited in IRIS (U.S. EPA 2009, last updated 1991)). To derive the RfD, a factor of 3 was applied to account for human variability, and was considered appropriate because the individuals in the study were sensitive individuals drawn from the larger study population. This value is also derived by the ATSDR (2003) for recovery from clinical selenosis, using data from a follow up study to that used in the derivation by the U.S. EPA. Health Canada (2002) provides a food-based provisional TDI of 0.75 mg/day. Using a body weight of 70.7 kg, this equates to a TDI of 0.01 mg/kg-d. The toxicological endpoint and effects are not reported.

Health Canada (2009) provides a TRV of 0.0055 mg/kg-d (although age-dependent values were derived the values were similar thus the lowest TRV was selected). The value is based on the assessment conducted by the Institute of Medicine and is based on selenosis. It is based epidemiological studies on exposure to selenium.

The U.S. EPA value is used in this assessment as it provides a more conservative estimate of health hazards although it is noted that the Health Canada value is very similar.

G.6.9 *Uranium*

Oral exposure limits for uranium were available from Health Canada (2001, 2002) and the U.S. EPA (2009, last updated 1989). Health Canada (2002) provides a food-based provisional TDI of 0.0015 mg/kg-d for reversible kidney effects, derived by the Toxicology Evaluation Section of the Chemical Health Hazard Assessment Division of Health Canada. Health Canada (2001) also provides a TDI of 0.0006 mg/kg-d, based on a subchronic study in which rats were administered uranyl nitrate hexahydrate in drinking water for 91 days. The study's endpoint was renal effects, with a LOAEL of 0.96 mg/L for degenerative lesions in the proximal convoluted tubule of the kidney in male rats. This study provides the basis for the uranium drinking water guideline. This value is repeated in Health Canada 2009. The U.S. EPA (2009, last updated 1989) provides an RfD of 0.003 mg/kg-d for uranium soluble salts, for which the toxicological endpoint is initial body weight loss and moderate nephrotoxicity. The Health Canada (2001) TDI is selected as the TRV over the value provided by the U.S. EPA because the site falls under Canadian jurisdiction and because the use of this value is more conservative. The Health Canada (2001) value of 0.0006 mg/kg-d is selected over the Health Canada (2002) value of 0.0015 mg/kg-d since it is more restrictive.

G.6.10 *Zinc*

The U.S. EPA (2009, last updated 2005) provides an oral RfD of 0.3 mg/kg-d for zinc, based on a LOAEL of 0.9 mg/kg-d. This value is based on a 47% decrease in erythrocyte Cu, Zn-superoxide dismutase (ESOD) activity in adult females after 10 weeks of zinc exposure. Copper status and ESOD activity are considered a sensitive measure of the effects of high levels of zinc exposure, with a reduced copper status being associated with an increased zinc intake. The ATSDR (2005) provides this same TRV, based on the same study.

Health Canada (2009) provides a TRV of 0.5 mg/kg-d (although age-dependent values were derived the values were similar thus the lowest TRV was selected). The value is based on the assessment conducted by the Institute of Medicine and is based on a significant decrease in ESOD activity in adults and increased infant growth, and length, weight and head circumference. As the U.S. EPA value is more conservative it was retained for use in the assessment.

Table G.6-1**Selected Oral TRVs for Human Receptors**

Chemical	Effect Type ^a	Value ^b	Health Effect	Reference ^c
Arsenic	C	1.8	Internal cancers (liver, lung, bladder, kidney) (oral, human)	Health Canada (2009)
	NC	0.001	Not provided	Health Canada Food Directorate (2002)
Cadmium	NC	0.001	Significant proteinuria	Health Canada (2009) IRIS (U.S. EPA 2009, last updated 1994)
Cobalt	NC	0.01	Haematological effects (polycythemia)	ATSDR (2004a)
Copper	NC	0.09	Hepatotoxicity	Health Canada (2009)
Lead	NC	0.0036	Increase in blood lead concentrations in infants	Health Canada (2004c)
Molybdenum	NC	0.005	Increased uric acid levels	IRIS (U.S. EPA 2009, last updated 1993)
Nickel	NC	0.011	Decreased body and organ weights (oral exposure, rats)	Health Canada (2009)
Selenium	NC	0.005	Clinical selenosis	IRIS (U.S. EPA 2009, last updated 1991)
Uranium	NC	0.0006	Degenerative lesions in kidney tubules	Health Canada (2001)
Zinc	NC	0.3	Diminished copper status (required for protection against free radicals and oxidative stress)	IRIS (U.S. EPA 2009, last updated 2005)
Notes: a - C is carcinogenic (non-threshold) effect; NC is non-carcinogenic (threshold) effect b - All values are in mg/kg-d except for carcinogenic (C) TRV for arsenic which is in (mg/(kg-d)) ⁻¹ c - IRIS - Integrated Risk Information System on-line database (last updated represents year of last significant revision) ATSDR – Agency for Toxic Substances and Disease Registry				

G.6.11 NO_x, SO₂ and Particulate Matter

In general, the adverse effects of exposure to gaseous air pollutants are associated with irritation of the tissues of the eyes and upper and lower respiratory systems. Exposures to the gaseous air pollutants (i.e., SO₂, NO₂) are assessed using values obtained from the WHO that are designed to offer guidance in reducing the health impacts of air pollution. The NO₂ guidelines are health-based values with no safety factors built in and are not targets, while the SO₂ values (Tier I and II) are only targets whereas the guideline is health-based. However, since no other TRVs are presently available to evaluate the health effects relating to NO₂ and SO₂ exposure, and since the WHO values are the most current health-based values available, they were used as health-based values in the assessment.

For NO₂, the WHO short-term guideline is based on human and animal studies which indicate that adverse effects are not observed at concentrations below 200 µg/m³ (WHO 2005). Studies

on bronchial responsiveness in asthmatics show an increased responsiveness at concentrations above 200 $\mu\text{g}/\text{m}^3$ and laboratory studies show a direct effect on pulmonary function in asthmatics at concentrations in the order of 560 $\mu\text{g}/\text{m}^3$. The use of the 200 $\mu\text{g}/\text{m}^3$ is protective of sensitive individuals (i.e., asthmatics) and therefore needs no built in safety factors. The annual guideline of 40 $\mu\text{g}/\text{m}^3$ is set to protect the public from gaseous effects of NO_2 (WHO 2005). This is based on the fact that no abatement methods are designed to reduce NO_2 (WHO 2005). Epidemiological evidence in children with asthma indicates that bronchitic symptoms increase with increasing NO_2 concentrations. There are also studies which indicate that there is some evidence of effects of respiratory symptoms in infants below 40 $\mu\text{g}/\text{m}^3$ (WHO 2005). However, there are other confounding variables which make it difficult to determine whether the effects are due only to NO_2 , or whether they are due to a mixture of air pollutants. Thus, the WHO indicates that there is insufficient health-based evidence at present to warrant changing the annual NO_2 guideline from the current value of 40 $\mu\text{g}/\text{m}^3$. Thus the WHO guidelines for NO_2 for acute (200 $\mu\text{g}/\text{m}^3$) and chronic (40 $\mu\text{g}/\text{m}^3$) exposures that are used in the assessment are based on the protection of sensitive individuals and are therefore health-based values.

The short-term (10 minute) value from the WHO for SO_2 of 500 $\mu\text{g}/\text{m}^3$ is based on asthmatics that showed changes in pulmonary function as well as respiratory symptoms after short-term exposure while exercising. Although the value of 500 $\mu\text{g}/\text{m}^3$ was based on 10 minute exposure, it has been used in the assessment for evaluation of 1 hour exposure effects and is a health-based value since the WHO indicates that scaling is not appropriate.

The 24 hour guideline for SO_2 has been updated in 2005 by the WHO; the new guideline is approximately 6 times lower than the 2000 guideline value and is based on epidemiological studies from 2003 onwards. These studies indicated that there was a major decrease in childhood respiratory disease and all-age mortality when the sulphur content in fuels was substantially reduced. Several studies by Wong et al. (2002), Pope et al. (2002) and Burnett et al. (2004) indicate that there is no threshold for health effects for 24 hour exposure to SO_2 concentrations in the range of 5 to 40 $\mu\text{g}/\text{m}^3$. The guideline has therefore been set at 20 $\mu\text{g}/\text{m}^3$. The WHO acknowledges the difficulty in achieving the new guideline value in the short-term, and has suggested a stepped approach using a tier I interim value of 125 $\mu\text{g}/\text{m}^3$. This is the previous guideline value (WHO 2000), which was derived by applying an uncertainty factor of 2 to a LOAEL for day-to-day changes in mortality, morbidity or lung function. The tier II interim value of 50 $\mu\text{g}/\text{m}^3$ is an intermediate goal based on a reduction of motor vehicle emissions, industrial emissions and/or emissions from power plant production. The WHO suggests that this is a reasonable and feasible goal for some developing countries and would lead to significant health improvements. In this assessment potential risks were calculated in comparison to the guideline value of 20 $\mu\text{g}/\text{m}^3$. It should be noted that these recommended guideline values for sulphur dioxide are not linked with guidelines for particles. WHO further noted in their Air Quality Guidelines Global Update (2005) that an annual guideline for SO_2 is not necessary since compliance with the 24 hour level will ensure low levels for the annual average. Therefore, no annual health-based guideline is provided.

Particulate matter (PM) describes all airborne solid and liquid particles of microscopic size, with the exception of pure water. The suspended portion of PM generally consists of particles less than 40 to 50 microns (μm) in diameter. These particles include a broad range of chemical species, such as elemental and organic carbon compounds, sulphates, nitrates and trace metals.

There is a growing body of scientific studies linking air pollutants to health effects. Recent assessments of the available health data are implying a stronger link between PM and health effects resulting from short- and long-term exposures. In addition, the effects are estimated to occur at levels that are lower than previously believed. This has motivated some regulators to re-assess the potential impact of particulate matter pollution on public health (CARB 2008). Many studies over the past few years have indicated that PM in the air aggravates symptoms of asthma, chronic pneumonia and cardiovascular problems in those people who already suffer from compromised respiratory systems.

The emphasis on particulate matter has been moving to the finer fractions of PM over the last 30 years as health studies and monitoring equipment have advanced to be able to detect differences in the particulate matter fractions. In the last 5 to 10 years health impact studies have been focussing on the impacts of particles less than $2.5\ \mu\text{m}$ in diameter ($\text{PM}_{2.5}$) or ultrafine particles which are less than $0.1\ \mu\text{m}$ in diameter (nanoparticles, $\text{PM}_{0.1}$). Due to their small size, $\text{PM}_{2.5}$ and $\text{PM}_{0.1}$ have the ability to reach the alveoli and penetrate deep into the lung. Their large surface area to volume ratio also gives these particles a greater capacity than PM_{10} to carry bound chemical components with them into the lung. The combination of these properties gives these particles an increased potential to cause adverse health effects. Additionally, $\text{PM}_{2.5}$ and $\text{PM}_{0.1}$ are less likely than PM_{10} to be coughed out. In essence, the smaller the particle the greater the capacity to produce potentially serious respiratory and cardiovascular complications. As such, evaluation of health effects from exposure to PM tends to focus on the finer fractions. With that said, however, there are currently no criteria for evaluation of ultrafine particles and thus quantitative evaluation is generally carried out using $\text{PM}_{2.5}$ standards. The effects of $\text{PM}_{0.1}$ and $\text{PM}_{2.5}$ are essentially the same from a qualitative standpoint.

The U.S. EPA has revoked their PM_{10} standard due to a lack of evidence linking health problems to long-term exposure to coarse particle pollution. In addition, the Canadian Federal government has not developed a PM_{10} Canada Wide Standard due to insufficient knowledge on the appropriateness of the standard. The federal government also recognizes that initiatives to reduce $\text{PM}_{2.5}$ will also likely reduce PM_{10} concentrations.

The Canadian Environmental Protection Agency Federal Provincial Agency Committee Working Group on Air Quality Objectives and Guidelines (CEPA/FPAC WGAQOG 1998) recommend a reference level of $25\ \mu\text{g}/\text{m}^3$ on a 24 hour averaging time for PM_{10} given the consistent associations observed in epidemiological studies with mortality and hospitalizations as well as concerns over links to chronic bronchitis and cardiovascular disease. The recommended reference level for $\text{PM}_{2.5}$ is $15\ \mu\text{g}/\text{m}^3$ on a 24 hour averaging time.

The WHO Working Group (2005) state that although clearly defined thresholds in exposure-response relationships for health effects from both long-term and short-term exposure are not available, adverse health effects from fine PM exposure are occurring at the levels of exposure currently experienced in urban areas in Europe. Since the conclusions were based on multi-city studies in the U.S., Canada and Europe, it suggests that health impacts also occur at fine PM levels commonly observed in Canada. The WHO state that there is little evidence to suggest that there is a threshold value for PM_{2.5} below which adverse health effects are not anticipated since adverse health effects have been observed at PM_{2.5} concentrations of 3 to 5 µg/m³. As such, the standard-setting process needs to aim at achieving the lowest concentrations possible and thus the WHO present numerical guidelines and interim target values to reflect the concentrations at which increased mortality due to PM air pollution is expected. The 24 hour and annual mean guidelines provided by the WHO are 10 µg/m³ and 25 µg/m³, respectively, for PM_{2.5} and 20 µg/m³ and 50 µg/m³, respectively, for PM₁₀. The 24 hour guideline for PM_{2.5} is based on the relationship between 24 hour and annual PM levels while the annual PM_{2.5} guideline represents the lowest levels at which total, cardiopulmonary and lung cancer mortality have been shown to increase with more than 95% confidence in response to long-term exposure to PM_{2.5} (WHO 2005). The PM₁₀ values are double the PM_{2.5} values. The WHO also provides three interim targets (IT). For exposure to PM_{2.5}, the 24 hour IT-1, -2 and -3 values are 75 µg/m³, 50 µg/m³ and 37.5 µg/m³, respectively, while the annual values are 35 µg/m³, 25 µg/m³ and 15 µg/m³, respectively. The PM₁₀ values are again simply double the PM_{2.5} values.

The California Environmental Protection Agency Air Resources Board does not have the same view. In a recent report (CARB 2008), a threshold level for PM_{2.5} exposure of 7 µg/m³ was suggested, since this was the lowest observed concentration in an American Cancer Society study carried out by Pope et al. (2002). This large cohort study provided evidence that exposure to PM_{2.5} as low as 7 µg/m³ can be associated with premature death. In addition, a level of 5 µg/m³ was also considered since it represented a concentration for the lowest observed short term levels associated with mortality (Ostro et al. 2006; Schwartz et al. 2002; Schwartz et al. 2002). The report was endorsed by a number of scientific advisors well known in the fine particulate area.

For PM₁₀, the reference level of 25 µg/m³, based on a 24 hour averaging time which resulted in consistent associations observed in epidemiological studies with mortality and hospitalizations as well as concerns over links to chronic bronchitis and cardiovascular disease (CEPA/FPAC WGAQOG 1998), was selected as a health-based limit.

A threshold value of 7 µg/m³ (CARB 2008) was used as the health-based level for PM_{2.5} (which encompasses ultrafine particles) and the epidemiological evidence related to short-term exposures are the most relevant to consider in this assessment. This threshold range was also considered in this assessment as a health-based limit.

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ATTACHMENT H ECOLOGICAL DOSE CALCULATIONS

H.1 AQUATIC DOSE CALCULATIONS

Table H.1-1 provides the dose calculations for aquatic receptor exposure to radionuclides for the maximum mean and maximum 95th percentile predicted concentrations.

H.2 TERRESTRIAL DOSE CALCULATIONS

Table H.2-1 provides the dose calculations for terrestrial receptor exposure to radionuclides using a RBE of 10 and a dose limit of 1 mGy/d. Table H.2-2 provides the dose calculations for terrestrial receptor exposure to radionuclides using a RBE of 10 and a dose limit of 3 mGy/d. Table H.2-3 provides the dose calculations for terrestrial receptor exposure to radionuclides using a RBE of 40 and a dose limit of 1 mGy/d. Table H.2-4 provides the dose calculations for terrestrial receptor exposure to radionuclides using a RBE of 40 and a dose limit of 3 mGy/d. These tables present the terrestrial dose calculations for baseline (2010), year 10 of operation (2023), year 5 of final closure (2043), year 15 of final closure (2053), and year 5 for post closure (2065).

Table H.1-1
Aquatic Dose Calculations

JSL-1 **Determination of Aquatic Dose - Average, RBE 10**

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Water									
Background	Bq/m3	wcb	12.30	6.00	4.00	11.00	5.00		
Impacted water body	Bq/m3	wc	13.17	31.7	20.8	58.0	27.0		<<<< input concentrations in water
Sediment									
Background	Bq/g(wet)	sedwcb	3.32E-02	4.00E-02	4.00E-02	1.00E-01	1.00E-01		
Impacted water body	Bq/g(wet)	sedwc	3.47E-02	4.57E-02	5.25E-02	1.19E-01	1.14E-01		<<<< input concentrations in sediment
Fish									
Water-to-fish biocon fa	m3/gwet	bcff	4.80E-07	3.60E-05	9.30E-05	8.50E-05	2.50E-04		<<<< input transfer factor
Fish in bkgd water	Bq/g wet	fc	5.90E-06	2.16E-04	3.72E-04	9.35E-04	1.25E-03		
Fish in impacted water	Bq/g wet	fc	6.32E-06	1.14E-03	1.94E-03	4.93E-03	6.75E-03		
Aquatic Plants									
Water-to-plants biocon	m3/gwet	bcfb	5.47E-05	4.6E-04	1.2E-04	6.0E-04	1.6E-03		<<<< input transfer factor
Plants in bkgd water	Bq/g wet	apcb	6.73E-04	2.76E-03	4.80E-04	6.60E-03	8.00E-03		
Plants in impacted water	Bq/g wet	apc	7.21E-04	1.46E-02	2.50E-03	3.48E-02	4.32E-02		
Benthic Invertebrates									
Water-to-benthos biocon	m3/gwet	bcfbi	7.13E-04	5.95E-05	9.70E-04	2.20E-04	1.52E-03		<<<< input transfer factor
Benthos in bkgd water	Bq/g wet	bicb	8.77E-03	3.57E-04	3.88E-03	2.42E-03	7.60E-03		
Benthos in impacted water	Bq/g wet	bic	9.39E-03	1.88E-03	2.02E-02	1.28E-02	4.10E-02		
Absorbed Doses - Fish									
Internal Dose Factor	mGy/d per Bq	Idcff	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadfb	8.38E-07	1.42E-05	5.91E-05	5.64E-06	9.25E-05	1.7E-04	'=fcb*Idcff
Internal dose impacted	mGy/d	Iadf	8.98E-07	7.50E-05	3.08E-04	2.97E-05	4.99E-04	9.1E-04	'=fc*Idcff
Ext. dose factor	mGy/d per Bq	Edcff	8.57E-03	2.93E-05	3.68E-02	2.50E-03	1.40E-07		
Ext. dose bkgd pelagic	mGy/d	Eadfb	1.05E-07	1.76E-10	1.47E-07	2.75E-08	7.00E-13	2.8E-07	'=wcb*Edcff/1000000
Ext. dose impacted pelagic	mGy/d	Eadf	1.13E-07	9.28E-10	7.66E-07	1.45E-07	3.78E-12	1.0E-06	'=wc*Edcff/1000000
Ext. dose bkgd benthic	mGy/d	Eadfbenb	1.42E-04	5.86E-07	7.36E-04	1.25E-04	7.00E-09	1.0E-03	'=Edcff*(wcb/1000000+sedwcb)/2
Ext. dose impacted benthic	mGy/d	Eadfben	1.49E-04	6.69E-07	9.66E-04	1.49E-04	8.01E-09	1.3E-03	'=Edcff*(wc/1000000+sedwc)/2
Total dose - pelagic bkgd	mGy/d	Tadfb	9.44E-07	1.42E-05	5.93E-05	5.67E-06	9.25E-05	1.7E-04	'=Iadfb+Eadfb
- pelagic impact	mGy/d	Tadfp	1.01E-06	7.50E-05	3.08E-04	2.99E-05	4.99E-04	9.1E-04	'=Iadf+Eadf
Total dose - benthic bkgd	mGy/d	Tadfbenb	1.43E-04	1.48E-05	7.95E-04	1.31E-04	9.25E-05	1.2E-03	'=Iadfb+Eadfbenb
- benthic impact	mGy/d	Tadfben	1.49E-04	7.57E-05	1.27E-03	1.79E-04	4.99E-04	2.2E-03	'=Iadf+Eadfben

Table H.1-1
Aquatic Dose Calculations

JSL-1		Determination of Aquatic Dose - Average, RBE 10						
		U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Absorbed Doses - Aquatic Plants								
Internal Dose Factor	mGy/d per Bq Idcfap	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d Iadapb	9.55E-05	1.82E-04	7.63E-05	3.98E-05	5.92E-04	9.9E-04	'=apcb*Idcfap
Internal dose impacted	mGy/d Iadap	1.02E-04	9.58E-04	3.97E-04	2.10E-04	3.20E-03	4.9E-03	'=apc*Idcfap
Ext. dose factor aq plan	mGy/d per Bq Edcfap	1.29E-02	2.25E-04	3.67E-02	6.03E-03	1.10E-07		
Ext. dose to leaf bkgd	mGy/d Eadpwb	1.59E-07	1.35E-09	1.47E-07	6.63E-08	5.50E-13	3.7E-07	'=wcb*Edcfap/1000000
Ext. dose to leaf impact	mGy/d Eadpw	1.70E-07	7.12E-09	7.64E-07	3.50E-07	2.97E-12	1.3E-06	'=wc*Edcfap/1000000
Ext. dose to root bkgd	mGy/d Eadpsb	4.28E-04	9.00E-06	1.47E-03	6.03E-04	1.10E-08	2.5E-03	'=sedwcb*Edcfap
Ext. dose to root impac	mGy/d Eadps	4.47E-04	1.03E-05	1.93E-03	7.18E-04	1.26E-08	3.1E-03	'=sedwc*Edcfap
Total dose - leaf bkgd	mGy/d Tadapl	9.57E-05	1.82E-04	7.65E-05	3.99E-05	5.92E-04	9.9E-04	'=Iadapb+Eadpwb
- leaf impacted	mGy/d Tadapl	1.03E-04	9.58E-04	3.98E-04	2.10E-04	3.20E-03	4.9E-03	'=Iadap+Eadpw
Total dose - root bkgd	mGy/d Tadaprb	5.24E-04	1.91E-04	1.54E-03	6.43E-04	5.92E-04	3.5E-03	'=Iadapb+Eadpsb
- root impacted	mGy/d Tadapr	5.49E-04	9.68E-04	2.32E-03	9.28E-04	3.20E-03	8.0E-03	'=Iadap+Eadps
Absorbed Doses - Benthic Invertebrates								
Internal Dose Factor	mGy/d per Bq Idcfbi	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d Iadbib	1.25E-03	2.35E-05	6.17E-04	1.46E-05	5.62E-04	2.5E-03	'=bicb*Idcfbi
Internal dose impacted	mGy/d Iadbi	1.33E-03	1.24E-04	3.21E-03	7.69E-05	3.04E-03	7.8E-03	'=bic*Idcfbi
Ext. dose factor ben inv	mGy/d per Bq Edcfbi	1.29E-02	2.25E-04	3.67E-02	6.03E-03	1.10E-07		
Ext. dose bkgd sedimer	mGy/d Eadbenb	4.28E-04	9.00E-06	1.47E-03	6.03E-04	1.10E-08	2.5E-03	'=sedwcb*Edcfbi
Ext. dose impacted sedi	mGy/d Eadben	4.47E-04	1.03E-05	1.93E-03	7.18E-04	1.26E-08	3.1E-03	'=sedwc*Edcfbi
Total dose - bkgd	mGy/d Tadbenb	1.67E-03	3.25E-05	2.08E-03	6.18E-04	5.62E-04	5.0E-03	'=Iadbib+Eadbenb
Total dose - impacted	mGy/d Tadben	1.78E-03	1.34E-04	5.14E-03	7.95E-04	3.04E-03	1.1E-02	'=Iadbi+Eadben
Equivalent Doses - Fish								
RBE for alpha	Sv/Gy	RBEf	10					
Total dose - pelagic bk	mSv/d Tedfpb	8.49E-06	1.42E-04	5.92E-04	5.67E-06	9.25E-04	1.7E-03	'=Iadfb*RBEf+Eadfb
- pelagic impact	mSv/d Tedfp	9.09E-06	7.50E-04	3.08E-03	2.99E-05	4.99E-03	8.9E-03	'=Iadf*RBEf+Eadf
Total dose - benthic bk	mSv/d Tedfbenb	1.51E-04	1.43E-04	1.33E-03	1.31E-04	9.25E-04	2.7E-03	'=Iadfb*RBEf+Eadfbenb
- benthic impact	mSv/d Tedfben	1.58E-04	7.51E-04	4.04E-03	1.79E-04	4.99E-03	1.0E-02	'=Iadf*RBEf+Eadfben
Equivalent Doses - Aquatic Plants								
RBE for alpha	Sv/Gy	RBEap	10					
Total dose - leaf bkgd	mSv/d Tedaplb	9.56E-04	1.82E-03	7.63E-04	3.99E-05	5.92E-03	9.5E-03	'=Iadapb*RBEap+Eadpwb
- leaf impacted	mSv/d Tedapl	1.02E-03	9.58E-03	3.97E-03	2.10E-04	3.20E-02	4.7E-02	'=Iadap*RBEap+Eadpw
Total dose - root bkgd	mSv/d Tedaprb	1.38E-03	1.83E-03	2.23E-03	6.43E-04	5.92E-03	1.2E-02	'=Iadapb*RBEap+Eadpsb
- root impacted	mSv/d Tedapr	1.47E-03	9.59E-03	5.90E-03	9.28E-04	3.20E-02	5.0E-02	'=Iadap*RBEap+Eadps

Table H.1-1

Aquatic Dose Calculations

JSL-1

Determination of Aquatic Dose - Average, RBE 10

Equivalent Doses - Benthic Invertebrates

RBE for alpha	Sv/Gy	RBEbi	10							
Total dose - bkgd	mSv/d	Tedbenb	1.29E-02	2.44E-04	7.64E-03	6.18E-04	5.62E-03	2.7E-02		'=Iadbib*RBEbi+Eadbenb
Total dose - impacted	mSv/d	Tedben	1.38E-02	1.25E-03	3.40E-02	7.95E-04	3.04E-02	8.0E-02		'=Iadbi*RBEbi+Eadben

0.6 Screening Criterion in mGy/d	3 6	Total Absorbed Dose mGy/d	Total Equivalent Dose mSv/d	Index (Absorbed Equivalent Dose)	Index (Absorbed Equivalent Dose)
Pelagic Fish - Background		1.7E-04	1.7E-03	2.9E-04	2.8E-03
Pelagic Fish - Impacted		9.1E-04	8.9E-03	1.5E-03	1.5E-02
Benthic Fish - Background		1.2E-03	2.7E-03	2.0E-03	4.5E-03
Benthic Fish - Impacted		2.2E-03	1.0E-02	3.6E-03	1.7E-02
Aquatic Plant Leaves - Background		9.9E-04	9.5E-03	3.3E-04	3.2E-03
Aquatic Plant Leaves - Impacted		4.9E-03	4.7E-02	1.6E-03	1.6E-02
Aquatic Plant Roots - Background		3.5E-03	1.2E-02	1.2E-03	4.0E-03
Aquatic Plant Roots - Impacted		8.0E-03	5.0E-02	2.7E-03	1.7E-02
Benthic Invertebrates - Background		5.0E-03	2.7E-02	8.3E-04	4.5E-03
Benthic Invertebrates - Impacted		1.1E-02	8.0E-02	1.8E-03	1.3E-02

U-238+	Internal	U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235
	External	U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235 (beta + gamma only)
Ra-226+	Internal	Ra-226 + 0.3* (Rn-222 + ...Po-214)
	External	Ra-226 + 1.0* (Rn-222 + ...Po-214) (beta + gamma only)
Th-232+	Internal	Th-232 + ...Po-212/Tl-208 (Th-232 + Th-228 are inputs)
	External	Th-232 + Po-212/Tl-208
Ra-228+	Internal	Ra-228 + ...Po-212/Tl-208

Table H.1-1
Aquatic Dose Calculations

JSL-1

Determination of Aquatic Dose - 95th Percentile, RBE 10

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Water									
Background	Bq/m3	wcb	12.30	6.00	4.00	11.00	5.00		
Impacted water body	Bq/m3	wc	27.42	34.7	22.0	61.0	31.0		<<<< input concentrations in water
Sediment									
Background	Bq/g(wet)	sedwcb	3.32E-02	4.00E-02	4.00E-02	1.00E-01	1.00E-01		
Impacted water body	Bq/g(wet)	sedwc	3.62E-02	5.16E-02	6.05E-02	1.32E-01	1.25E-01		<<<< input concentrations in sediment
Fish									
Water-to-fish biocon fa	m3/gwet	bcff	4.80E-07	3.60E-05	9.30E-05	8.50E-05	2.50E-04		<<<< input transfer factor
Fish in bkgd water	Bq/g wet	fc	5.90E-06	2.16E-04	3.72E-04	9.35E-04	1.25E-03		
Fish in impacted water	Bq/g wet	fc	1.32E-05	1.25E-03	2.04E-03	5.19E-03	7.75E-03		
Aquatic Plants									
Water-to-plants biocon m3/gwet		bcfb	5.47E-05	4.6E-04	1.2E-04	6.0E-04	1.6E-03		<<<< input transfer factor
Plants in bkgd water	Bq/g wet	apcb	6.73E-04	2.76E-03	4.80E-04	6.60E-03	8.00E-03		
Plants in impacted water	Bq/g wet	apc	1.50E-03	1.60E-02	2.63E-03	3.66E-02	4.96E-02		
Benthic Invertebrates									
Water-to-benthos biocon m3/gwet		bcfbi	7.13E-04	5.95E-05	9.70E-04	2.20E-04	1.52E-03		<<<< input transfer factor
Benthos in bkgd water	Bq/g wet	bicb	8.77E-03	3.57E-04	3.88E-03	2.42E-03	7.60E-03		
Benthos in impacted water	Bq/g wet	bic	1.95E-02	2.06E-03	2.13E-02	1.34E-02	4.71E-02		
Absorbed Doses - Fish									
Internal Dose Factor	mGy/d per Bq	Idc	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadfb	8.38E-07	1.42E-05	5.91E-05	5.64E-06	9.25E-05	1.7E-04	'=fcb*Idc
Internal dose impacted	mGy/d	Iadf	1.87E-06	8.22E-05	3.25E-04	3.13E-05	5.73E-04	1.0E-03	'=fc*Idc
Ext. dose factor	mGy/d per Bq	Edc	8.57E-03	2.93E-05	3.68E-02	2.50E-03	1.40E-07		
Ext. dose bkgd pelagic	mGy/d	Eadfb	1.05E-07	1.76E-10	1.47E-07	2.75E-08	7.00E-13	2.8E-07	'=wcb*Edc/1000000
Ext. dose impacted pelagic	mGy/d	Eadf	2.35E-07	1.02E-09	8.08E-07	1.53E-07	4.34E-12	1.2E-06	'=wc*Edc/1000000
Ext. dose bkgd benthic	mGy/d	Eadfbenb	1.42E-04	5.86E-07	7.36E-04	1.25E-04	7.00E-09	1.0E-03	'=Edc*((wcb/1000000+sedwcb)/2
Ext. dose impacted benthic	mGy/d	Eadfben	1.55E-04	7.57E-07	1.11E-03	1.65E-04	8.74E-09	1.4E-03	'=Edc*((wc/1000000+sedwc)/2
Total dose - pelagic bkgd	mGy/d	Tadfbp	9.44E-07	1.42E-05	5.93E-05	5.67E-06	9.25E-05	1.7E-04	'=Iadfb+Eadfb
- pelagic impact	mGy/d	Tadfp	2.10E-06	8.22E-05	3.25E-04	3.14E-05	5.73E-04	1.0E-03	'=Iadf+Eadf
Total dose - benthic bkgd	mGy/d	Tadfbenb	1.43E-04	1.48E-05	7.95E-04	1.31E-04	9.25E-05	1.2E-03	'=Iadfb+Eadfbenb
- benthic impact	mGy/d	Tadfben	1.57E-04	8.29E-05	1.44E-03	1.96E-04	5.73E-04	2.4E-03	'=Iadf+Eadfben

Table H.1-1

Aquatic Dose Calculations

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Absorbed Doses - Aquatic Plants									
Internal Dose Factor	mGy/d per Bq	Idcfap	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadapb	9.55E-05	1.82E-04	7.63E-05	3.98E-05	5.92E-04	9.9E-04	'=apcb*Idcfap
Internal dose impacted	mGy/d	Iadap	2.13E-04	1.05E-03	4.19E-04	2.21E-04	3.67E-03	5.6E-03	'=apc*Idcfap
Ext. dose factor aq plan	mGy/d per Bq	Edcfap	1.29E-02	2.25E-04	3.67E-02	6.03E-03	1.10E-07		
Ext. dose to leaf bkgd	mGy/d	Eadpwb	1.59E-07	1.35E-09	1.47E-07	6.63E-08	5.50E-13	3.7E-07	'=wcb*Edcfap/1000000
Ext. dose to leaf impact	mGy/d	Eadpw	3.54E-07	7.80E-09	8.06E-07	3.68E-07	3.41E-12	1.5E-06	'=wc*Edcfap/1000000
Ext. dose to root bkgd	mGy/d	Eadpsb	4.28E-04	9.00E-06	1.47E-03	6.03E-04	1.10E-08	2.5E-03	'=sedwcb*Edcfap
Ext. dose to root impact	mGy/d	Eadps	4.67E-04	1.16E-05	2.22E-03	7.95E-04	1.37E-08	3.5E-03	'=sedwc*Edcfap
Total dose - leaf bkgd	mGy/d	Tadaplb	9.57E-05	1.82E-04	7.65E-05	3.99E-05	5.92E-04	9.9E-04	'=Iadapb+Eadpwb
- leaf impacted	mGy/d	Tadapl	2.13E-04	1.05E-03	4.20E-04	2.21E-04	3.67E-03	5.6E-03	'=Iadap+Eadpw
Total dose - root bkgd	mGy/d	Tadaprb	5.24E-04	1.91E-04	1.54E-03	6.43E-04	5.92E-04	3.5E-03	'=Iadapb+Eadpsb
- root impacted	mGy/d	Tadapr	6.80E-04	1.06E-03	2.64E-03	1.02E-03	3.67E-03	9.1E-03	'=Iadap+Eadps
Absorbed Doses - Benthic Invertebrates									
Internal Dose Factor	mGy/d per Bq	Idcfbi	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadbib	1.25E-03	2.35E-05	6.17E-04	1.46E-05	5.62E-04	2.5E-03	'=bicb*Idcfbi
Internal dose impacted	mGy/d	Iadbi	2.78E-03	1.36E-04	3.39E-03	8.09E-05	3.48E-03	9.9E-03	'=bic*Idcfbi
Ext. dose factor ben inv	mGy/d per Bq	Edcfbi	1.29E-02	2.25E-04	3.67E-02	6.03E-03	1.10E-07		
Ext. dose bkgd sedimer	mGy/d	Eadbenb	4.28E-04	9.00E-06	1.47E-03	6.03E-04	1.10E-08	2.5E-03	'=sedwcb*Edcfbi
Ext. dose impacted sedi	mGy/d	Eadben	4.67E-04	1.16E-05	2.22E-03	7.95E-04	1.37E-08	3.5E-03	'=sedwc*Edcfbi
Total dose - bkgd	mGy/d	Tadbenb	1.67E-03	3.25E-05	2.08E-03	6.18E-04	5.62E-04	5.0E-03	'=Iadbib+Eadbenb
Total dose - impacted	mGy/d	Tadben	3.24E-03	1.47E-04	5.61E-03	8.76E-04	3.48E-03	1.3E-02	'=Iadbi+Eadben
Equivalent Doses - Fish									
RBE for alpha	Sv/Gy	RBEf	10						
Total dose - pelagic bkg	mSv/d	Tedfpb	8.49E-06	1.42E-04	5.92E-04	5.67E-06	9.25E-04	1.7E-03	'=Iadfb*RBEf+Eadfb
- pelagic impact	mSv/d	Tedfp	1.89E-05	8.22E-04	3.25E-03	3.14E-05	5.73E-03	9.9E-03	'=Iadf*RBEf+Eadf
Total dose - benthic bkg	mSv/d	Tedfbenb	1.51E-04	1.43E-04	1.33E-03	1.31E-04	9.25E-04	2.7E-03	'=Iadfb*RBEf+Eadfbenb
- benthic impact	mSv/d	Tedfben	1.74E-04	8.22E-04	4.36E-03	1.96E-04	5.73E-03	1.1E-02	'=Iadf*RBEf+Eadfben
Equivalent Doses - Aquatic Plants									
RBE for alpha	Sv/Gy	RBEap	10						
Total dose - leaf bkgd	mSv/d	Tedaplb	9.56E-04	1.82E-03	7.63E-04	3.99E-05	5.92E-03	9.5E-03	'=Iadapb*RBEap+Eadpwb
- leaf impacted	mSv/d	Tedapl	2.13E-03	1.05E-02	4.19E-03	2.21E-04	3.67E-02	5.4E-02	'=Iadap*RBEap+Eadpw
Total dose - root bkgd	mSv/d	Tedaprb	1.38E-03	1.83E-03	2.23E-03	6.43E-04	5.92E-03	1.2E-02	'=Iadapb*RBEap+Eadpsb
- root impacted	mSv/d	Tedapr	2.60E-03	1.05E-02	6.41E-03	1.02E-03	3.67E-02	5.7E-02	'=Iadap*RBEap+Eadps

Table H.1-1

Aquatic Dose Calculations

Equivalent Doses - Benthic Invertebrates

RBE for alpha	Sv/Gy	RBEbi	10							
Total dose - bkgd	mSv/d	Tedbenb	1.29E-02	2.44E-04	7.64E-03	6.18E-04	5.62E-03	2.7E-02		'=Iadbib*RBEbi+Eadbenb
Total dose - impacted	mSv/d	Tedben	2.82E-02	1.37E-03	3.61E-02	8.76E-04	3.48E-02	1.0E-01		'=Iadbi*RBEbi+Eadben

0.6 Screening Criterion in mGy/d	3 6	Total Absorbed Dose mGy/d	Total Equivalent Dose mSv/d	Index (Absorbed Equivalent Dose)	Index (Absorbed Equivalent Dose)
Pelagic Fish - Background		1.7E-04	1.7E-03	2.9E-04	2.8E-03
Pelagic Fish - Impacted		1.0E-03	9.9E-03	1.7E-03	1.6E-02
Benthic Fish - Background		1.2E-03	2.7E-03	2.0E-03	4.5E-03
Benthic Fish - Impacted		2.4E-03	1.1E-02	4.1E-03	1.9E-02
Aquatic Plant Leaves - Background		9.9E-04	9.5E-03	3.3E-04	3.2E-03
Aquatic Plant Leaves - Impacted		5.6E-03	5.4E-02	1.9E-03	1.8E-02
Aquatic Plant Roots - Background		3.5E-03	1.2E-02	1.2E-03	4.0E-03
Aquatic Plant Roots - Impacted		9.1E-03	5.7E-02	3.0E-03	1.9E-02
Benthic Invertebrates - Background		5.0E-03	2.7E-02	8.3E-04	4.5E-03
Benthic Invertebrates - Impacted		1.3E-02	1.0E-01	2.2E-03	1.7E-02

U-238+	Internal	U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235
	External	U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235 (beta + gamma only)
Ra-226+	Internal	Ra-226 + 0.3* (Rn-222 + ...Po-214)
	External	Ra-226 + 1.0* (Rn-222 + ...Po-214) (beta + gamma only)
Th-232+	Internal	Th-232 + ...Po-212/Tl-208 (Th-232 + Th-228 are inputs)
	External	Th-232 + Po-212/Tl-208
Ra-228+	Internal	Ra-228 + ...Po-212/Tl-208

Table H.1-1
Aquatic Dose Calculations

JSL-1 **Determination of Aquatic Dose - Average, RBE 40**

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Water									
Background	Bq/m3	wcb	12.30	6.00	4.00	11.00	5.00		
Impacted water body	Bq/m3	wc	13.17	31.7	20.8	58.0	27.0		<<<< input concentrations in water
Sediment									
Background	Bq/g(wet)	sedwcb	3.32E-02	4.00E-02	4.00E-02	1.00E-01	1.00E-01		
Impacted water body	Bq/g(wet)	sedwc	3.47E-02	4.57E-02	5.25E-02	1.19E-01	1.14E-01		<<<< input concentrations in sediment
Fish									
Water-to-fish biocon fa	m3/gwet	bcff	4.80E-07	3.60E-05	9.30E-05	8.50E-05	2.50E-04		<<<< input transfer factor
Fish in bkgd water	Bq/g wet	fc	5.90E-06	2.16E-04	3.72E-04	9.35E-04	1.25E-03		
Fish in impacted water	Bq/g wet	fc	6.32E-06	1.14E-03	1.94E-03	4.93E-03	6.75E-03		
Aquatic Plants									
Water-to-plants biocon	m3/gwet	bcfb	5.47E-05	4.6E-04	1.2E-04	6.0E-04	1.6E-03		<<<< input transfer factor
Plants in bkgd water	Bq/g wet	apcb	6.73E-04	2.76E-03	4.80E-04	6.60E-03	8.00E-03		
Plants in impacted water	Bq/g wet	apc	7.21E-04	1.46E-02	2.50E-03	3.48E-02	4.32E-02		
Benthic Invertebrates									
Water-to-benthos biocon	m3/gwet	bcfbi	7.13E-04	5.95E-05	9.70E-04	2.20E-04	1.52E-03		<<<< input transfer factor
Benthos in bkgd water	Bq/g wet	bicb	8.77E-03	3.57E-04	3.88E-03	2.42E-03	7.60E-03		
Benthos in impacted water	Bq/g wet	bic	9.39E-03	1.88E-03	2.02E-02	1.28E-02	4.10E-02		
Absorbed Doses - Fish									
Internal Dose Factor	mGy/d per Bq	Idcff	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadfb	8.38E-07	1.42E-05	5.91E-05	5.64E-06	9.25E-05	1.7E-04	'=fcb*Idcff
Internal dose impacted	mGy/d	Iadf	8.98E-07	7.50E-05	3.08E-04	2.97E-05	4.99E-04	9.1E-04	'=fc*Idcff
Ext. dose factor	mGy/d per Bq	Edcff	8.57E-03	2.93E-05	3.68E-02	2.50E-03	1.40E-07		
Ext. dose bkgd pelagic	mGy/d	Eadfb	1.05E-07	1.76E-10	1.47E-07	2.75E-08	7.00E-13	2.8E-07	'=wcb*Edcff/1000000
Ext. dose impacted pelagic	mGy/d	Eadf	1.13E-07	9.28E-10	7.66E-07	1.45E-07	3.78E-12	1.0E-06	'=wc*Edcff/1000000
Ext. dose bkgd benthic	mGy/d	Eadfbenb	1.42E-04	5.86E-07	7.36E-04	1.25E-04	7.00E-09	1.0E-03	'=Edcff*(wcb/1000000+sedwcb)/2
Ext. dose impacted benthic	mGy/d	Eadfben	1.49E-04	6.69E-07	9.66E-04	1.49E-04	8.01E-09	1.3E-03	'=Edcff*(wc/1000000+sedwc)/2
Total dose - pelagic bkgd	mGy/d	Tadfb	9.44E-07	1.42E-05	5.93E-05	5.67E-06	9.25E-05	1.7E-04	'=Iadfb+Eadfb
- pelagic impact	mGy/d	Tadfp	1.01E-06	7.50E-05	3.08E-04	2.99E-05	4.99E-04	9.1E-04	'=Iadf+Eadf
Total dose - benthic bkgd	mGy/d	Tadfbenb	1.43E-04	1.48E-05	7.95E-04	1.31E-04	9.25E-05	1.2E-03	'=Iadfb+Eadfbenb
- benthic impact	mGy/d	Tadfben	1.49E-04	7.57E-05	1.27E-03	1.79E-04	4.99E-04	2.2E-03	'=Iadf+Eadfben

Table H.1-1

Aquatic Dose Calculations

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Absorbed Doses - Aquatic Plants									
Internal Dose Factor	mGy/d per Bq	Idcfap	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadapb	9.55E-05	1.82E-04	7.63E-05	3.98E-05	5.92E-04	9.9E-04	'=apcb*Idcfap
Internal dose impacted	mGy/d	Iadap	1.02E-04	9.58E-04	3.97E-04	2.10E-04	3.20E-03	4.9E-03	'=apc*Idcfap
Ext. dose factor aq plan	mGy/d per Bq	Edcfap	1.29E-02	2.25E-04	3.67E-02	6.03E-03	1.10E-07		
Ext. dose to leaf bkgd	mGy/d	Eadpwb	1.59E-07	1.35E-09	1.47E-07	6.63E-08	5.50E-13	3.7E-07	'=wcb*Edcfap/1000000
Ext. dose to leaf impact	mGy/d	Eadpw	1.70E-07	7.12E-09	7.64E-07	3.50E-07	2.97E-12	1.3E-06	'=wc*Edcfap/1000000
Ext. dose to root bkgd	mGy/d	Eadpsb	4.28E-04	9.00E-06	1.47E-03	6.03E-04	1.10E-08	2.5E-03	'=sedwcb*Edcfap
Ext. dose to root impact	mGy/d	Eadps	4.47E-04	1.03E-05	1.93E-03	7.18E-04	1.26E-08	3.1E-03	'=sedwc*Edcfap
Total dose - leaf bkgd	mGy/d	Tadaplb	9.57E-05	1.82E-04	7.65E-05	3.99E-05	5.92E-04	9.9E-04	'=Iadapb+Eadpwb
- leaf impacted	mGy/d	Tadapl	1.03E-04	9.58E-04	3.98E-04	2.10E-04	3.20E-03	4.9E-03	'=Iadap+Eadpw
Total dose - root bkgd	mGy/d	Tadaprb	5.24E-04	1.91E-04	1.54E-03	6.43E-04	5.92E-04	3.5E-03	'=Iadapb+Eadpsb
- root impacted	mGy/d	Tadapr	5.49E-04	9.68E-04	2.32E-03	9.28E-04	3.20E-03	8.0E-03	'=Iadap+Eadps
Absorbed Doses - Benthic Invertebrates									
Internal Dose Factor	mGy/d per Bq	Idcfbi	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadbib	1.25E-03	2.35E-05	6.17E-04	1.46E-05	5.62E-04	2.5E-03	'=bicb*Idcfbi
Internal dose impacted	mGy/d	Iadbi	1.33E-03	1.24E-04	3.21E-03	7.69E-05	3.04E-03	7.8E-03	'=bic*Idcfbi
Ext. dose factor ben inv	mGy/d per Bq	Edcfbi	1.29E-02	2.25E-04	3.67E-02	6.03E-03	1.10E-07		
Ext. dose bkgd sedimer	mGy/d	Eadbenb	4.28E-04	9.00E-06	1.47E-03	6.03E-04	1.10E-08	2.5E-03	'=sedwcb*Edcfbi
Ext. dose impacted sedi	mGy/d	Eadben	4.47E-04	1.03E-05	1.93E-03	7.18E-04	1.26E-08	3.1E-03	'=sedwc*Edcfbi
Total dose - bkgd	mGy/d	Tadbenb	1.67E-03	3.25E-05	2.08E-03	6.18E-04	5.62E-04	5.0E-03	'=Iadbib+Eadbenb
Total dose - impacted	mGy/d	Tadben	1.78E-03	1.34E-04	5.14E-03	7.95E-04	3.04E-03	1.1E-02	'=Iadbi+Eadben
Equivalent Doses - Fish									
RBE for alpha	Sv/Gy	RBEf	40						
Total dose - pelagic bkg	mSv/d	Tedfpb	3.36E-05	5.69E-04	2.37E-03	5.67E-06	3.70E-03	6.7E-03	'=Iadfb*RBEf+Eadfb
- pelagic impact	mSv/d	Tedfp	3.60E-05	3.00E-03	1.23E-02	2.99E-05	2.00E-02	3.5E-02	'=Iadf*RBEf+Eadf
Total dose - benthic bkg	mSv/d	Tedfbenb	1.76E-04	5.69E-04	3.10E-03	1.31E-04	3.70E-03	7.7E-03	'=Iadfb*RBEf+Eadfbenb
- benthic impact	mSv/d	Tedfben	1.84E-04	3.00E-03	1.33E-02	1.79E-04	2.00E-02	3.7E-02	'=Iadf*RBEf+Eadfben
Equivalent Doses - Aquatic Plants									
RBE for alpha	Sv/Gy	RBEap	40						
Total dose - leaf bkgd	mSv/d	Tedaplb	3.82E-03	7.26E-03	3.05E-03	3.99E-05	2.37E-02	3.8E-02	'=Iadapb*RBEap+Eadpwb
- leaf impacted	mSv/d	Tedapl	4.09E-03	3.83E-02	1.59E-02	2.10E-04	1.28E-01	1.9E-01	'=Iadap*RBEap+Eadpw
Total dose - root bkgd	mSv/d	Tedaprb	4.25E-03	7.27E-03	4.52E-03	6.43E-04	2.37E-02	4.0E-02	'=Iadapb*RBEap+Eadpsb
- root impacted	mSv/d	Tedapr	4.54E-03	3.83E-02	1.78E-02	9.28E-04	1.28E-01	1.9E-01	'=Iadap*RBEap+Eadps

Table H.1-1

Aquatic Dose Calculations

Equivalent Doses - Benthic Invertebrates

RBE for alpha	Sv/Gy	RBEbi	40							
Total dose - bkgd	mSv/d	Tedbenb	5.02E-02	9.49E-04	2.61E-02	6.18E-04	2.25E-02	1.0E-01		'=Iadbib*RBEbi+Eadbenb
Total dose - impacted	mSv/d	Tedben	5.38E-02	4.97E-03	1.30E-01	7.95E-04	1.21E-01	3.1E-01		'=Iadbi*RBEbi+Eadben

0.6 Screening Criterion in mGy/d	3 6	Total Absorbed Dose mGy/d	Total Equivalent Dose mSv/d	Index (Absorbed Equivalent Dose)	Index (Absorbed Equivalent Dose)
Pelagic Fish - Background		1.7E-04	6.7E-03	2.9E-04	1.1E-02
Pelagic Fish - Impacted		9.1E-04	3.5E-02	1.5E-03	5.9E-02
Benthic Fish - Background		1.2E-03	7.7E-03	2.0E-03	1.3E-02
Benthic Fish - Impacted		2.2E-03	3.7E-02	3.6E-03	6.1E-02
Aquatic Plant Leaves - Background		9.9E-04	3.8E-02	3.3E-04	1.3E-02
Aquatic Plant Leaves - Impacted		4.9E-03	1.9E-01	1.6E-03	6.2E-02
Aquatic Plant Roots - Background		3.5E-03	4.0E-02	1.2E-03	1.3E-02
Aquatic Plant Roots - Impacted		8.0E-03	1.9E-01	2.7E-03	6.3E-02
Benthic Invertebrates - Background		5.0E-03	1.0E-01	8.3E-04	1.7E-02
Benthic Invertebrates - Impacted		1.1E-02	3.1E-01	1.8E-03	5.2E-02

U-238+	Internal	U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235
	External	U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235 (beta + gamma only)
Ra-226+	Internal	Ra-226 + 0.3* (Rn-222 + ...Po-214)
	External	Ra-226 + 1.0* (Rn-222 + ...Po-214) (beta + gamma only)
Th-232+	Internal	Th-232 + ...Po-212/Tl-208 (Th-232 + Th-228 are inputs)
	External	Th-232 + Po-212/Tl-208
Ra-228+	Internal	Ra-228 + ...Po-212/Tl-208

Table H.1-1
Aquatic Dose Calculations

JSL-1

Determination of Aquatic Dose - 95th Percentile, RBE 40

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Water									
Background	Bq/m3	wcb	12.30	6.00	4.00	11.00	5.00		
Impacted water body	Bq/m3	wc	27.42	34.7	22.0	61.0	31.0		<<<< input concentrations in water
Sediment									
Background	Bq/g(wet)	sedwcb	3.32E-02	4.00E-02	4.00E-02	1.00E-01	1.00E-01		
Impacted water body	Bq/g(wet)	sedwc	3.62E-02	5.16E-02	6.05E-02	1.32E-01	1.25E-01		<<<< input concentrations in sediment
Fish									
Water-to-fish biocon fa	m3/gwet	bcff	4.80E-07	3.60E-05	9.30E-05	8.50E-05	2.50E-04		<<<< input transfer factor
Fish in bkgd water	Bq/g wet	fc	5.90E-06	2.16E-04	3.72E-04	9.35E-04	1.25E-03		
Fish in impacted water	Bq/g wet	fc	1.32E-05	1.25E-03	2.04E-03	5.19E-03	7.75E-03		
Aquatic Plants									
Water-to-plants biocon m3/gwet		bcfb	5.47E-05	4.6E-04	1.2E-04	6.0E-04	1.6E-03		<<<< input transfer factor
Plants in bkgd water	Bq/g wet	apcb	6.73E-04	2.76E-03	4.80E-04	6.60E-03	8.00E-03		
Plants in impacted water	Bq/g wet	apc	1.50E-03	1.60E-02	2.63E-03	3.66E-02	4.96E-02		
Benthic Invertebrates									
Water-to-benthos biocon m3/gwet		bcfbi	7.13E-04	5.95E-05	9.70E-04	2.20E-04	1.52E-03		<<<< input transfer factor
Benthos in bkgd water	Bq/g wet	bicb	8.77E-03	3.57E-04	3.88E-03	2.42E-03	7.60E-03		
Benthos in impacted water	Bq/g wet	bic	1.95E-02	2.06E-03	2.13E-02	1.34E-02	4.71E-02		
Absorbed Doses - Fish									
Internal Dose Factor	mGy/d per Bq	Idc	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadfb	8.38E-07	1.42E-05	5.91E-05	5.64E-06	9.25E-05	1.7E-04	'=fcb*Idc
Internal dose impacted	mGy/d	Iadf	1.87E-06	8.22E-05	3.25E-04	3.13E-05	5.73E-04	1.0E-03	'=fc*Idc
Ext. dose factor	mGy/d per Bq	Edc	8.57E-03	2.93E-05	3.68E-02	2.50E-03	1.40E-07		
Ext. dose bkgd pelagic	mGy/d	Eadfb	1.05E-07	1.76E-10	1.47E-07	2.75E-08	7.00E-13	2.8E-07	'=wcb*Edc/1000000
Ext. dose impacted pelagic	mGy/d	Eadf	2.35E-07	1.02E-09	8.08E-07	1.53E-07	4.34E-12	1.2E-06	'=wc*Edc/1000000
Ext. dose bkgd benthic	mGy/d	Eadfbenb	1.42E-04	5.86E-07	7.36E-04	1.25E-04	7.00E-09	1.0E-03	'=Edc*(wcb/1000000+sedwcb)/2
Ext. dose impacted benthic	mGy/d	Eadfben	1.55E-04	7.57E-07	1.11E-03	1.65E-04	8.74E-09	1.4E-03	'=Edc*(wc/1000000+sedwc)/2
Total dose - pelagic bkgd	mGy/d	Tadfb	9.44E-07	1.42E-05	5.93E-05	5.67E-06	9.25E-05	1.7E-04	'=Iadfb+Eadfb
- pelagic impact	mGy/d	Tadfp	2.10E-06	8.22E-05	3.25E-04	3.14E-05	5.73E-04	1.0E-03	'=Iadf+Eadf
Total dose - benthic bkgd	mGy/d	Tadfbenb	1.43E-04	1.48E-05	7.95E-04	1.31E-04	9.25E-05	1.2E-03	'=Iadfb+Eadfbenb
- benthic impact	mGy/d	Tadfben	1.57E-04	8.29E-05	1.44E-03	1.96E-04	5.73E-04	2.4E-03	'=Iadf+Eadfben

Table H.1-1

Aquatic Dose Calculations

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Absorbed Doses - Aquatic Plants									
Internal Dose Factor	mGy/d per Bq	Idcfap	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadapb	9.55E-05	1.82E-04	7.63E-05	3.98E-05	5.92E-04	9.9E-04	'=apcb*Idcfap
Internal dose impacted	mGy/d	Iadap	2.13E-04	1.05E-03	4.19E-04	2.21E-04	3.67E-03	5.6E-03	'=apc*Idcfap
Ext. dose factor aq plan	mGy/d per Bq	Edcfap	1.29E-02	2.25E-04	3.67E-02	6.03E-03	1.10E-07		
Ext. dose to leaf bkgd	mGy/d	Eadpwb	1.59E-07	1.35E-09	1.47E-07	6.63E-08	5.50E-13	3.7E-07	'=wcb*Edcfap/1000000
Ext. dose to leaf impact	mGy/d	Eadpw	3.54E-07	7.80E-09	8.06E-07	3.68E-07	3.41E-12	1.5E-06	'=wc*Edcfap/1000000
Ext. dose to root bkgd	mGy/d	Eadpsb	4.28E-04	9.00E-06	1.47E-03	6.03E-04	1.10E-08	2.5E-03	'=sedwcb*Edcfap
Ext. dose to root impact	mGy/d	Eadps	4.67E-04	1.16E-05	2.22E-03	7.95E-04	1.37E-08	3.5E-03	'=sedwc*Edcfap
Total dose - leaf bkgd	mGy/d	Tadaplb	9.57E-05	1.82E-04	7.65E-05	3.99E-05	5.92E-04	9.9E-04	'=Iadapb+Eadpwb
- leaf impacted	mGy/d	Tadapl	2.13E-04	1.05E-03	4.20E-04	2.21E-04	3.67E-03	5.6E-03	'=Iadap+Eadpw
Total dose - root bkgd	mGy/d	Tadaprb	5.24E-04	1.91E-04	1.54E-03	6.43E-04	5.92E-04	3.5E-03	'=Iadapb+Eadpsb
- root impacted	mGy/d	Tadapr	6.80E-04	1.06E-03	2.64E-03	1.02E-03	3.67E-03	9.1E-03	'=Iadap+Eadps
Absorbed Doses - Benthic Invertebrates									
Internal Dose Factor	mGy/d per Bq	Idcfbi	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadbib	1.25E-03	2.35E-05	6.17E-04	1.46E-05	5.62E-04	2.5E-03	'=bicb*Idcfbi
Internal dose impacted	mGy/d	Iadbi	2.78E-03	1.36E-04	3.39E-03	8.09E-05	3.48E-03	9.9E-03	'=bic*Idcfbi
Ext. dose factor ben inv	mGy/d per Bq	Edcfbi	1.29E-02	2.25E-04	3.67E-02	6.03E-03	1.10E-07		
Ext. dose bkgd sedimer	mGy/d	Eadbenb	4.28E-04	9.00E-06	1.47E-03	6.03E-04	1.10E-08	2.5E-03	'=sedwcb*Edcfbi
Ext. dose impacted sedi	mGy/d	Eadben	4.67E-04	1.16E-05	2.22E-03	7.95E-04	1.37E-08	3.5E-03	'=sedwc*Edcfbi
Total dose - bkgd	mGy/d	Tadbenb	1.67E-03	3.25E-05	2.08E-03	6.18E-04	5.62E-04	5.0E-03	'=Iadbib+Eadbenb
Total dose - impacted	mGy/d	Tadben	3.24E-03	1.47E-04	5.61E-03	8.76E-04	3.48E-03	1.3E-02	'=Iadbi+Eadben
Equivalent Doses - Fish									
RBE for alpha	Sv/Gy	RBEf	40						
Total dose - pelagic bkg	mSv/d	Tedfpb	3.36E-05	5.69E-04	2.37E-03	5.67E-06	3.70E-03	6.7E-03	'=Iadfb*RBEf+Eadfb
- pelagic impact	mSv/d	Tedfp	7.50E-05	3.29E-03	1.30E-02	3.14E-05	2.29E-02	3.9E-02	'=Iadf*RBEf+Eadf
Total dose - benthic bkg	mSv/d	Tedfbenb	1.76E-04	5.69E-04	3.10E-03	1.31E-04	3.70E-03	7.7E-03	'=Iadfb*RBEf+Eadfbenb
- benthic impact	mSv/d	Tedfben	2.30E-04	3.29E-03	1.41E-02	1.96E-04	2.29E-02	4.1E-02	'=Iadf*RBEf+Eadfben
Equivalent Doses - Aquatic Plants									
RBE for alpha	Sv/Gy	RBEap	40						
Total dose - leaf bkgd	mSv/d	Tedaplb	3.82E-03	7.26E-03	3.05E-03	3.99E-05	2.37E-02	3.8E-02	'=Iadapb*RBEap+Eadpwb
- leaf impacted	mSv/d	Tedapl	8.52E-03	4.20E-02	1.68E-02	2.21E-04	1.47E-01	2.1E-01	'=Iadap*RBEap+Eadpw
Total dose - root bkgd	mSv/d	Tedaprb	4.25E-03	7.27E-03	4.52E-03	6.43E-04	2.37E-02	4.0E-02	'=Iadapb*RBEap+Eadpsb
- root impacted	mSv/d	Tedapr	8.99E-03	4.20E-02	1.90E-02	1.02E-03	1.47E-01	2.2E-01	'=Iadap*RBEap+Eadps

Table H.1-1

Aquatic Dose Calculations

Equivalent Doses - Benthic Invertebrates

RBE for alpha	Sv/Gy	RBEbi	40							
Total dose - bkgd	mSv/d	Tedbenb	5.02E-02	9.49E-04	2.61E-02	6.18E-04	2.25E-02	1.0E-01		'=Iadbib*RBEbi+Eadbenb
Total dose - impacted	mSv/d	Tedben	1.12E-01	5.44E-03	1.38E-01	8.76E-04	1.39E-01	3.9E-01		'=Iadbi*RBEbi+Eadben

0.6 Screening Criterion in mGy/d	3 6	Total Absorbed Dose mGy/d	Total Equivalent Dose mSv/d	Index (Absorbed Equivalent Dose)	Index (Absorbed Equivalent Dose)
Pelagic Fish - Background		1.7E-04	6.7E-03	2.9E-04	1.1E-02
Pelagic Fish - Impacted		1.0E-03	3.9E-02	1.7E-03	6.6E-02
Benthic Fish - Background		1.2E-03	7.7E-03	2.0E-03	1.3E-02
Benthic Fish - Impacted		2.4E-03	4.1E-02	4.1E-03	6.8E-02
Aquatic Plant Leaves - Background		9.9E-04	3.8E-02	3.3E-04	1.3E-02
Aquatic Plant Leaves - Impacted		5.6E-03	2.1E-01	1.9E-03	7.1E-02
Aquatic Plant Roots - Background		3.5E-03	4.0E-02	1.2E-03	1.3E-02
Aquatic Plant Roots - Impacted		9.1E-03	2.2E-01	3.0E-03	7.3E-02
Benthic Invertebrates - Background		5.0E-03	1.0E-01	8.3E-04	1.7E-02
Benthic Invertebrates - Impacted		1.3E-02	3.9E-01	2.2E-03	6.6E-02

U-238+	Internal	U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235
	External	U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235 (beta + gamma only)
Ra-226+	Internal	Ra-226 + 0.3* (Rn-222 + ...Po-214)
	External	Ra-226 + 1.0* (Rn-222 + ...Po-214) (beta + gamma only)
Th-232+	Internal	Th-232 + ...Po-212/Tl-208 (Th-232 + Th-228 are inputs)
	External	Th-232 + Po-212/Tl-208
Ra-228+	Internal	Ra-228 + ...Po-212/Tl-208

Table H.1-1
Aquatic Dose Calculations

JSL-2

Determination of Aquatic Dose - Average, RBE 10

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Water									
Background	Bq/m3	wcb	12.30	6.00	4.00	11.00	5.00		
Impacted water body	Bq/m3	wc	9.77	13.3	8.4	24.3	12.1		<<<< input concentrations in water
Sediment									
Background	Bq/g(wet)	sedwcb	3.32E-02	4.00E-02	4.00E-02	1.00E-01	1.00E-01		
Impacted water body	Bq/g(wet)	sedwc	3.48E-02	4.44E-02	5.13E-02	1.16E-01	1.12E-01		<<<< input concentrations in sediment
Fish									
Water-to-fish biocon fa	m3/gwet	bcff	4.80E-07	3.60E-05	9.30E-05	8.50E-05	2.50E-04		<<<< input transfer factor
Fish in bkgd water	Bq/g wet	fc	5.90E-06	2.16E-04	3.72E-04	9.35E-04	1.25E-03		
Fish in impacted water	Bq/g wet	fc	4.69E-06	4.80E-04	7.81E-04	2.06E-03	3.02E-03		
Aquatic Plants									
Water-to-plants biocon	m3/gwet	bcfb	5.47E-05	4.6E-04	1.2E-04	6.0E-04	1.6E-03		<<<< input transfer factor
Plants in bkgd water	Bq/g wet	apcb	6.73E-04	2.76E-03	4.80E-04	6.60E-03	8.00E-03		
Plants in impacted water	Bq/g wet	apc	5.34E-04	6.14E-03	1.01E-03	1.46E-02	1.93E-02		
Benthic Invertebrates									
Water-to-benthos bioco	m3/gwet	bcfbi	7.13E-04	5.95E-05	9.70E-04	2.20E-04	1.52E-03		<<<< input transfer factor
Benthos in bkgd water	Bq/g wet	bicb	8.77E-03	3.57E-04	3.88E-03	2.42E-03	7.60E-03		
Benthos in impacted water	Bq/g wet	bic	6.96E-03	7.94E-04	8.15E-03	5.34E-03	1.84E-02		
Absorbed Doses - Fish									
Internal Dose Factor	mGy/d per Bq	Idcff	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadfb	8.38E-07	1.42E-05	5.91E-05	5.64E-06	9.25E-05	1.7E-04	'=fcb*Idcff
Internal dose impacted	mGy/d	Iadf	6.66E-07	3.16E-05	1.24E-04	1.25E-05	2.24E-04	3.9E-04	'=fc*Idcff
Ext. dose factor	mGy/d per Bq	Edcff	8.57E-03	2.93E-05	3.68E-02	2.50E-03	1.40E-07		
Ext. dose bkgd pelagic	mGy/d	Eadfb	1.05E-07	1.76E-10	1.47E-07	2.75E-08	7.00E-13	2.8E-07	'=wcb*Edcff/1000000
Ext. dose impacted pelagic	mGy/d	Eadf	8.37E-08	3.91E-10	3.09E-07	6.07E-08	1.69E-12	4.5E-07	'=wc*Edcff/1000000
Ext. dose bkgd benthic	mGy/d	Eadfbenb	1.42E-04	5.86E-07	7.36E-04	1.25E-04	7.00E-09	1.0E-03	'=Edcff*(wcb/1000000+sedwcb)/2
Ext. dose impacted benthic	mGy/d	Eadfben	1.49E-04	6.51E-07	9.45E-04	1.45E-04	7.82E-09	1.2E-03	'=Edcff*(wc/1000000+sedwc)/2
Total dose - pelagic bkgd	mGy/d	Tadfb	9.44E-07	1.42E-05	5.93E-05	5.67E-06	9.25E-05	1.7E-04	'=Iadfb+Eadfb
- pelagic impact	mGy/d	Tadf	7.49E-07	3.16E-05	1.25E-04	1.25E-05	2.24E-04	3.9E-04	'=Iadf+Eadf
Total dose - benthic bkgd	mGy/d	Tadfbenb	1.43E-04	1.48E-05	7.95E-04	1.31E-04	9.25E-05	1.2E-03	'=Iadfb+Eadfbenb
- benthic impact	mGy/d	Tadfben	1.50E-04	3.23E-05	1.07E-03	1.57E-04	2.24E-04	1.6E-03	'=Iadf+Eadfben

Table H.1-1

Aquatic Dose Calculations

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Absorbed Doses - Aquatic Plants									
Internal Dose Factor	mGy/d per Bq	Idcfap	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadapb	9.55E-05	1.82E-04	7.63E-05	3.98E-05	5.92E-04	9.9E-04	'=apcb*Idcfap
Internal dose impacted	mGy/d	Iadap	7.59E-05	4.04E-04	1.60E-04	8.79E-05	1.43E-03	2.2E-03	'=apc*Idcfap
Ext. dose factor aq plan	mGy/d per Bq	Edcfap	1.29E-02	2.25E-04	3.67E-02	6.03E-03	1.10E-07		
Ext. dose to leaf bkgd	mGy/d	Eadpwb	1.59E-07	1.35E-09	1.47E-07	6.63E-08	5.50E-13	3.7E-07	'=wcb*Edcfap/1000000
Ext. dose to leaf impact	mGy/d	Eadpw	1.26E-07	3.00E-09	3.08E-07	1.46E-07	1.33E-12	5.8E-07	'=wc*Edcfap/1000000
Ext. dose to root bkgd	mGy/d	Eadpsb	4.28E-04	9.00E-06	1.47E-03	6.03E-04	1.10E-08	2.5E-03	'=sedwcb*Edcfap
Ext. dose to root impact	mGy/d	Eadps	4.49E-04	1.00E-05	1.88E-03	6.99E-04	1.23E-08	3.0E-03	'=sedwc*Edcfap
Total dose - leaf bkgd	mGy/d	Tadaplb	9.57E-05	1.82E-04	7.65E-05	3.99E-05	5.92E-04	9.9E-04	'=Iadapb+Eadpwb
- leaf impacted	mGy/d	Tadapl	7.60E-05	4.04E-04	1.61E-04	8.80E-05	1.43E-03	2.2E-03	'=Iadap+Eadpw
Total dose - root bkgd	mGy/d	Tadaprb	5.24E-04	1.91E-04	1.54E-03	6.43E-04	5.92E-04	3.5E-03	'=Iadapb+Eadpsb
- root impacted	mGy/d	Tadapr	5.25E-04	4.14E-04	2.04E-03	7.87E-04	1.43E-03	5.2E-03	'=Iadap+Eadps
Absorbed Doses - Benthic Invertebrates									
Internal Dose Factor	mGy/d per Bq	Idcfbi	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadbib	1.25E-03	2.35E-05	6.17E-04	1.46E-05	5.62E-04	2.5E-03	'=bicb*Idcfbi
Internal dose impacted	mGy/d	Iadbi	9.89E-04	5.23E-05	1.30E-03	3.22E-05	1.36E-03	3.7E-03	'=bic*Idcfbi
Ext. dose factor ben inv	mGy/d per Bq	Edcfbi	1.29E-02	2.25E-04	3.67E-02	6.03E-03	1.10E-07		
Ext. dose bkgd sedimer	mGy/d	Eadbenb	4.28E-04	9.00E-06	1.47E-03	6.03E-04	1.10E-08	2.5E-03	'=sedwcb*Edcfbi
Ext. dose impacted sedi	mGy/d	Eadben	4.49E-04	1.00E-05	1.88E-03	6.99E-04	1.23E-08	3.0E-03	'=sedwc*Edcfbi
Total dose - bkgd	mGy/d	Tadbenb	1.67E-03	3.25E-05	2.08E-03	6.18E-04	5.62E-04	5.0E-03	'=Iadbib+Eadbenb
Total dose - impacted	mGy/d	Tadben	1.44E-03	6.23E-05	3.18E-03	7.31E-04	1.36E-03	6.8E-03	'=Iadbi+Eadben
Equivalent Doses - Fish									
RBE for alpha	Sv/Gy	RBEf	10						
Total dose - pelagic bkg	mSv/d	Tedfpb	8.49E-06	1.42E-04	5.92E-04	5.67E-06	9.25E-04	1.7E-03	'=Iadfb*RBEf+Eadfb
- pelagic impact	mSv/d	Tedfp	6.74E-06	3.16E-04	1.24E-03	1.25E-04	2.24E-03	3.9E-03	'=Iadf*RBEf+Eadf
Total dose - benthic bkg	mSv/d	Tedfbenb	1.51E-04	1.43E-04	1.33E-03	1.31E-04	9.25E-04	2.7E-03	'=Iadfb*RBEf+Eadfbenb
- benthic impact	mSv/d	Tedfben	1.56E-04	3.17E-04	2.19E-03	2.69E-04	2.24E-03	5.2E-03	'=Iadf*RBEf+Eadfben
Equivalent Doses - Aquatic Plants									
RBE for alpha	Sv/Gy	RBEap	10						
Total dose - leaf bkgd	mSv/d	Tedaplb	9.56E-04	1.82E-03	7.63E-04	3.99E-05	5.92E-03	9.5E-03	'=Iadapb*RBEap+Eadpwb
- leaf impacted	mSv/d	Tedapl	7.59E-04	4.04E-03	1.60E-03	8.79E-04	1.43E-02	2.2E-02	'=Iadap*RBEap+Eadpw
Total dose - root bkgd	mSv/d	Tedaprb	1.38E-03	1.83E-03	2.23E-03	6.43E-04	5.92E-03	1.2E-02	'=Iadapb*RBEap+Eadpsb
- root impacted	mSv/d	Tedapr	1.21E-03	4.05E-03	3.49E-03	1.58E-03	1.43E-02	2.5E-02	'=Iadap*RBEap+Eadps

Table H.1-1

Aquatic Dose Calculations

Equivalent Doses - Benthic Invertebrates

RBE for alpha	Sv/Gy	RBEbi	10							
Total dose - bkgd	mSv/d	Tedbenb	1.29E-02	2.44E-04	7.64E-03	6.18E-04	5.62E-03	2.7E-02		'=Iadbib*RBEbi+Eadbenb
Total dose - impacted	mSv/d	Tedben	1.03E-02	5.33E-04	1.48E-02	1.02E-03	1.36E-02	4.0E-02		'=Iadbi*RBEbi+Eadben

0.6 Screening Criterion in mGy/d	3 6	Total Absorbed Dose mGy/d	Total Equivalent Dose mSv/d	Index (Absorbed Equivalent Dose)	Index (Absorbed Equivalent Dose)
Pelagic Fish - Background		1.7E-04	1.7E-03	2.9E-04	2.8E-03
Pelagic Fish - Impacted		3.9E-04	3.9E-03	6.6E-04	6.5E-03
Benthic Fish - Background		1.2E-03	2.7E-03	2.0E-03	4.5E-03
Benthic Fish - Impacted		1.6E-03	5.2E-03	2.7E-03	8.6E-03
Aquatic Plant Leaves - Background		9.9E-04	9.5E-03	3.3E-04	3.2E-03
Aquatic Plant Leaves - Impacted		2.2E-03	2.2E-02	7.2E-04	7.2E-03
Aquatic Plant Roots - Background		3.5E-03	1.2E-02	1.2E-03	4.0E-03
Aquatic Plant Roots - Impacted		5.2E-03	2.5E-02	1.7E-03	8.2E-03
Benthic Invertebrates - Background		5.0E-03	2.7E-02	8.3E-04	4.5E-03
Benthic Invertebrates - Impacted		6.8E-03	4.0E-02	1.1E-03	6.7E-03

U-238+	Internal	U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235
	External	U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235 (beta + gamma only)
Ra-226+	Internal	Ra-226 + 0.3* (Rn-222 + ...Po-214)
	External	Ra-226 + 1.0* (Rn-222 + ...Po-214) (beta + gamma only)
Th-232+	Internal	Th-232 + ...Po-212/Tl-208 (Th-232 + Th-228 are inputs)
	External	Th-232 + Po-212/Tl-208
Ra-228+	Internal	Ra-228 + ...Po-212/Tl-208

Table H.1-1
Aquatic Dose Calculations

JSL-2

Determination of Aquatic Dose - 95th Percentile, RBE 10

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Water									
Background	Bq/m3	wcb	12.30	6.00	4.00	11.00	5.00		
Impacted water body	Bq/m3	wc	21.09	15.6	8.9	25.8	15.3		<<<< input concentrations in water
Sediment									
Background	Bq/g(wet)	sedwcb	3.32E-02	4.00E-02	4.00E-02	1.00E-01	1.00E-01		
Impacted water body	Bq/g(wet)	sedwc	3.62E-02	4.96E-02	6.03E-02	1.28E-01	1.22E-01		<<<< input concentrations in sediment
Fish									
Water-to-fish biocon fa	m3/gwet	bcff	4.80E-07	3.60E-05	9.30E-05	8.50E-05	2.50E-04		<<<< input transfer factor
Fish in bkgd water	Bq/g wet	fc	5.90E-06	2.16E-04	3.72E-04	9.35E-04	1.25E-03		
Fish in impacted water	Bq/g wet	fc	1.01E-05	5.63E-04	8.32E-04	2.19E-03	3.82E-03		
Aquatic Plants									
Water-to-plants biocon	m3/gwet	bcfap	5.47E-05	4.6E-04	1.2E-04	6.0E-04	1.6E-03		<<<< input transfer factor
Plants in bkgd water	Bq/g wet	apcb	6.73E-04	2.76E-03	4.80E-04	6.60E-03	8.00E-03		
Plants in impacted water	Bq/g wet	apc	1.15E-03	7.19E-03	1.07E-03	1.55E-02	2.45E-02		
Benthic Invertebrates									
Water-to-benthos bioco	m3/gwet	bcfbi	7.13E-04	5.95E-05	9.70E-04	2.20E-04	1.52E-03		<<<< input transfer factor
Benthos in bkgd water	Bq/g wet	bicb	8.77E-03	3.57E-04	3.88E-03	2.42E-03	7.60E-03		
Benthos in impacted water	Bq/g wet	bic	1.50E-02	9.31E-04	8.67E-03	5.68E-03	2.33E-02		
Absorbed Doses - Fish									
Internal Dose Factor	mGy/d per Bq	Idcff	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadfb	8.38E-07	1.42E-05	5.91E-05	5.64E-06	9.25E-05	1.7E-04	'=fcb*Idcff
Internal dose impacted	mGy/d	Iadf	1.44E-06	3.70E-05	1.32E-04	1.32E-05	2.83E-04	4.7E-04	'=fc*Idcff
Ext. dose factor	mGy/d per Bq	Edcff	8.57E-03	2.93E-05	3.68E-02	2.50E-03	1.40E-07		
Ext. dose bkgd pelagic	mGy/d	Eadfb	1.05E-07	1.76E-10	1.47E-07	2.75E-08	7.00E-13	2.8E-07	'=wcb*Edcff/1000000
Ext. dose impacted pelagic	mGy/d	Eadf	1.81E-07	4.58E-10	3.29E-07	6.45E-08	2.14E-12	5.7E-07	'=wc*Edcff/1000000
Ext. dose bkgd benthic	mGy/d	Eadfbenb	1.42E-04	5.86E-07	7.36E-04	1.25E-04	7.00E-09	1.0E-03	'=Edcff*(wcb/1000000+sedwcb)/2
Ext. dose impacted benthic	mGy/d	Eadfben	1.55E-04	7.26E-07	1.11E-03	1.61E-04	8.53E-09	1.4E-03	'=Edcff*(wc/1000000+sedwc)/2
Total dose - pelagic bkgd	mGy/d	Tadfbp	9.44E-07	1.42E-05	5.93E-05	5.67E-06	9.25E-05	1.7E-04	'=Iadfb+Eadfb
- pelagic impact	mGy/d	Tadfp	1.62E-06	3.70E-05	1.33E-04	1.33E-05	2.83E-04	4.7E-04	'=Iadf+Eadf
Total dose - benthic bkgd	mGy/d	Tadfbenb	1.43E-04	1.48E-05	7.95E-04	1.31E-04	9.25E-05	1.2E-03	'=Iadfb+Eadfbenb
- benthic impact	mGy/d	Tadfben	1.57E-04	3.78E-05	1.24E-03	1.74E-04	2.83E-04	1.9E-03	'=Iadf+Eadfben

Table H.1-1

Aquatic Dose Calculations

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Absorbed Doses - Aquatic Plants									
Internal Dose Factor	mGy/d per Bq	Idcfap	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadapb	9.55E-05	1.82E-04	7.63E-05	3.98E-05	5.92E-04	9.9E-04	'=apcb*Idcfap
Internal dose impacted	mGy/d	Iadap	1.64E-04	4.73E-04	1.71E-04	9.34E-05	1.81E-03	2.7E-03	'=apc*Idcfap
Ext. dose factor aq plan	mGy/d per Bq	Edcfap	1.29E-02	2.25E-04	3.67E-02	6.03E-03	1.10E-07		
Ext. dose to leaf bkgd	mGy/d	Eadpwb	1.59E-07	1.35E-09	1.47E-07	6.63E-08	5.50E-13	3.7E-07	'=wcb*Edcfap/1000000
Ext. dose to leaf impact	mGy/d	Eadpw	2.72E-07	3.52E-09	3.28E-07	1.56E-07	1.68E-12	7.6E-07	'=wc*Edcfap/1000000
Ext. dose to root bkgd	mGy/d	Eadpsb	4.28E-04	9.00E-06	1.47E-03	6.03E-04	1.10E-08	2.5E-03	'=sedwcb*Edcfap
Ext. dose to root impact	mGy/d	Eadps	4.67E-04	1.12E-05	2.21E-03	7.74E-04	1.34E-08	3.5E-03	'=sedwc*Edcfap
Total dose - leaf bkgd	mGy/d	Tadaplb	9.57E-05	1.82E-04	7.65E-05	3.99E-05	5.92E-04	9.9E-04	'=Iadapb+Eadpwb
- leaf impacted	mGy/d	Tadapl	1.64E-04	4.73E-04	1.71E-04	9.36E-05	1.81E-03	2.7E-03	'=Iadap+Eadpw
Total dose - root bkgd	mGy/d	Tadaprb	5.24E-04	1.91E-04	1.54E-03	6.43E-04	5.92E-04	3.5E-03	'=Iadapb+Eadpsb
- root impacted	mGy/d	Tadapr	6.31E-04	4.85E-04	2.38E-03	8.68E-04	1.81E-03	6.2E-03	'=Iadap+Eadps
Absorbed Doses - Benthic Invertebrates									
Internal Dose Factor	mGy/d per Bq	Idcfbi	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadbib	1.25E-03	2.35E-05	6.17E-04	1.46E-05	5.62E-04	2.5E-03	'=bicb*Idcfbi
Internal dose impacted	mGy/d	Iadbi	2.14E-03	6.12E-05	1.38E-03	3.43E-05	1.72E-03	5.3E-03	'=bic*Idcfbi
Ext. dose factor ben inv	mGy/d per Bq	Edcfbi	1.29E-02	2.25E-04	3.67E-02	6.03E-03	1.10E-07		
Ext. dose bkgd sedimer	mGy/d	Eadbenb	4.28E-04	9.00E-06	1.47E-03	6.03E-04	1.10E-08	2.5E-03	'=sedwcb*Edcfbi
Ext. dose impacted sedi	mGy/d	Eadben	4.67E-04	1.12E-05	2.21E-03	7.74E-04	1.34E-08	3.5E-03	'=sedwc*Edcfbi
Total dose - bkgd	mGy/d	Tadbenb	1.67E-03	3.25E-05	2.08E-03	6.18E-04	5.62E-04	5.0E-03	'=Iadbib+Eadbenb
Total dose - impacted	mGy/d	Tadben	2.60E-03	7.24E-05	3.59E-03	8.09E-04	1.72E-03	8.8E-03	'=Iadbi+Eadben
Equivalent Doses - Fish									
RBE for alpha	Sv/Gy	RBEf	10						
Total dose - pelagic bkg	mSv/d	Tedfpb	8.49E-06	1.42E-04	5.92E-04	5.67E-06	9.25E-04	1.7E-03	'=Iadfb*RBEf+Eadfb
- pelagic impact	mSv/d	Tedfp	1.46E-05	3.70E-04	1.32E-03	1.33E-05	2.83E-03	4.6E-03	'=Iadf*RBEf+Eadf
Total dose - benthic bkg	mSv/d	Tedfbenb	1.51E-04	1.43E-04	1.33E-03	1.31E-04	9.25E-04	2.7E-03	'=Iadfb*RBEf+Eadfbenb
- benthic impact	mSv/d	Tedfben	1.70E-04	3.71E-04	2.43E-03	1.74E-04	2.83E-03	6.0E-03	'=Iadf*RBEf+Eadfben
Equivalent Doses - Aquatic Plants									
RBE for alpha	Sv/Gy	RBEap	10						
Total dose - leaf bkgd	mSv/d	Tedaplb	9.56E-04	1.82E-03	7.63E-04	3.99E-05	5.92E-03	9.5E-03	'=Iadapb*RBEap+Eadpwb
- leaf impacted	mSv/d	Tedapl	1.64E-03	4.73E-03	1.71E-03	9.36E-05	1.81E-02	2.6E-02	'=Iadap*RBEap+Eadpw
Total dose - root bkgd	mSv/d	Tedaprb	1.38E-03	1.83E-03	2.23E-03	6.43E-04	5.92E-03	1.2E-02	'=Iadapb*RBEap+Eadpsb
- root impacted	mSv/d	Tedapr	2.11E-03	4.74E-03	3.92E-03	8.68E-04	1.81E-02	3.0E-02	'=Iadap*RBEap+Eadps

Table H.1-1

Aquatic Dose Calculations

Equivalent Doses - Benthic Invertebrates

RBE for alpha	Sv/Gy	RBEbi	10							
Total dose - bkgd	mSv/d	Tedbenb	1.29E-02	2.44E-04	7.64E-03	6.18E-04	5.62E-03	2.7E-02		'=Iadbib*RBEbi+Eadbenb
Total dose - impacted	mSv/d	Tedben	2.18E-02	6.23E-04	1.60E-02	8.09E-04	1.72E-02	5.6E-02		'=Iadbi*RBEbi+Eadben

0.6 Screening Criterion in mGy/d	3 6	Total Absorbed Dose mGy/d	Total Equivalent Dose mSv/d	Index (Absorbed Equivalent Dose)	Index (Absorbed Equivalent Dose)
Pelagic Fish - Background		1.7E-04	1.7E-03	2.9E-04	2.8E-03
Pelagic Fish - Impacted		4.7E-04	4.6E-03	7.8E-04	7.6E-03
Benthic Fish - Background		1.2E-03	2.7E-03	2.0E-03	4.5E-03
Benthic Fish - Impacted		1.9E-03	6.0E-03	3.2E-03	1.0E-02
Aquatic Plant Leaves - Background		9.9E-04	9.5E-03	3.3E-04	3.2E-03
Aquatic Plant Leaves - Impacted		2.7E-03	2.6E-02	9.0E-04	8.8E-03
Aquatic Plant Roots - Background		3.5E-03	1.2E-02	1.2E-03	4.0E-03
Aquatic Plant Roots - Impacted		6.2E-03	3.0E-02	2.1E-03	9.9E-03
Benthic Invertebrates - Background		5.0E-03	2.7E-02	8.3E-04	4.5E-03
Benthic Invertebrates - Impacted		8.8E-03	5.6E-02	1.5E-03	9.4E-03

U-238+	Internal	U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235
	External	U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235 (beta + gamma only)
Ra-226+	Internal	Ra-226 + 0.3* (Rn-222 + ...Po-214)
	External	Ra-226 + 1.0* (Rn-222 + ...Po-214) (beta + gamma only)
Th-232+	Internal	Th-232 + ...Po-212/Tl-208 (Th-232 + Th-228 are inputs)
	External	Th-232 + Po-212/Tl-208
Ra-228+	Internal	Ra-228 + ...Po-212/Tl-208

Table H.1-1
Aquatic Dose Calculations

JSL-2

Determination of Aquatic Dose - Average, RBE 40

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Water									
Background	Bq/m3	wcb	12.30	6.00	4.00	11.00	5.00		
Impacted water body	Bq/m3	wc	9.77	13.3	8.4	24.3	12.1		<<<< input concentrations in water
Sediment									
Background	Bq/g(wet)	sedwcb	3.32E-02	4.00E-02	4.00E-02	1.00E-01	1.00E-01		
Impacted water body	Bq/g(wet)	sedwc	3.48E-02	4.44E-02	5.13E-02	1.16E-01	1.12E-01		<<<< input concentrations in sediment
Fish									
Water-to-fish biocon fa	m3/gwet	bcff	4.80E-07	3.60E-05	9.30E-05	8.50E-05	2.50E-04		<<<< input transfer factor
Fish in bkgd water	Bq/g wet	fc	5.90E-06	2.16E-04	3.72E-04	9.35E-04	1.25E-03		
Fish in impacted water	Bq/g wet	fc	4.69E-06	4.80E-04	7.81E-04	2.06E-03	3.02E-03		
Aquatic Plants									
Water-to-plants biocon	m3/gwet	bcfb	5.47E-05	4.6E-04	1.2E-04	6.0E-04	1.6E-03		<<<< input transfer factor
Plants in bkgd water	Bq/g wet	apcb	6.73E-04	2.76E-03	4.80E-04	6.60E-03	8.00E-03		
Plants in impacted water	Bq/g wet	apc	5.34E-04	6.14E-03	1.01E-03	1.46E-02	1.93E-02		
Benthic Invertebrates									
Water-to-benthos bioco	m3/gwet	bcfbi	7.13E-04	5.95E-05	9.70E-04	2.20E-04	1.52E-03		<<<< input transfer factor
Benthos in bkgd water	Bq/g wet	bicb	8.77E-03	3.57E-04	3.88E-03	2.42E-03	7.60E-03		
Benthos in impacted water	Bq/g wet	bic	6.96E-03	7.94E-04	8.15E-03	5.34E-03	1.84E-02		
Absorbed Doses - Fish									
Internal Dose Factor	mGy/d per Bq	Idc	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadfb	8.38E-07	1.42E-05	5.91E-05	5.64E-06	9.25E-05	1.7E-04	'=fcb*Idc
Internal dose impacted	mGy/d	Iadf	6.66E-07	3.16E-05	1.24E-04	1.25E-05	2.24E-04	3.9E-04	'=fc*Idc
Ext. dose factor	mGy/d per Bq	Edc	8.57E-03	2.93E-05	3.68E-02	2.50E-03	1.40E-07		
Ext. dose bkgd pelagic	mGy/d	Eadfb	1.05E-07	1.76E-10	1.47E-07	2.75E-08	7.00E-13	2.8E-07	'=wcb*Edc/1000000
Ext. dose impacted pelagic	mGy/d	Eadf	8.37E-08	3.91E-10	3.09E-07	6.07E-08	1.69E-12	4.5E-07	'=wc*Edc/1000000
Ext. dose bkgd benthic	mGy/d	Eadfbenb	1.42E-04	5.86E-07	7.36E-04	1.25E-04	7.00E-09	1.0E-03	'=Edc*(wcb/1000000+sedwcb)/2
Ext. dose impacted benthic	mGy/d	Eadfben	1.49E-04	6.51E-07	9.45E-04	1.45E-04	7.82E-09	1.2E-03	'=Edc*(wc/1000000+sedwc)/2
Total dose - pelagic bkgd	mGy/d	Tadfb	9.44E-07	1.42E-05	5.93E-05	5.67E-06	9.25E-05	1.7E-04	'=Iadfb+Eadfb
- pelagic impact	mGy/d	Tadf	7.49E-07	3.16E-05	1.25E-04	1.25E-05	2.24E-04	3.9E-04	'=Iadf+Eadf
Total dose - benthic bkgd	mGy/d	Tadfbenb	1.43E-04	1.48E-05	7.95E-04	1.31E-04	9.25E-05	1.2E-03	'=Iadfb+Eadfbenb
- benthic impact	mGy/d	Tadfben	1.50E-04	3.23E-05	1.07E-03	1.57E-04	2.24E-04	1.6E-03	'=Iadf+Eadfben

Table H.1-1

Aquatic Dose Calculations

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Absorbed Doses - Aquatic Plants									
Internal Dose Factor	mGy/d per Bq	Idcfap	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadapb	9.55E-05	1.82E-04	7.63E-05	3.98E-05	5.92E-04	9.9E-04	'=apcb*Idcfap
Internal dose impacted	mGy/d	Iadap	7.59E-05	4.04E-04	1.60E-04	8.79E-05	1.43E-03	2.2E-03	'=apc*Idcfap
Ext. dose factor aq plan	mGy/d per Bq	Edcfap	1.29E-02	2.25E-04	3.67E-02	6.03E-03	1.10E-07		
Ext. dose to leaf bkgd	mGy/d	Eadpwb	1.59E-07	1.35E-09	1.47E-07	6.63E-08	5.50E-13	3.7E-07	'=wcb*Edcfap/1000000
Ext. dose to leaf impact	mGy/d	Eadpw	1.26E-07	3.00E-09	3.08E-07	1.46E-07	1.33E-12	5.8E-07	'=wc*Edcfap/1000000
Ext. dose to root bkgd	mGy/d	Eadpsb	4.28E-04	9.00E-06	1.47E-03	6.03E-04	1.10E-08	2.5E-03	'=sedwcb*Edcfap
Ext. dose to root impact	mGy/d	Eadps	4.49E-04	1.00E-05	1.88E-03	6.99E-04	1.23E-08	3.0E-03	'=sedwc*Edcfap
Total dose - leaf bkgd	mGy/d	Tadaplb	9.57E-05	1.82E-04	7.65E-05	3.99E-05	5.92E-04	9.9E-04	'=Iadapb+Eadpwb
- leaf impacted	mGy/d	Tadapl	7.60E-05	4.04E-04	1.61E-04	8.80E-05	1.43E-03	2.2E-03	'=Iadap+Eadpw
Total dose - root bkgd	mGy/d	Tadaprb	5.24E-04	1.91E-04	1.54E-03	6.43E-04	5.92E-04	3.5E-03	'=Iadapb+Eadpsb
- root impacted	mGy/d	Tadapr	5.25E-04	4.14E-04	2.04E-03	7.87E-04	1.43E-03	5.2E-03	'=Iadap+Eadps
Absorbed Doses - Benthic Invertebrates									
Internal Dose Factor	mGy/d per Bq	Idcfbi	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadbib	1.25E-03	2.35E-05	6.17E-04	1.46E-05	5.62E-04	2.5E-03	'=bicb*Idcfbi
Internal dose impacted	mGy/d	Iadbi	9.89E-04	5.23E-05	1.30E-03	3.22E-05	1.36E-03	3.7E-03	'=bic*Idcfbi
Ext. dose factor ben inv	mGy/d per Bq	Edcfbi	1.29E-02	2.25E-04	3.67E-02	6.03E-03	1.10E-07		
Ext. dose bkgd sedimer	mGy/d	Eadbenb	4.28E-04	9.00E-06	1.47E-03	6.03E-04	1.10E-08	2.5E-03	'=sedwcb*Edcfbi
Ext. dose impacted sedi	mGy/d	Eadben	4.49E-04	1.00E-05	1.88E-03	6.99E-04	1.23E-08	3.0E-03	'=sedwc*Edcfbi
Total dose - bkgd	mGy/d	Tadbenb	1.67E-03	3.25E-05	2.08E-03	6.18E-04	5.62E-04	5.0E-03	'=Iadbib+Eadbenb
Total dose - impacted	mGy/d	Tadben	1.44E-03	6.23E-05	3.18E-03	7.31E-04	1.36E-03	6.8E-03	'=Iadbi+Eadben
Equivalent Doses - Fish									
RBE for alpha	Sv/Gy	RBEf	40						
Total dose - pelagic bkg	mSv/d	Tedfpb	8.49E-06	1.42E-04	5.92E-04	5.67E-06	9.25E-04	1.7E-03	'=Iadfb*RBEf+Eadfb
- pelagic impact	mSv/d	Tedfp	6.74E-06	3.16E-04	1.24E-03	1.25E-04	2.24E-03	3.9E-03	'=Iadf*RBEf+Eadf
Total dose - benthic bkg	mSv/d	Tedfbenb	1.51E-04	1.43E-04	1.33E-03	1.31E-04	9.25E-04	2.7E-03	'=Iadfb*RBEf+Eadfbenb
- benthic impact	mSv/d	Tedfben	1.56E-04	3.17E-04	2.19E-03	2.69E-04	2.24E-03	5.2E-03	'=Iadf*RBEf+Eadfben
Equivalent Doses - Aquatic Plants									
RBE for alpha	Sv/Gy	RBEap	40						
Total dose - leaf bkgd	mSv/d	Tedaplb	9.56E-04	1.82E-03	7.63E-04	3.99E-05	5.92E-03	9.5E-03	'=Iadapb*RBEap+Eadpwb
- leaf impacted	mSv/d	Tedapl	7.59E-04	4.04E-03	1.60E-03	8.79E-04	1.43E-02	2.2E-02	'=Iadap*RBEap+Eadpw
Total dose - root bkgd	mSv/d	Tedaprb	1.38E-03	1.83E-03	2.23E-03	6.43E-04	5.92E-03	1.2E-02	'=Iadapb*RBEap+Eadpsb
- root impacted	mSv/d	Tedapr	1.21E-03	4.05E-03	3.49E-03	1.58E-03	1.43E-02	2.5E-02	'=Iadap*RBEap+Eadps

Table H.1-1

Aquatic Dose Calculations

Equivalent Doses - Benthic Invertebrates

RBE for alpha	Sv/Gy	RBEbi	40							
Total dose - bkgd	mSv/d	Tedbenb	1.29E-02	2.44E-04	7.64E-03	6.18E-04	5.62E-03	2.7E-02		'=Iadbib*RBEbi+Eadbenb
Total dose - impacted	mSv/d	Tedben	1.03E-02	5.33E-04	1.48E-02	1.02E-03	1.36E-02	4.0E-02		'=Iadbi*RBEbi+Eadben

0.6 Screening Criterion in mGy/d	3 6	Total Absorbed Dose mGy/d	Total Equivalent Dose mSv/d	Index (Absorbed Equivalent Dose)	Index (Absorbed Equivalent Dose)
Pelagic Fish - Background		1.7E-04	1.7E-03	2.9E-04	2.8E-03
Pelagic Fish - Impacted		3.9E-04	3.9E-03	6.6E-04	6.5E-03
Benthic Fish - Background		1.2E-03	2.7E-03	2.0E-03	4.5E-03
Benthic Fish - Impacted		1.6E-03	5.2E-03	2.7E-03	8.6E-03
Aquatic Plant Leaves - Background		9.9E-04	9.5E-03	3.3E-04	3.2E-03
Aquatic Plant Leaves - Impacted		2.2E-03	2.2E-02	7.2E-04	7.2E-03
Aquatic Plant Roots - Background		3.5E-03	1.2E-02	1.2E-03	4.0E-03
Aquatic Plant Roots - Impacted		5.2E-03	2.5E-02	1.7E-03	8.2E-03
Benthic Invertebrates - Background		5.0E-03	2.7E-02	8.3E-04	4.5E-03
Benthic Invertebrates - Impacted		6.8E-03	4.0E-02	1.1E-03	6.7E-03

U-238+	Internal	U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235
	External	U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235 (beta + gamma only)
Ra-226+	Internal	Ra-226 + 0.3* (Rn-222 + ...Po-214)
	External	Ra-226 + 1.0* (Rn-222 + ...Po-214) (beta + gamma only)
Th-232+	Internal	Th-232 + ...Po-212/Tl-208 (Th-232 + Th-228 are inputs)
	External	Th-232 + Po-212/Tl-208
Ra-228+	Internal	Ra-228 + ...Po-212/Tl-208

Table H.1-1
Aquatic Dose Calculations

JSL-2

Determination of Aquatic Dose - 95th Percentile, RBE 40

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Water									
Background	Bq/m3	wcb	12.30	6.00	4.00	11.00	5.00		
Impacted water body	Bq/m3	wc	21.09	15.6	8.9	25.8	15.3		<<<< input concentrations in water
Sediment									
Background	Bq/g(wet)	sedwcb	3.32E-02	4.00E-02	4.00E-02	1.00E-01	1.00E-01		
Impacted water body	Bq/g(wet)	sedwc	3.62E-02	4.96E-02	6.03E-02	1.28E-01	1.22E-01		<<<< input concentrations in sediment
Fish									
Water-to-fish biocon fa	m3/gwet	bcff	4.80E-07	3.60E-05	9.30E-05	8.50E-05	2.50E-04		<<<< input transfer factor
Fish in bkgd water	Bq/g wet	fc	5.90E-06	2.16E-04	3.72E-04	9.35E-04	1.25E-03		
Fish in impacted water	Bq/g wet	fc	1.01E-05	5.63E-04	8.32E-04	2.19E-03	3.82E-03		
Aquatic Plants									
Water-to-plants biocon	m3/gwet	bcfap	5.47E-05	4.6E-04	1.2E-04	6.0E-04	1.6E-03		<<<< input transfer factor
Plants in bkgd water	Bq/g wet	apcb	6.73E-04	2.76E-03	4.80E-04	6.60E-03	8.00E-03		
Plants in impacted water	Bq/g wet	apc	1.15E-03	7.19E-03	1.07E-03	1.55E-02	2.45E-02		
Benthic Invertebrates									
Water-to-benthos bioco	m3/gwet	bcfbi	7.13E-04	5.95E-05	9.70E-04	2.20E-04	1.52E-03		<<<< input transfer factor
Benthos in bkgd water	Bq/g wet	bicb	8.77E-03	3.57E-04	3.88E-03	2.42E-03	7.60E-03		
Benthos in impacted water	Bq/g wet	bic	1.50E-02	9.31E-04	8.67E-03	5.68E-03	2.33E-02		
Absorbed Doses - Fish									
Internal Dose Factor	mGy/d per Bq	Idcff	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadfb	8.38E-07	1.42E-05	5.91E-05	5.64E-06	9.25E-05	1.7E-04	'=fcb*Idcff
Internal dose impacted	mGy/d	Iadf	1.44E-06	3.70E-05	1.32E-04	1.32E-05	2.83E-04	4.7E-04	'=fc*Idcff
Ext. dose factor	mGy/d per Bq	Edcff	8.57E-03	2.93E-05	3.68E-02	2.50E-03	1.40E-07		
Ext. dose bkgd pelagic	mGy/d	Eadfb	1.05E-07	1.76E-10	1.47E-07	2.75E-08	7.00E-13	2.8E-07	'=wcb*Edcff/1000000
Ext. dose impacted pelagic	mGy/d	Eadf	1.81E-07	4.58E-10	3.29E-07	6.45E-08	2.14E-12	5.7E-07	'=wc*Edcff/1000000
Ext. dose bkgd benthic	mGy/d	Eadfbenb	1.42E-04	5.86E-07	7.36E-04	1.25E-04	7.00E-09	1.0E-03	'=Edcff*(wcb/1000000+sedwcb)/2
Ext. dose impacted benthic	mGy/d	Eadfben	1.55E-04	7.26E-07	1.11E-03	1.61E-04	8.53E-09	1.4E-03	'=Edcff*(wc/1000000+sedwc)/2
Total dose - pelagic bkgd	mGy/d	Tadfbp	9.44E-07	1.42E-05	5.93E-05	5.67E-06	9.25E-05	1.7E-04	'=Iadfb+Eadfb
- pelagic impact	mGy/d	Tadfp	1.62E-06	3.70E-05	1.33E-04	1.33E-05	2.83E-04	4.7E-04	'=Iadf+Eadf
Total dose - benthic bkgd	mGy/d	Tadfbenb	1.43E-04	1.48E-05	7.95E-04	1.31E-04	9.25E-05	1.2E-03	'=Iadfb+Eadfbenb
- benthic impact	mGy/d	Tadfben	1.57E-04	3.78E-05	1.24E-03	1.74E-04	2.83E-04	1.9E-03	'=Iadf+Eadfben

Table H.1-1

Aquatic Dose Calculations

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Absorbed Doses - Aquatic Plants									
Internal Dose Factor	mGy/d per Bq	Idcfap	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadapb	9.55E-05	1.82E-04	7.63E-05	3.98E-05	5.92E-04	9.9E-04	'=apcb*Idcfap
Internal dose impacted	mGy/d	Iadap	1.64E-04	4.73E-04	1.71E-04	9.34E-05	1.81E-03	2.7E-03	'=apc*Idcfap
Ext. dose factor aq plan	mGy/d per Bq	Edcfap	1.29E-02	2.25E-04	3.67E-02	6.03E-03	1.10E-07		
Ext. dose to leaf bkgd	mGy/d	Eadpwb	1.59E-07	1.35E-09	1.47E-07	6.63E-08	5.50E-13	3.7E-07	'=wcb*Edcfap/1000000
Ext. dose to leaf impact	mGy/d	Eadpw	2.72E-07	3.52E-09	3.28E-07	1.56E-07	1.68E-12	7.6E-07	'=wc*Edcfap/1000000
Ext. dose to root bkgd	mGy/d	Eadpsb	4.28E-04	9.00E-06	1.47E-03	6.03E-04	1.10E-08	2.5E-03	'=sedwcb*Edcfap
Ext. dose to root impact	mGy/d	Eadps	4.67E-04	1.12E-05	2.21E-03	7.74E-04	1.34E-08	3.5E-03	'=sedwc*Edcfap
Total dose - leaf bkgd	mGy/d	Tadaplb	9.57E-05	1.82E-04	7.65E-05	3.99E-05	5.92E-04	9.9E-04	'=Iadapb+Eadpwb
- leaf impacted	mGy/d	Tadapl	1.64E-04	4.73E-04	1.71E-04	9.36E-05	1.81E-03	2.7E-03	'=Iadap+Eadpw
Total dose - root bkgd	mGy/d	Tadaprb	5.24E-04	1.91E-04	1.54E-03	6.43E-04	5.92E-04	3.5E-03	'=Iadapb+Eadpsb
- root impacted	mGy/d	Tadapr	6.31E-04	4.85E-04	2.38E-03	8.68E-04	1.81E-03	6.2E-03	'=Iadap+Eadps
Absorbed Doses - Benthic Invertebrates									
Internal Dose Factor	mGy/d per Bq	Idcfbi	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadbib	1.25E-03	2.35E-05	6.17E-04	1.46E-05	5.62E-04	2.5E-03	'=bicb*Idcfbi
Internal dose impacted	mGy/d	Iadbi	2.14E-03	6.12E-05	1.38E-03	3.43E-05	1.72E-03	5.3E-03	'=bic*Idcfbi
Ext. dose factor ben inv	mGy/d per Bq	Edcfbi	1.29E-02	2.25E-04	3.67E-02	6.03E-03	1.10E-07		
Ext. dose bkgd sedimer	mGy/d	Eadbenb	4.28E-04	9.00E-06	1.47E-03	6.03E-04	1.10E-08	2.5E-03	'=sedwcb*Edcfbi
Ext. dose impacted sedi	mGy/d	Eadben	4.67E-04	1.12E-05	2.21E-03	7.74E-04	1.34E-08	3.5E-03	'=sedwc*Edcfbi
Total dose - bkgd	mGy/d	Tadbenb	1.67E-03	3.25E-05	2.08E-03	6.18E-04	5.62E-04	5.0E-03	'=Iadbib+Eadbenb
Total dose - impacted	mGy/d	Tadben	2.60E-03	7.24E-05	3.59E-03	8.09E-04	1.72E-03	8.8E-03	'=Iadbi+Eadben
Equivalent Doses - Fish									
RBE for alpha	Sv/Gy	RBEf	40						
Total dose - pelagic bkg	mSv/d	Tedfpb	3.36E-05	5.69E-04	2.37E-03	5.67E-06	3.70E-03	6.7E-03	'=Iadfb*RBEf+Eadfb
- pelagic impact	mSv/d	Tedfp	5.77E-05	1.48E-03	5.29E-03	1.33E-05	1.13E-02	1.8E-02	'=Iadf*RBEf+Eadf
Total dose - benthic bkg	mSv/d	Tedfbenb	1.76E-04	5.69E-04	3.10E-03	1.31E-04	3.70E-03	7.7E-03	'=Iadfb*RBEf+Eadfbenb
- benthic impact	mSv/d	Tedfben	2.13E-04	1.48E-03	6.40E-03	1.74E-04	1.13E-02	2.0E-02	'=Iadf*RBEf+Eadfben
Equivalent Doses - Aquatic Plants									
RBE for alpha	Sv/Gy	RBEap	40						
Total dose - leaf bkgd	mSv/d	Tedaplb	3.82E-03	7.26E-03	3.05E-03	3.99E-05	2.37E-02	3.8E-02	'=Iadapb*RBEap+Eadpwb
- leaf impacted	mSv/d	Tedapl	6.55E-03	1.89E-02	6.82E-03	9.36E-05	7.25E-02	1.0E-01	'=Iadap*RBEap+Eadpw
Total dose - root bkgd	mSv/d	Tedaprb	4.25E-03	7.27E-03	4.52E-03	6.43E-04	2.37E-02	4.0E-02	'=Iadapb*RBEap+Eadpsb
- root impacted	mSv/d	Tedapr	7.02E-03	1.89E-02	9.04E-03	8.68E-04	7.25E-02	1.1E-01	'=Iadap*RBEap+Eadps

Table H.1-1

Aquatic Dose Calculations

Equivalent Doses - Benthic Invertebrates

RBE for alpha	Sv/Gy	RBEbi	40							
Total dose - bkgd	mSv/d	Tedbenb	5.02E-02	9.49E-04	2.61E-02	6.18E-04	2.25E-02	1.0E-01		'=Iadbib*RBEbi+Eadbenb
Total dose - impacted	mSv/d	Tedben	8.59E-02	2.46E-03	5.74E-02	8.09E-04	6.88E-02	2.2E-01		'=Iadbi*RBEbi+Eadben

0.6 Screening Criterion in mGy/d	3 6	Total Absorbed Dose mGy/d	Total Equivalent Dose mSv/d	Index (Absorbed Equivalent Dose)	Index (Absorbed Equivalent Dose)
Pelagic Fish - Background		1.7E-04	6.7E-03	2.9E-04	1.1E-02
Pelagic Fish - Impacted		4.7E-04	1.8E-02	7.8E-04	3.0E-02
Benthic Fish - Background		1.2E-03	7.7E-03	2.0E-03	1.3E-02
Benthic Fish - Impacted		1.9E-03	2.0E-02	3.2E-03	3.3E-02
Aquatic Plant Leaves - Background		9.9E-04	3.8E-02	3.3E-04	1.3E-02
Aquatic Plant Leaves - Impacted		2.7E-03	1.0E-01	9.0E-04	3.5E-02
Aquatic Plant Roots - Background		3.5E-03	4.0E-02	1.2E-03	1.3E-02
Aquatic Plant Roots - Impacted		6.2E-03	1.1E-01	2.1E-03	3.6E-02
Benthic Invertebrates - Background		5.0E-03	1.0E-01	8.3E-04	1.7E-02
Benthic Invertebrates - Impacted		8.8E-03	2.2E-01	1.5E-03	3.6E-02

U-238+	Internal	U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235
	External	U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235 (beta + gamma only)
Ra-226+	Internal	Ra-226 + 0.3* (Rn-222 + ...Po-214)
	External	Ra-226 + 1.0* (Rn-222 + ...Po-214) (beta + gamma only)
Th-232+	Internal	Th-232 + ...Po-212/Tl-208 (Th-232 + Th-228 are inputs)
	External	Th-232 + Po-212/Tl-208
Ra-228+	Internal	Ra-228 + ...Po-212/Tl-208

Table H.1-1
Aquatic Dose Calculations

JSL-3

Determination of Aquatic Dose - Average, RBE 10

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Water									
Background	Bq/m3	wcb	12.30	6.00	4.00	11.00	5.00		
Impacted water body	Bq/m3	wc	9.56	9.5	5.7	16.8	9.2		<<<< input concentrations in water
Sediment									
Background	Bq/g(wet)	sedwcb	3.32E-02	4.00E-02	4.00E-02	1.00E-01	1.00E-01		
Impacted water body	Bq/g(wet)	sedwc	3.48E-02	4.35E-02	4.87E-02	1.12E-01	1.08E-01		<<<< input concentrations in sediment
Fish									
Water-to-fish biocon fa	m3/gwet	bcff	4.80E-07	3.60E-05	9.30E-05	8.50E-05	2.50E-04		<<<< input transfer factor
Fish in bkgd water	Bq/g wet	fc	5.90E-06	2.16E-04	3.72E-04	9.35E-04	1.25E-03		
Fish in impacted water	Bq/g wet	fc	4.59E-06	3.43E-04	5.27E-04	1.43E-03	2.29E-03		
Aquatic Plants									
Water-to-plants biocon	m3/gwet	bcfap	5.47E-05	4.6E-04	1.2E-04	6.0E-04	1.6E-03		<<<< input transfer factor
Plants in bkgd water	Bq/g wet	apcb	6.73E-04	2.76E-03	4.80E-04	6.60E-03	8.00E-03		
Plants in impacted water	Bq/g wet	apc	5.23E-04	4.38E-03	6.80E-04	1.01E-02	1.47E-02		
Benthic Invertebrates									
Water-to-benthos bioco	m3/gwet	bcfbi	7.13E-04	5.95E-05	9.70E-04	2.20E-04	1.52E-03		<<<< input transfer factor
Benthos in bkgd water	Bq/g wet	bicb	8.77E-03	3.57E-04	3.88E-03	2.42E-03	7.60E-03		
Benthos in impacted water	Bq/g wet	bic	6.82E-03	5.66E-04	5.50E-03	3.70E-03	1.39E-02		
Absorbed Doses - Fish									
Internal Dose Factor	mGy/d per Bq	Idcff	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadfb	8.38E-07	1.42E-05	5.91E-05	5.64E-06	9.25E-05	1.7E-04	'=fcb*Idcff
Internal dose impacted	mGy/d	Iadf	6.52E-07	2.25E-05	8.38E-05	8.62E-06	1.70E-04	2.9E-04	'=fc*Idcff
Ext. dose factor	mGy/d per Bq	Edcff	8.57E-03	2.93E-05	3.68E-02	2.50E-03	1.40E-07		
Ext. dose bkgd pelagic	mGy/d	Eadfb	1.05E-07	1.76E-10	1.47E-07	2.75E-08	7.00E-13	2.8E-07	'=wcb*Edcff/1000000
Ext. dose impacted pelagic	mGy/d	Eadf	8.19E-08	2.79E-10	2.08E-07	4.20E-08	1.28E-12	3.3E-07	'=wc*Edcff/1000000
Ext. dose bkgd benthic	mGy/d	Eadfbenb	1.42E-04	5.86E-07	7.36E-04	1.25E-04	7.00E-09	1.0E-03	'=Edcff*(wcb/1000000+sedwcb)/2
Ext. dose impacted benthic	mGy/d	Eadfben	1.49E-04	6.37E-07	8.96E-04	1.40E-04	7.59E-09	1.2E-03	'=Edcff*(wc/1000000+sedwc)/2
Total dose - pelagic bkgd	mGy/d	Tadfbp	9.44E-07	1.42E-05	5.93E-05	5.67E-06	9.25E-05	1.7E-04	'=Iadfb+Eadfb
- pelagic impact	mGy/d	Tadfp	7.33E-07	2.25E-05	8.40E-05	8.66E-06	1.70E-04	2.9E-04	'=Iadf+Eadf
Total dose - benthic bkgd	mGy/d	Tadfbenb	1.43E-04	1.48E-05	7.95E-04	1.31E-04	9.25E-05	1.2E-03	'=Iadfb+Eadfbenb
- benthic impact	mGy/d	Tadfben	1.50E-04	2.32E-05	9.80E-04	1.49E-04	1.70E-04	1.5E-03	'=Iadf+Eadfben

Table H.1-1

Aquatic Dose Calculations

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Absorbed Doses - Aquatic Plants									
Internal Dose Factor	mGy/d per Bq	Idcfap	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadapb	9.55E-05	1.82E-04	7.63E-05	3.98E-05	5.92E-04	9.9E-04	'=apcb*Idcfap
Internal dose impacted	mGy/d	Iadap	7.42E-05	2.88E-04	1.08E-04	6.08E-05	1.09E-03	1.6E-03	'=apc*Idcfap
Ext. dose factor aq plan	mGy/d per Bq	Edcfap	1.29E-02	2.25E-04	3.67E-02	6.03E-03	1.10E-07		
Ext. dose to leaf bkgd	mGy/d	Eadpwb	1.59E-07	1.35E-09	1.47E-07	6.63E-08	5.50E-13	3.7E-07	'=wcb*Edcfap/1000000
Ext. dose to leaf impact	mGy/d	Eadpw	1.23E-07	2.14E-09	2.08E-07	1.01E-07	1.01E-12	4.3E-07	'=wc*Edcfap/1000000
Ext. dose to root bkgd	mGy/d	Eadpsb	4.28E-04	9.00E-06	1.47E-03	6.03E-04	1.10E-08	2.5E-03	'=sedwcb*Edcfap
Ext. dose to root impact	mGy/d	Eadps	4.49E-04	9.78E-06	1.79E-03	6.76E-04	1.19E-08	2.9E-03	'=sedwc*Edcfap
Total dose - leaf bkgd	mGy/d	Tadaplb	9.57E-05	1.82E-04	7.65E-05	3.99E-05	5.92E-04	9.9E-04	'=Iadapb+Eadpwb
- leaf impacted	mGy/d	Tadapl	7.44E-05	2.88E-04	1.08E-04	6.09E-05	1.09E-03	1.6E-03	'=Iadap+Eadpw
Total dose - root bkgd	mGy/d	Tadaprb	5.24E-04	1.91E-04	1.54E-03	6.43E-04	5.92E-04	3.5E-03	'=Iadapb+Eadpsb
- root impacted	mGy/d	Tadapr	5.23E-04	2.98E-04	1.90E-03	7.37E-04	1.09E-03	4.5E-03	'=Iadap+Eadps
Absorbed Doses - Benthic Invertebrates									
Internal Dose Factor	mGy/d per Bq	Idcfbi	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadbib	1.25E-03	2.35E-05	6.17E-04	1.46E-05	5.62E-04	2.5E-03	'=bicb*Idcfbi
Internal dose impacted	mGy/d	Iadbi	9.68E-04	3.73E-05	8.74E-04	2.23E-05	1.03E-03	2.9E-03	'=bic*Idcfbi
Ext. dose factor ben inv	mGy/d per Bq	Edcfbi	1.29E-02	2.25E-04	3.67E-02	6.03E-03	1.10E-07		
Ext. dose bkgd sedimer	mGy/d	Eadbenb	4.28E-04	9.00E-06	1.47E-03	6.03E-04	1.10E-08	2.5E-03	'=sedwcb*Edcfbi
Ext. dose impacted sedi	mGy/d	Eadben	4.49E-04	9.78E-06	1.79E-03	6.76E-04	1.19E-08	2.9E-03	'=sedwc*Edcfbi
Total dose - bkgd	mGy/d	Tadbenb	1.67E-03	3.25E-05	2.08E-03	6.18E-04	5.62E-04	5.0E-03	'=Iadbib+Eadbenb
Total dose - impacted	mGy/d	Tadben	1.42E-03	4.70E-05	2.66E-03	6.98E-04	1.03E-03	5.9E-03	'=Iadbi+Eadben
Equivalent Doses - Fish									
RBE for alpha	Sv/Gy	RBEf	10						
Total dose - pelagic bkg	mSv/d	Tedfpb	8.49E-06	1.42E-04	5.92E-04	5.67E-06	9.25E-04	1.7E-03	'=Iadfb*RBEf+Eadfb
- pelagic impact	mSv/d	Tedfp	6.60E-06	2.25E-04	8.38E-04	8.62E-05	1.70E-03	2.9E-03	'=Iadf*RBEf+Eadf
Total dose - benthic bkg	mSv/d	Tedfbenb	1.51E-04	1.43E-04	1.33E-03	1.31E-04	9.25E-04	2.7E-03	'=Iadfb*RBEf+Eadfbenb
- benthic impact	mSv/d	Tedfben	1.56E-04	2.26E-04	1.73E-03	2.26E-04	1.70E-03	4.0E-03	'=Iadf*RBEf+Eadfben
Equivalent Doses - Aquatic Plants									
RBE for alpha	Sv/Gy	RBEap	10						
Total dose - leaf bkgd	mSv/d	Tedaplb	9.56E-04	1.82E-03	7.63E-04	3.99E-05	5.92E-03	9.5E-03	'=Iadapb*RBEap+Eadpwb
- leaf impacted	mSv/d	Tedapl	7.43E-04	2.88E-03	1.08E-03	6.08E-04	1.09E-02	1.6E-02	'=Iadap*RBEap+Eadpw
Total dose - root bkgd	mSv/d	Tedaprb	1.38E-03	1.83E-03	2.23E-03	6.43E-04	5.92E-03	1.2E-02	'=Iadapb*RBEap+Eadpsb
- root impacted	mSv/d	Tedapr	1.19E-03	2.89E-03	2.87E-03	1.28E-03	1.09E-02	1.9E-02	'=Iadap*RBEap+Eadps

Table H.1-1

Aquatic Dose Calculations

Equivalent Doses - Benthic Invertebrates

RBE for alpha	Sv/Gy	RBEbi	10							
Total dose - bkgd	mSv/d	Tedbenb	1.29E-02	2.44E-04	7.64E-03	6.18E-04	5.62E-03	2.7E-02		'=Iadbib*RBEbi+Eadbenb
Total dose - impacted	mSv/d	Tedben	1.01E-02	3.82E-04	1.05E-02	8.99E-04	1.03E-02	3.2E-02		'=Iadbi*RBEbi+Eadben

0.6 Screening Criterion in mGy/d	3 6	Total Absorbed Dose mGy/d	Total Equivalent Dose mSv/d	Index (Absorbed Equivalent Dose)	Index (Absorbed Equivalent Dose)
Pelagic Fish - Background		1.7E-04	1.7E-03	2.9E-04	2.8E-03
Pelagic Fish - Impacted		2.9E-04	2.9E-03	4.8E-04	4.8E-03
Benthic Fish - Background		1.2E-03	2.7E-03	2.0E-03	4.5E-03
Benthic Fish - Impacted		1.5E-03	4.0E-03	2.5E-03	6.7E-03
Aquatic Plant Leaves - Background		9.9E-04	9.5E-03	3.3E-04	3.2E-03
Aquatic Plant Leaves - Impacted		1.6E-03	1.6E-02	5.4E-04	5.4E-03
Aquatic Plant Roots - Background		3.5E-03	1.2E-02	1.2E-03	4.0E-03
Aquatic Plant Roots - Impacted		4.5E-03	1.9E-02	1.5E-03	6.4E-03
Benthic Invertebrates - Background		5.0E-03	2.7E-02	8.3E-04	4.5E-03
Benthic Invertebrates - Impacted		5.9E-03	3.2E-02	9.8E-04	5.4E-03

U-238+	Internal	U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235
	External	U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235 (beta + gamma only)
Ra-226+	Internal	Ra-226 + 0.3* (Rn-222 + ...Po-214)
	External	Ra-226 + 1.0* (Rn-222 + ...Po-214) (beta + gamma only)
Th-232+	Internal	Th-232 + ...Po-212/Tl-208 (Th-232 + Th-228 are inputs)
	External	Th-232 + Po-212/Tl-208
Ra-228+	Internal	Ra-228 + ...Po-212/Tl-208

Table H.1-1
Aquatic Dose Calculations

JSL-3

Determination of Aquatic Dose - 95th Percentile, RBE 10

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Water									
Background	Bq/m3	wcb	12.30	6.00	4.00	11.00	5.00		
Impacted water body	Bq/m3	wc	24.92	12.4	6.5	19.1	14.7		<<<< input concentrations in water
Sediment									
Background	Bq/g(wet)	sedwcb	3.32E-02	4.00E-02	4.00E-02	1.00E-01	1.00E-01		
Impacted water body	Bq/g(wet)	sedwc	3.60E-02	4.75E-02	5.57E-02	1.22E-01	1.16E-01		<<<< input concentrations in sediment
Fish									
Water-to-fish biocon fa	m3/gwet	bcff	4.80E-07	3.60E-05	9.30E-05	8.50E-05	2.50E-04		<<<< input transfer factor
Fish in bkgd water	Bq/g wet	fc	5.90E-06	2.16E-04	3.72E-04	9.35E-04	1.25E-03		
Fish in impacted water	Bq/g wet	fc	1.20E-05	4.46E-04	6.04E-04	1.62E-03	3.68E-03		
Aquatic Plants									
Water-to-plants biocon	m3/gwet	bcfb	5.47E-05	4.6E-04	1.2E-04	6.0E-04	1.6E-03		<<<< input transfer factor
Plants in bkgd water	Bq/g wet	apcb	6.73E-04	2.76E-03	4.80E-04	6.60E-03	8.00E-03		
Plants in impacted water	Bq/g wet	apc	1.36E-03	5.70E-03	7.79E-04	1.15E-02	2.36E-02		
Benthic Invertebrates									
Water-to-benthos bioco	m3/gwet	bcfbi	7.13E-04	5.95E-05	9.70E-04	2.20E-04	1.52E-03		<<<< input transfer factor
Benthos in bkgd water	Bq/g wet	bicb	8.77E-03	3.57E-04	3.88E-03	2.42E-03	7.60E-03		
Benthos in impacted water	Bq/g wet	bic	1.78E-02	7.38E-04	6.30E-03	4.20E-03	2.24E-02		
Absorbed Doses - Fish									
Internal Dose Factor	mGy/d per Bq	Idcff	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadfb	8.38E-07	1.42E-05	5.91E-05	5.64E-06	9.25E-05	1.7E-04	'=fcb*Idcff
Internal dose impacted	mGy/d	Iadf	1.70E-06	2.94E-05	9.60E-05	9.79E-06	2.73E-04	4.1E-04	'=fc*Idcff
Ext. dose factor	mGy/d per Bq	Edcff	8.57E-03	2.93E-05	3.68E-02	2.50E-03	1.40E-07		
Ext. dose bkgd pelagic	mGy/d	Eadfb	1.05E-07	1.76E-10	1.47E-07	2.75E-08	7.00E-13	2.8E-07	'=wcb*Edcff/1000000
Ext. dose impacted pelagic	mGy/d	Eadf	2.14E-07	3.63E-10	2.39E-07	4.78E-08	2.06E-12	5.0E-07	'=wc*Edcff/1000000
Ext. dose bkgd benthic	mGy/d	Eadfbenb	1.42E-04	5.86E-07	7.36E-04	1.25E-04	7.00E-09	1.0E-03	'=Edcff*(wcb/1000000+sedwcb)/2
Ext. dose impacted benthic	mGy/d	Eadfben	1.55E-04	6.97E-07	1.02E-03	1.52E-04	8.14E-09	1.3E-03	'=Edcff*(wc/1000000+sedwc)/2
Total dose - pelagic bkgd	mGy/d	Tadfb	9.44E-07	1.42E-05	5.93E-05	5.67E-06	9.25E-05	1.7E-04	'=Iadfb+Eadfb
- pelagic impact	mGy/d	Tadfp	1.91E-06	2.94E-05	9.63E-05	9.84E-06	2.73E-04	4.1E-04	'=Iadf+Eadf
Total dose - benthic bkgd	mGy/d	Tadfbenb	1.43E-04	1.48E-05	7.95E-04	1.31E-04	9.25E-05	1.2E-03	'=Iadfb+Eadfbenb
- benthic impact	mGy/d	Tadfben	1.56E-04	3.01E-05	1.12E-03	1.62E-04	2.73E-04	1.7E-03	'=Iadf+Eadfben

Table H.1-1

Aquatic Dose Calculations

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Absorbed Doses - Aquatic Plants									
Internal Dose Factor	mGy/d per Bq	Idcfap	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadapb	9.55E-05	1.82E-04	7.63E-05	3.98E-05	5.92E-04	9.9E-04	'=apcb*Idcfap
Internal dose impacted	mGy/d	Iadap	1.94E-04	3.75E-04	1.24E-04	6.91E-05	1.74E-03	2.5E-03	'=apc*Idcfap
Ext. dose factor aq plan	mGy/d per Bq	Edcfap	1.29E-02	2.25E-04	3.67E-02	6.03E-03	1.10E-07		
Ext. dose to leaf bkgd	mGy/d	Eadpwb	1.59E-07	1.35E-09	1.47E-07	6.63E-08	5.50E-13	3.7E-07	'=wcb*Edcfap/1000000
Ext. dose to leaf impact	mGy/d	Eadpw	3.22E-07	2.79E-09	2.38E-07	1.15E-07	1.62E-12	6.8E-07	'=wc*Edcfap/1000000
Ext. dose to root bkgd	mGy/d	Eadpsb	4.28E-04	9.00E-06	1.47E-03	6.03E-04	1.10E-08	2.5E-03	'=sedwcb*Edcfap
Ext. dose to root impact	mGy/d	Eadps	4.65E-04	1.07E-05	2.04E-03	7.33E-04	1.28E-08	3.3E-03	'=sedwc*Edcfap
Total dose - leaf bkgd	mGy/d	Tadaplb	9.57E-05	1.82E-04	7.65E-05	3.99E-05	5.92E-04	9.9E-04	'=Iadapb+Eadpwb
- leaf impacted	mGy/d	Tadapl	1.94E-04	3.75E-04	1.24E-04	6.92E-05	1.74E-03	2.5E-03	'=Iadap+Eadpw
Total dose - root bkgd	mGy/d	Tadaprb	5.24E-04	1.91E-04	1.54E-03	6.43E-04	5.92E-04	3.5E-03	'=Iadapb+Eadpsb
- root impacted	mGy/d	Tadapr	6.59E-04	3.86E-04	2.17E-03	8.03E-04	1.74E-03	5.8E-03	'=Iadap+Eadps
Absorbed Doses - Benthic Invertebrates									
Internal Dose Factor	mGy/d per Bq	Idcfbi	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadbib	1.25E-03	2.35E-05	6.17E-04	1.46E-05	5.62E-04	2.5E-03	'=bicb*Idcfbi
Internal dose impacted	mGy/d	Iadbi	2.52E-03	4.85E-05	1.00E-03	2.53E-05	1.66E-03	5.3E-03	'=bic*Idcfbi
Ext. dose factor ben inv	mGy/d per Bq	Edcfbi	1.29E-02	2.25E-04	3.67E-02	6.03E-03	1.10E-07		
Ext. dose bkgd sedimer	mGy/d	Eadbenb	4.28E-04	9.00E-06	1.47E-03	6.03E-04	1.10E-08	2.5E-03	'=sedwcb*Edcfbi
Ext. dose impacted sedi	mGy/d	Eadben	4.65E-04	1.07E-05	2.04E-03	7.33E-04	1.28E-08	3.3E-03	'=sedwc*Edcfbi
Total dose - bkgd	mGy/d	Tadbenb	1.67E-03	3.25E-05	2.08E-03	6.18E-04	5.62E-04	5.0E-03	'=Iadbib+Eadbenb
Total dose - impacted	mGy/d	Tadben	2.99E-03	5.92E-05	3.05E-03	7.59E-04	1.66E-03	8.5E-03	'=Iadbi+Eadben
Equivalent Doses - Fish									
RBE for alpha	Sv/Gy	RBEf	10						
Total dose - pelagic bkg	mSv/d	Tedfpb	8.49E-06	1.42E-04	5.92E-04	5.67E-06	9.25E-04	1.7E-03	'=Iadfb*RBEf+Eadfb
- pelagic impact	mSv/d	Tedfp	1.72E-05	2.94E-04	9.61E-04	9.84E-06	2.73E-03	4.0E-03	'=Iadf*RBEf+Eadf
Total dose - benthic bkg	mSv/d	Tedfbenb	1.51E-04	1.43E-04	1.33E-03	1.31E-04	9.25E-04	2.7E-03	'=Iadfb*RBEf+Eadfbenb
- benthic impact	mSv/d	Tedfben	1.72E-04	2.94E-04	1.99E-03	1.62E-04	2.73E-03	5.3E-03	'=Iadf*RBEf+Eadfben
Equivalent Doses - Aquatic Plants									
RBE for alpha	Sv/Gy	RBEap	10						
Total dose - leaf bkgd	mSv/d	Tedaplb	9.56E-04	1.82E-03	7.63E-04	3.99E-05	5.92E-03	9.5E-03	'=Iadapb*RBEap+Eadpwb
- leaf impacted	mSv/d	Tedapl	1.94E-03	3.75E-03	1.24E-03	6.92E-05	1.74E-02	2.4E-02	'=Iadap*RBEap+Eadpw
Total dose - root bkgd	mSv/d	Tedaprb	1.38E-03	1.83E-03	2.23E-03	6.43E-04	5.92E-03	1.2E-02	'=Iadapb*RBEap+Eadpsb
- root impacted	mSv/d	Tedapr	2.40E-03	3.76E-03	3.28E-03	8.03E-04	1.74E-02	2.8E-02	'=Iadap*RBEap+Eadps

Table H.1-1

Aquatic Dose Calculations

Equivalent Doses - Benthic Invertebrates

RBE for alpha	Sv/Gy	RBEbi	10							
Total dose - bkgd	mSv/d	Tedbenb	1.29E-02	2.44E-04	7.64E-03	6.18E-04	5.62E-03	2.7E-02		'=Iadbib*RBEbi+Eadbenb
Total dose - impacted	mSv/d	Tedben	2.57E-02	4.96E-04	1.21E-02	7.59E-04	1.66E-02	5.6E-02		'=Iadbi*RBEbi+Eadben

0.6 Screening Criterion in mGy/d	3 6	Total Absorbed Dose mGy/d	Total Equivalent Dose mSv/d	Index (Absorbed Equivalent Dose)	Index (Absorbed Equivalent Dose)
Pelagic Fish - Background		1.7E-04	1.7E-03	2.9E-04	2.8E-03
Pelagic Fish - Impacted		4.1E-04	4.0E-03	6.8E-04	6.7E-03
Benthic Fish - Background		1.2E-03	2.7E-03	2.0E-03	4.5E-03
Benthic Fish - Impacted		1.7E-03	5.3E-03	2.9E-03	8.9E-03
Aquatic Plant Leaves - Background		9.9E-04	9.5E-03	3.3E-04	3.2E-03
Aquatic Plant Leaves - Impacted		2.5E-03	2.4E-02	8.4E-04	8.1E-03
Aquatic Plant Roots - Background		3.5E-03	1.2E-02	1.2E-03	4.0E-03
Aquatic Plant Roots - Impacted		5.8E-03	2.8E-02	1.9E-03	9.2E-03
Benthic Invertebrates - Background		5.0E-03	2.7E-02	8.3E-04	4.5E-03
Benthic Invertebrates - Impacted		8.5E-03	5.6E-02	1.4E-03	9.3E-03

U-238+	Internal	U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235
	External	U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235 (beta + gamma only)
Ra-226+	Internal	Ra-226 + 0.3* (Rn-222 + ...Po-214)
	External	Ra-226 + 1.0* (Rn-222 + ...Po-214) (beta + gamma only)
Th-232+	Internal	Th-232 + ...Po-212/Tl-208 (Th-232 + Th-228 are inputs)
	External	Th-232 + Po-212/Tl-208
Ra-228+	Internal	Ra-228 + ...Po-212/Tl-208

Table H.1-1
Aquatic Dose Calculations

JSL-3

Determination of Aquatic Dose - Average, RBE 40

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Water									
Background	Bq/m3	wcb	12.30	6.00	4.00	11.00	5.00		
Impacted water body	Bq/m3	wc	9.56	9.5	5.7	16.8	9.2		<<<< input concentrations in water
Sediment									
Background	Bq/g(wet)	sedwcb	3.32E-02	4.00E-02	4.00E-02	1.00E-01	1.00E-01		
Impacted water body	Bq/g(wet)	sedwc	3.48E-02	4.35E-02	4.87E-02	1.12E-01	1.08E-01		<<<< input concentrations in sediment
Fish									
Water-to-fish biocon fa	m3/gwet	bcff	4.80E-07	3.60E-05	9.30E-05	8.50E-05	2.50E-04		<<<< input transfer factor
Fish in bkgd water	Bq/g wet	fc	5.90E-06	2.16E-04	3.72E-04	9.35E-04	1.25E-03		
Fish in impacted water	Bq/g wet	fc	4.59E-06	3.43E-04	5.27E-04	1.43E-03	2.29E-03		
Aquatic Plants									
Water-to-plants biocon	m3/gwet	bcfap	5.47E-05	4.6E-04	1.2E-04	6.0E-04	1.6E-03		<<<< input transfer factor
Plants in bkgd water	Bq/g wet	apcb	6.73E-04	2.76E-03	4.80E-04	6.60E-03	8.00E-03		
Plants in impacted water	Bq/g wet	apc	5.23E-04	4.38E-03	6.80E-04	1.01E-02	1.47E-02		
Benthic Invertebrates									
Water-to-benthos bioco	m3/gwet	bcfbi	7.13E-04	5.95E-05	9.70E-04	2.20E-04	1.52E-03		<<<< input transfer factor
Benthos in bkgd water	Bq/g wet	bicb	8.77E-03	3.57E-04	3.88E-03	2.42E-03	7.60E-03		
Benthos in impacted water	Bq/g wet	bic	6.82E-03	5.66E-04	5.50E-03	3.70E-03	1.39E-02		
Absorbed Doses - Fish									
Internal Dose Factor	mGy/d per Bq	Idcff	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadfb	8.38E-07	1.42E-05	5.91E-05	5.64E-06	9.25E-05	1.7E-04	'=fcb*Idcff
Internal dose impacted	mGy/d	Iadf	6.52E-07	2.25E-05	8.38E-05	8.62E-06	1.70E-04	2.9E-04	'=fc*Idcff
Ext. dose factor	mGy/d per Bq	Edcff	8.57E-03	2.93E-05	3.68E-02	2.50E-03	1.40E-07		
Ext. dose bkgd pelagic	mGy/d	Eadfb	1.05E-07	1.76E-10	1.47E-07	2.75E-08	7.00E-13	2.8E-07	'=wcb*Edcff/1000000
Ext. dose impacted pelagic	mGy/d	Eadf	8.19E-08	2.79E-10	2.08E-07	4.20E-08	1.28E-12	3.3E-07	'=wc*Edcff/1000000
Ext. dose bkgd benthic	mGy/d	Eadfbenb	1.42E-04	5.86E-07	7.36E-04	1.25E-04	7.00E-09	1.0E-03	'=Edcff*(wcb/1000000+sedwcb)/2
Ext. dose impacted benthic	mGy/d	Eadfben	1.49E-04	6.37E-07	8.96E-04	1.40E-04	7.59E-09	1.2E-03	'=Edcff*(wc/1000000+sedwc)/2
Total dose - pelagic bkgd	mGy/d	Tadfbp	9.44E-07	1.42E-05	5.93E-05	5.67E-06	9.25E-05	1.7E-04	'=Iadfb+Eadfb
- pelagic impact	mGy/d	Tadfp	7.33E-07	2.25E-05	8.40E-05	8.66E-06	1.70E-04	2.9E-04	'=Iadf+Eadf
Total dose - benthic bkgd	mGy/d	Tadfbenb	1.43E-04	1.48E-05	7.95E-04	1.31E-04	9.25E-05	1.2E-03	'=Iadfb+Eadfbenb
- benthic impact	mGy/d	Tadfben	1.50E-04	2.32E-05	9.80E-04	1.49E-04	1.70E-04	1.5E-03	'=Iadf+Eadfben

Table H.1-1

Aquatic Dose Calculations

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Absorbed Doses - Aquatic Plants									
Internal Dose Factor	mGy/d per Bq	Idcfap	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadapb	9.55E-05	1.82E-04	7.63E-05	3.98E-05	5.92E-04	9.9E-04	'=apcb*Idcfap
Internal dose impacted	mGy/d	Iadap	7.42E-05	2.88E-04	1.08E-04	6.08E-05	1.09E-03	1.6E-03	'=apc*Idcfap
Ext. dose factor aq plan	mGy/d per Bq	Edcfap	1.29E-02	2.25E-04	3.67E-02	6.03E-03	1.10E-07		
Ext. dose to leaf bkgd	mGy/d	Eadpwb	1.59E-07	1.35E-09	1.47E-07	6.63E-08	5.50E-13	3.7E-07	'=wcb*Edcfap/1000000
Ext. dose to leaf impact	mGy/d	Eadpw	1.23E-07	2.14E-09	2.08E-07	1.01E-07	1.01E-12	4.3E-07	'=wc*Edcfap/1000000
Ext. dose to root bkgd	mGy/d	Eadpsb	4.28E-04	9.00E-06	1.47E-03	6.03E-04	1.10E-08	2.5E-03	'=sedwcb*Edcfap
Ext. dose to root impact	mGy/d	Eadps	4.49E-04	9.78E-06	1.79E-03	6.76E-04	1.19E-08	2.9E-03	'=sedwc*Edcfap
Total dose - leaf bkgd	mGy/d	Tadaplb	9.57E-05	1.82E-04	7.65E-05	3.99E-05	5.92E-04	9.9E-04	'=Iadapb+Eadpwb
- leaf impacted	mGy/d	Tadapl	7.44E-05	2.88E-04	1.08E-04	6.09E-05	1.09E-03	1.6E-03	'=Iadap+Eadpw
Total dose - root bkgd	mGy/d	Tadaprb	5.24E-04	1.91E-04	1.54E-03	6.43E-04	5.92E-04	3.5E-03	'=Iadapb+Eadpsb
- root impacted	mGy/d	Tadapr	5.23E-04	2.98E-04	1.90E-03	7.37E-04	1.09E-03	4.5E-03	'=Iadap+Eadps
Absorbed Doses - Benthic Invertebrates									
Internal Dose Factor	mGy/d per Bq	Idcfbi	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadbib	1.25E-03	2.35E-05	6.17E-04	1.46E-05	5.62E-04	2.5E-03	'=bicb*Idcfbi
Internal dose impacted	mGy/d	Iadbi	9.68E-04	3.73E-05	8.74E-04	2.23E-05	1.03E-03	2.9E-03	'=bic*Idcfbi
Ext. dose factor ben inv	mGy/d per Bq	Edcfbi	1.29E-02	2.25E-04	3.67E-02	6.03E-03	1.10E-07		
Ext. dose bkgd sedimer	mGy/d	Eadbenb	4.28E-04	9.00E-06	1.47E-03	6.03E-04	1.10E-08	2.5E-03	'=sedwcb*Edcfbi
Ext. dose impacted sedi	mGy/d	Eadben	4.49E-04	9.78E-06	1.79E-03	6.76E-04	1.19E-08	2.9E-03	'=sedwc*Edcfbi
Total dose - bkgd	mGy/d	Tadbenb	1.67E-03	3.25E-05	2.08E-03	6.18E-04	5.62E-04	5.0E-03	'=Iadbib+Eadbenb
Total dose - impacted	mGy/d	Tadben	1.42E-03	4.70E-05	2.66E-03	6.98E-04	1.03E-03	5.9E-03	'=Iadbi+Eadben
Equivalent Doses - Fish									
RBE for alpha	Sv/Gy	RBEf	40						
Total dose - pelagic bkg	mSv/d	Tedfpb	3.36E-05	5.69E-04	2.37E-03	5.67E-06	3.70E-03	6.7E-03	'=Iadfb*RBEf+Eadfb
- pelagic impact	mSv/d	Tedfp	2.61E-05	9.02E-04	3.35E-03	3.45E-04	6.79E-03	1.1E-02	'=Iadf*RBEf+Eadf
Total dose - benthic bkg	mSv/d	Tedfbenb	1.76E-04	5.69E-04	3.10E-03	1.31E-04	3.70E-03	7.7E-03	'=Iadfb*RBEf+Eadfbenb
- benthic impact	mSv/d	Tedfben	1.75E-04	9.03E-04	4.25E-03	4.85E-04	6.79E-03	1.3E-02	'=Iadf*RBEf+Eadfben
Equivalent Doses - Aquatic Plants									
RBE for alpha	Sv/Gy	RBEap	40						
Total dose - leaf bkgd	mSv/d	Tedaplb	3.82E-03	7.26E-03	3.05E-03	3.99E-05	2.37E-02	3.8E-02	'=Iadapb*RBEap+Eadpwb
- leaf impacted	mSv/d	Tedapl	2.97E-03	1.15E-02	4.32E-03	2.43E-03	4.34E-02	6.5E-02	'=Iadap*RBEap+Eadpw
Total dose - root bkgd	mSv/d	Tedaprb	4.25E-03	7.27E-03	4.52E-03	6.43E-04	2.37E-02	4.0E-02	'=Iadapb*RBEap+Eadpsb
- root impacted	mSv/d	Tedapr	3.42E-03	1.15E-02	6.11E-03	3.11E-03	4.34E-02	6.8E-02	'=Iadap*RBEap+Eadps

Table H.1-1

Aquatic Dose Calculations

Equivalent Doses - Benthic Invertebrates

RBE for alpha	Sv/Gy	RBEbi	40							
Total dose - bkgd	mSv/d	Tedbenb	1.29E-02	2.44E-04	7.64E-03	6.18E-04	5.62E-03	2.7E-02		'=Iadbib*RBEbi+Eadbenb
Total dose - impacted	mSv/d	Tedben	3.92E-02	9.78E-06	1.79E-03	6.76E-04	1.19E-08	4.2E-02		'=Iadbi*RBEbi+Eadben

0.6 Screening Criterion in mGy/d	3 6	Total Absorbed Dose mGy/d	Total Equivalent Dose mSv/d	Index (Absorbed Equivalent Dose)	Index (Absorbed Equivalent Dose)
Pelagic Fish - Background		1.7E-04	6.7E-03	2.9E-04	1.1E-02
Pelagic Fish - Impacted		2.9E-04	1.1E-02	4.8E-04	1.9E-02
Benthic Fish - Background		1.2E-03	7.7E-03	2.0E-03	1.3E-02
Benthic Fish - Impacted		1.5E-03	1.3E-02	2.5E-03	2.1E-02
Aquatic Plant Leaves - Background		9.9E-04	3.8E-02	3.3E-04	1.3E-02
Aquatic Plant Leaves - Impacted		1.6E-03	6.5E-02	5.4E-04	2.2E-02
Aquatic Plant Roots - Background		3.5E-03	4.0E-02	1.2E-03	1.3E-02
Aquatic Plant Roots - Impacted		4.5E-03	6.8E-02	1.5E-03	2.3E-02
Benthic Invertebrates - Background		5.0E-03	2.7E-02	8.3E-04	4.5E-03
Benthic Invertebrates - Impacted		5.9E-03	4.2E-02	9.8E-04	6.9E-03

U-238+	Internal	U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235
	External	U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235 (beta + gamma only)
Ra-226+	Internal	Ra-226 + 0.3* (Rn-222 + ...Po-214)
	External	Ra-226 + 1.0* (Rn-222 + ...Po-214) (beta + gamma only)
Th-232+	Internal	Th-232 + ...Po-212/Tl-208 (Th-232 + Th-228 are inputs)
	External	Th-232 + Po-212/Tl-208
Ra-228+	Internal	Ra-228 + ...Po-212/Tl-208

Table H.1-1
Aquatic Dose Calculations

JSL-3

Determination of Aquatic Dose - 95th Percentile, RBE 40

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Water									
Background	Bq/m3	wcb	12.30	6.00	4.00	11.00	5.00		
Impacted water body	Bq/m3	wc	24.92	12.4	6.5	19.1	14.7		<<<< input concentrations in water
Sediment									
Background	Bq/g(wet)	sedwcb	3.32E-02	4.00E-02	4.00E-02	1.00E-01	1.00E-01		
Impacted water body	Bq/g(wet)	sedwc	3.60E-02	4.75E-02	5.57E-02	1.22E-01	1.16E-01		<<<< input concentrations in sediment
Fish									
Water-to-fish biocon fa	m3/gwet	bcff	4.80E-07	3.60E-05	9.30E-05	8.50E-05	2.50E-04		<<<< input transfer factor
Fish in bkgd water	Bq/g wet	fc	5.90E-06	2.16E-04	3.72E-04	9.35E-04	1.25E-03		
Fish in impacted water	Bq/g wet	fc	1.20E-05	4.46E-04	6.04E-04	1.62E-03	3.68E-03		
Aquatic Plants									
Water-to-plants biocon	m3/gwet	bcfap	5.47E-05	4.6E-04	1.2E-04	6.0E-04	1.6E-03		<<<< input transfer factor
Plants in bkgd water	Bq/g wet	apcb	6.73E-04	2.76E-03	4.80E-04	6.60E-03	8.00E-03		
Plants in impacted water	Bq/g wet	apc	1.36E-03	5.70E-03	7.79E-04	1.15E-02	2.36E-02		
Benthic Invertebrates									
Water-to-benthos bioco	m3/gwet	bcfbi	7.13E-04	5.95E-05	9.70E-04	2.20E-04	1.52E-03		<<<< input transfer factor
Benthos in bkgd water	Bq/g wet	bicb	8.77E-03	3.57E-04	3.88E-03	2.42E-03	7.60E-03		
Benthos in impacted water	Bq/g wet	bic	1.78E-02	7.38E-04	6.30E-03	4.20E-03	2.24E-02		
Absorbed Doses - Fish									
Internal Dose Factor	mGy/d per Bq	Idcff	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadfb	8.38E-07	1.42E-05	5.91E-05	5.64E-06	9.25E-05	1.7E-04	'=fcb*Idcff
Internal dose impacted	mGy/d	Iadf	1.70E-06	2.94E-05	9.60E-05	9.79E-06	2.73E-04	4.1E-04	'=fc*Idcff
Ext. dose factor	mGy/d per Bq	Edcff	8.57E-03	2.93E-05	3.68E-02	2.50E-03	1.40E-07		
Ext. dose bkgd pelagic	mGy/d	Eadfb	1.05E-07	1.76E-10	1.47E-07	2.75E-08	7.00E-13	2.8E-07	'=wcb*Edcff/1000000
Ext. dose impacted pelagic	mGy/d	Eadf	2.14E-07	3.63E-10	2.39E-07	4.78E-08	2.06E-12	5.0E-07	'=wc*Edcff/1000000
Ext. dose bkgd benthic	mGy/d	Eadfbenb	1.42E-04	5.86E-07	7.36E-04	1.25E-04	7.00E-09	1.0E-03	'=Edcff*(wcb/1000000+sedwcb)/2
Ext. dose impacted benthic	mGy/d	Eadfben	1.55E-04	6.97E-07	1.02E-03	1.52E-04	8.14E-09	1.3E-03	'=Edcff*(wc/1000000+sedwc)/2
Total dose - pelagic bkgd	mGy/d	Tadfbp	9.44E-07	1.42E-05	5.93E-05	5.67E-06	9.25E-05	1.7E-04	'=Iadfb+Eadfb
- pelagic impact	mGy/d	Tadfp	1.91E-06	2.94E-05	9.63E-05	9.84E-06	2.73E-04	4.1E-04	'=Iadf+Eadf
Total dose - benthic bkgd	mGy/d	Tadfbenb	1.43E-04	1.48E-05	7.95E-04	1.31E-04	9.25E-05	1.2E-03	'=Iadfb+Eadfbenb
- benthic impact	mGy/d	Tadfben	1.56E-04	3.01E-05	1.12E-03	1.62E-04	2.73E-04	1.7E-03	'=Iadf+Eadfben

Table H.1-1

Aquatic Dose Calculations

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Absorbed Doses - Aquatic Plants									
Internal Dose Factor	mGy/d per Bq	Idcfap	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadapb	9.55E-05	1.82E-04	7.63E-05	3.98E-05	5.92E-04	9.9E-04	'=apcb*Idcfap
Internal dose impacted	mGy/d	Iadap	1.94E-04	3.75E-04	1.24E-04	6.91E-05	1.74E-03	2.5E-03	'=apc*Idcfap
Ext. dose factor aq plan	mGy/d per Bq	Edcfap	1.29E-02	2.25E-04	3.67E-02	6.03E-03	1.10E-07		
Ext. dose to leaf bkgd	mGy/d	Eadpwb	1.59E-07	1.35E-09	1.47E-07	6.63E-08	5.50E-13	3.7E-07	'=wcb*Edcfap/1000000
Ext. dose to leaf impact	mGy/d	Eadpw	3.22E-07	2.79E-09	2.38E-07	1.15E-07	1.62E-12	6.8E-07	'=wc*Edcfap/1000000
Ext. dose to root bkgd	mGy/d	Eadpsb	4.28E-04	9.00E-06	1.47E-03	6.03E-04	1.10E-08	2.5E-03	'=sedwcb*Edcfap
Ext. dose to root impact	mGy/d	Eadps	4.65E-04	1.07E-05	2.04E-03	7.33E-04	1.28E-08	3.3E-03	'=sedwc*Edcfap
Total dose - leaf bkgd	mGy/d	Tadaplb	9.57E-05	1.82E-04	7.65E-05	3.99E-05	5.92E-04	9.9E-04	'=Iadapb+Eadpwb
- leaf impacted	mGy/d	Tadapl	1.94E-04	3.75E-04	1.24E-04	6.92E-05	1.74E-03	2.5E-03	'=Iadap+Eadpw
Total dose - root bkgd	mGy/d	Tadaprb	5.24E-04	1.91E-04	1.54E-03	6.43E-04	5.92E-04	3.5E-03	'=Iadapb+Eadpsb
- root impacted	mGy/d	Tadapr	6.59E-04	3.86E-04	2.17E-03	8.03E-04	1.74E-03	5.8E-03	'=Iadap+Eadps
Absorbed Doses - Benthic Invertebrates									
Internal Dose Factor	mGy/d per Bq	Idcfbi	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadbib	1.25E-03	2.35E-05	6.17E-04	1.46E-05	5.62E-04	2.5E-03	'=bicb*Idcfbi
Internal dose impacted	mGy/d	Iadbi	2.52E-03	4.85E-05	1.00E-03	2.53E-05	1.66E-03	5.3E-03	'=bic*Idcfbi
Ext. dose factor ben inv	mGy/d per Bq	Edcfbi	1.29E-02	2.25E-04	3.67E-02	6.03E-03	1.10E-07		
Ext. dose bkgd sedimer	mGy/d	Eadbenb	4.28E-04	9.00E-06	1.47E-03	6.03E-04	1.10E-08	2.5E-03	'=sedwcb*Edcfbi
Ext. dose impacted sedi	mGy/d	Eadben	4.65E-04	1.07E-05	2.04E-03	7.33E-04	1.28E-08	3.3E-03	'=sedwc*Edcfbi
Total dose - bkgd	mGy/d	Tadbenb	1.67E-03	3.25E-05	2.08E-03	6.18E-04	5.62E-04	5.0E-03	'=Iadbib+Eadbenb
Total dose - impacted	mGy/d	Tadben	2.99E-03	5.92E-05	3.05E-03	7.59E-04	1.66E-03	8.5E-03	'=Iadbi+Eadben
Equivalent Doses - Fish									
RBE for alpha	Sv/Gy	RBEf	40						
Total dose - pelagic bkg	mSv/d	Tedfpb	3.36E-05	5.69E-04	2.37E-03	5.67E-06	3.70E-03	6.7E-03	'=Iadfb*RBEf+Eadfb
- pelagic impact	mSv/d	Tedfp	6.82E-05	1.17E-03	3.84E-03	9.84E-06	1.09E-02	1.6E-02	'=Iadf*RBEf+Eadf
Total dose - benthic bkg	mSv/d	Tedfbenb	1.76E-04	5.69E-04	3.10E-03	1.31E-04	3.70E-03	7.7E-03	'=Iadfb*RBEf+Eadfbenb
- benthic impact	mSv/d	Tedfben	2.23E-04	1.18E-03	4.87E-03	1.62E-04	1.09E-02	1.7E-02	'=Iadf*RBEf+Eadfben
Equivalent Doses - Aquatic Plants									
RBE for alpha	Sv/Gy	RBEap	40						
Total dose - leaf bkgd	mSv/d	Tedaplb	3.82E-03	7.26E-03	3.05E-03	3.99E-05	2.37E-02	3.8E-02	'=Iadapb*RBEap+Eadpwb
- leaf impacted	mSv/d	Tedapl	7.74E-03	1.50E-02	4.96E-03	6.92E-05	6.98E-02	9.8E-02	'=Iadap*RBEap+Eadpw
Total dose - root bkgd	mSv/d	Tedaprb	4.25E-03	7.27E-03	4.52E-03	6.43E-04	2.37E-02	4.0E-02	'=Iadapb*RBEap+Eadpsb
- root impacted	mSv/d	Tedapr	8.21E-03	1.50E-02	7.00E-03	8.03E-04	6.98E-02	1.0E-01	'=Iadap*RBEap+Eadps

Table H.1-1

Aquatic Dose Calculations

Equivalent Doses - Benthic Invertebrates

RBE for alpha	Sv/Gy	RBEbi	40							
Total dose - bkgd	mSv/d	Tedbenb	5.02E-02	9.49E-04	2.61E-02	6.18E-04	2.25E-02	1.0E-01		'=Iadbib*RBEbi+Eadbenb
Total dose - impacted	mSv/d	Tedben	1.01E-01	1.95E-03	4.21E-02	7.59E-04	6.63E-02	2.1E-01		'=Iadbi*RBEbi+Eadben

0.6 Screening Criterion in mGy/d	3 6	Total Absorbed Dose mGy/d	Total Equivalent Dose mSv/d	Index (Absorbed Equivalent Dose)	Index (Absorbed Equivalent Dose)
Pelagic Fish - Background		1.7E-04	6.7E-03	2.9E-04	1.1E-02
Pelagic Fish - Impacted		4.1E-04	1.6E-02	6.8E-04	2.7E-02
Benthic Fish - Background		1.2E-03	7.7E-03	2.0E-03	1.3E-02
Benthic Fish - Impacted		1.7E-03	1.7E-02	2.9E-03	2.9E-02
Aquatic Plant Leaves - Background		9.9E-04	3.8E-02	3.3E-04	1.3E-02
Aquatic Plant Leaves - Impacted		2.5E-03	9.8E-02	8.4E-04	3.3E-02
Aquatic Plant Roots - Background		3.5E-03	4.0E-02	1.2E-03	1.3E-02
Aquatic Plant Roots - Impacted		5.8E-03	1.0E-01	1.9E-03	3.4E-02
Benthic Invertebrates - Background		5.0E-03	1.0E-01	8.3E-04	1.7E-02
Benthic Invertebrates - Impacted		8.5E-03	2.1E-01	1.4E-03	3.5E-02

U-238+	Internal	U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235
	External	U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235 (beta + gamma only)
Ra-226+	Internal	Ra-226 + 0.3* (Rn-222 + ...Po-214)
	External	Ra-226 + 1.0* (Rn-222 + ...Po-214) (beta + gamma only)
Th-232+	Internal	Th-232 + ...Po-212/Tl-208 (Th-232 + Th-228 are inputs)
	External	Th-232 + Po-212/Tl-208
Ra-228+	Internal	Ra-228 + ...Po-212/Tl-208

Table H.1-1
Aquatic Dose Calculations

JSL-4

Determination of Aquatic Dose - Average, RBE 10

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Water									
Background	Bq/m3	wcb	12.30	6.00	4.00	11.00	5.00		
Impacted water body	Bq/m3	wc	8.51	8.9	5.4	15.9	8.6		<<<< input concentrations in water
Sediment									
Background	Bq/g(wet)	sedwcb	3.32E-02	4.00E-02	4.00E-02	1.00E-01	1.00E-01		
Impacted water body	Bq/g(wet)	sedwc	3.46E-02	4.34E-02	4.88E-02	1.12E-01	1.08E-01		<<<< input concentrations in sediment
Fish									
Water-to-fish biocon fa	m3/gwet	bcff	4.80E-07	3.60E-05	9.30E-05	8.50E-05	2.50E-04		<<<< input transfer factor
Fish in bkgd water	Bq/g wet	fc	5.90E-06	2.16E-04	3.72E-04	9.35E-04	1.25E-03		
Fish in impacted water	Bq/g wet	fc	4.09E-06	3.22E-04	5.05E-04	1.35E-03	2.16E-03		
Aquatic Plants									
Water-to-plants biocon	m3/gwet	bcfap	5.47E-05	4.6E-04	1.2E-04	6.0E-04	1.6E-03		<<<< input transfer factor
Plants in bkgd water	Bq/g wet	apcb	6.73E-04	2.76E-03	4.80E-04	6.60E-03	8.00E-03		
Plants in impacted water	Bq/g wet	apc	4.66E-04	4.11E-03	6.51E-04	9.55E-03	1.38E-02		
Benthic Invertebrates									
Water-to-benthos bioco	m3/gwet	bcfbi	7.13E-04	5.95E-05	9.70E-04	2.20E-04	1.52E-03		<<<< input transfer factor
Benthos in bkgd water	Bq/g wet	bicb	8.77E-03	3.57E-04	3.88E-03	2.42E-03	7.60E-03		
Benthos in impacted water	Bq/g wet	bic	6.07E-03	5.32E-04	5.26E-03	3.50E-03	1.31E-02		
Absorbed Doses - Fish									
Internal Dose Factor	mGy/d per Bq	Idcff	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadfb	8.38E-07	1.42E-05	5.91E-05	5.64E-06	9.25E-05	1.7E-04	'=fcb*Idcff
Internal dose impacted	mGy/d	Iadf	5.80E-07	2.12E-05	8.02E-05	8.16E-06	1.60E-04	2.7E-04	'=fc*Idcff
Ext. dose factor	mGy/d per Bq	Edcff	8.57E-03	2.93E-05	3.68E-02	2.50E-03	1.40E-07		
Ext. dose bkgd pelagic	mGy/d	Eadfb	1.05E-07	1.76E-10	1.47E-07	2.75E-08	7.00E-13	2.8E-07	'=wcb*Edcff/1000000
Ext. dose impacted pelagic	mGy/d	Eadf	7.30E-08	2.62E-10	2.00E-07	3.98E-08	1.21E-12	3.1E-07	'=wc*Edcff/1000000
Ext. dose bkgd benthic	mGy/d	Eadfbenb	1.42E-04	5.86E-07	7.36E-04	1.25E-04	7.00E-09	1.0E-03	'=Edcff*(wcb/1000000+sedwcb)/2
Ext. dose impacted benthic	mGy/d	Eadfben	1.48E-04	6.36E-07	8.98E-04	1.40E-04	7.59E-09	1.2E-03	'=Edcff*(wc/1000000+sedwc)/2
Total dose - pelagic bkgd	mGy/d	Tadfbp	9.44E-07	1.42E-05	5.93E-05	5.67E-06	9.25E-05	1.7E-04	'=Iadfb+Eadfb
- pelagic impact	mGy/d	Tadfp	6.53E-07	2.12E-05	8.04E-05	8.20E-06	1.60E-04	2.7E-04	'=Iadf+Eadf
Total dose - benthic bkgd	mGy/d	Tadfbenb	1.43E-04	1.48E-05	7.95E-04	1.31E-04	9.25E-05	1.2E-03	'=Iadfb+Eadfbenb
- benthic impact	mGy/d	Tadfben	1.49E-04	2.18E-05	9.78E-04	1.48E-04	1.60E-04	1.5E-03	'=Iadf+Eadfben

Table H.1-1

Aquatic Dose Calculations

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Absorbed Doses - Aquatic Plants									
Internal Dose Factor	mGy/d per Bq	Idcfap	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadapb	9.55E-05	1.82E-04	7.63E-05	3.98E-05	5.92E-04	9.9E-04	'=apcb*Idcfap
Internal dose impacted	mGy/d	Iadap	6.61E-05	2.70E-04	1.04E-04	5.76E-05	1.02E-03	1.5E-03	'=apc*Idcfap
Ext. dose factor aq plan	mGy/d per Bq	Edcfap	1.29E-02	2.25E-04	3.67E-02	6.03E-03	1.10E-07		
Ext. dose to leaf bkgd	mGy/d	Eadpwb	1.59E-07	1.35E-09	1.47E-07	6.63E-08	5.50E-13	3.7E-07	'=wcb*Edcfap/1000000
Ext. dose to leaf impact	mGy/d	Eadpw	1.10E-07	2.01E-09	1.99E-07	9.60E-08	9.50E-13	4.1E-07	'=wc*Edcfap/1000000
Ext. dose to root bkgd	mGy/d	Eadpsb	4.28E-04	9.00E-06	1.47E-03	6.03E-04	1.10E-08	2.5E-03	'=sedwcb*Edcfap
Ext. dose to root impact	mGy/d	Eadps	4.47E-04	9.77E-06	1.79E-03	6.75E-04	1.19E-08	2.9E-03	'=sedwc*Edcfap
Total dose - leaf bkgd	mGy/d	Tadaplb	9.57E-05	1.82E-04	7.65E-05	3.99E-05	5.92E-04	9.9E-04	'=Iadapb+Eadpwb
- leaf impacted	mGy/d	Tadapl	6.62E-05	2.70E-04	1.04E-04	5.77E-05	1.02E-03	1.5E-03	'=Iadap+Eadpw
Total dose - root bkgd	mGy/d	Tadaprb	5.24E-04	1.91E-04	1.54E-03	6.43E-04	5.92E-04	3.5E-03	'=Iadapb+Eadpsb
- root impacted	mGy/d	Tadapr	5.13E-04	2.80E-04	1.89E-03	7.33E-04	1.02E-03	4.4E-03	'=Iadap+Eadps
Absorbed Doses - Benthic Invertebrates									
Internal Dose Factor	mGy/d per Bq	Idcfbi	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadbib	1.25E-03	2.35E-05	6.17E-04	1.46E-05	5.62E-04	2.5E-03	'=bicb*Idcfbi
Internal dose impacted	mGy/d	Iadbi	8.62E-04	3.50E-05	8.37E-04	2.11E-05	9.71E-04	2.7E-03	'=bic*Idcfbi
Ext. dose factor ben inv	mGy/d per Bq	Edcfbi	1.29E-02	2.25E-04	3.67E-02	6.03E-03	1.10E-07		
Ext. dose bkgd sedimer	mGy/d	Eadbenb	4.28E-04	9.00E-06	1.47E-03	6.03E-04	1.10E-08	2.5E-03	'=sedwcb*Edcfbi
Ext. dose impacted sedi	mGy/d	Eadben	4.47E-04	9.77E-06	1.79E-03	6.75E-04	1.19E-08	2.9E-03	'=sedwc*Edcfbi
Total dose - bkgd	mGy/d	Tadbenb	1.67E-03	3.25E-05	2.08E-03	6.18E-04	5.62E-04	5.0E-03	'=Iadbib+Eadbenb
Total dose - impacted	mGy/d	Tadben	1.31E-03	4.48E-05	2.63E-03	6.97E-04	9.71E-04	5.6E-03	'=Iadbi+Eadben
Equivalent Doses - Fish									
RBE for alpha	Sv/Gy	RBEf	10						
Total dose - pelagic bkg	mSv/d	Tedfpb	8.49E-06	1.42E-04	5.92E-04	5.67E-06	9.25E-04	1.7E-03	'=Iadfb*RBEf+Eadfb
- pelagic impact	mSv/d	Tedfp	5.88E-06	2.12E-04	8.03E-04	8.16E-05	1.60E-03	2.7E-03	'=Iadf*RBEf+Eadf
Total dose - benthic bkg	mSv/d	Tedfbenb	1.51E-04	1.43E-04	1.33E-03	1.31E-04	9.25E-04	2.7E-03	'=Iadfb*RBEf+Eadfbenb
- benthic impact	mSv/d	Tedfben	1.54E-04	2.12E-04	1.70E-03	2.22E-04	1.60E-03	3.9E-03	'=Iadf*RBEf+Eadfben
Equivalent Doses - Aquatic Plants									
RBE for alpha	Sv/Gy	RBEap	10						
Total dose - leaf bkgd	mSv/d	Tedaplb	9.56E-04	1.82E-03	7.63E-04	3.99E-05	5.92E-03	9.5E-03	'=Iadapb*RBEap+Eadpwb
- leaf impacted	mSv/d	Tedapl	6.61E-04	2.70E-03	1.04E-03	5.76E-04	1.02E-02	1.5E-02	'=Iadap*RBEap+Eadpw
Total dose - root bkgd	mSv/d	Tedaprb	1.38E-03	1.83E-03	2.23E-03	6.43E-04	5.92E-03	1.2E-02	'=Iadapb*RBEap+Eadpsb
- root impacted	mSv/d	Tedapr	1.11E-03	2.71E-03	2.83E-03	1.25E-03	1.02E-02	1.8E-02	'=Iadap*RBEap+Eadps

Table H.1-1

Aquatic Dose Calculations

Equivalent Doses - Benthic Invertebrates

RBE for alpha	Sv/Gy	RBEbi	10							
Total dose - bkgd	mSv/d	Tedbenb	1.29E-02	2.44E-04	7.64E-03	6.18E-04	5.62E-03	2.7E-02		'=Iadbib*RBEbi+Eadbenb
Total dose - impacted	mSv/d	Tedben	9.07E-03	3.60E-04	1.02E-02	8.87E-04	9.71E-03	3.0E-02		'=Iadbi*RBEbi+Eadben

0.6 Screening Criterion in mGy/d	3 6	Total Absorbed Dose mGy/d	Total Equivalent Dose mSv/d	Index (Absorbed Equivalent Dose)	Index (Absorbed Equivalent Dose)
Pelagic Fish - Background		1.7E-04	1.7E-03	2.9E-04	2.8E-03
Pelagic Fish - Impacted		2.7E-04	2.7E-03	4.5E-04	4.5E-03
Benthic Fish - Background		1.2E-03	2.7E-03	2.0E-03	4.5E-03
Benthic Fish - Impacted		1.5E-03	3.9E-03	2.4E-03	6.5E-03
Aquatic Plant Leaves - Background		9.9E-04	9.5E-03	3.3E-04	3.2E-03
Aquatic Plant Leaves - Impacted		1.5E-03	1.5E-02	5.1E-04	5.1E-03
Aquatic Plant Roots - Background		3.5E-03	1.2E-02	1.2E-03	4.0E-03
Aquatic Plant Roots - Impacted		4.4E-03	1.8E-02	1.5E-03	6.0E-03
Benthic Invertebrates - Background		5.0E-03	2.7E-02	8.3E-04	4.5E-03
Benthic Invertebrates - Impacted		5.6E-03	3.0E-02	9.4E-04	5.0E-03

U-238+	Internal	U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235
	External	U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235 (beta + gamma only)
Ra-226+	Internal	Ra-226 + 0.3* (Rn-222 + ...Po-214)
	External	Ra-226 + 1.0* (Rn-222 + ...Po-214) (beta + gamma only)
Th-232+	Internal	Th-232 + ...Po-212/Tl-208 (Th-232 + Th-228 are inputs)
	External	Th-232 + Po-212/Tl-208
Ra-228+	Internal	Ra-228 + ...Po-212/Tl-208

Table H.1-1
Aquatic Dose Calculations

JSL-4

Determination of Aquatic Dose - 95th Percentile, RBE 10

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Water									
Background	Bq/m3	wcb	12.30	6.00	4.00	11.00	5.00		
Impacted water body	Bq/m3	wc	19.93	11.1	5.9	17.3	12.2		<<<< input concentrations in water
Sediment									
Background	Bq/g(wet)	sedwcb	3.32E-02	4.00E-02	4.00E-02	1.00E-01	1.00E-01		
Impacted water body	Bq/g(wet)	sedwc	3.59E-02	4.75E-02	5.58E-02	1.22E-01	1.16E-01		<<<< input concentrations in sediment
Fish									
Water-to-fish biocon fa	m3/gwet	bcff	4.80E-07	3.60E-05	9.30E-05	8.50E-05	2.50E-04		<<<< input transfer factor
Fish in bkgd water	Bq/g wet	fc	5.90E-06	2.16E-04	3.72E-04	9.35E-04	1.25E-03		
Fish in impacted water	Bq/g wet	fc	9.57E-06	4.01E-04	5.50E-04	1.47E-03	3.05E-03		
Aquatic Plants									
Water-to-plants biocon	m3/gwet	bcfb	5.47E-05	4.6E-04	1.2E-04	6.0E-04	1.6E-03		<<<< input transfer factor
Plants in bkgd water	Bq/g wet	apcb	6.73E-04	2.76E-03	4.80E-04	6.60E-03	8.00E-03		
Plants in impacted water	Bq/g wet	apc	1.09E-03	5.12E-03	7.10E-04	1.04E-02	1.95E-02		
Benthic Invertebrates									
Water-to-benthos biocon	m3/gwet	bcfbi	7.13E-04	5.95E-05	9.70E-04	2.20E-04	1.52E-03		<<<< input transfer factor
Benthos in bkgd water	Bq/g wet	bicb	8.77E-03	3.57E-04	3.88E-03	2.42E-03	7.60E-03		
Benthos in impacted water	Bq/g wet	bic	1.42E-02	6.63E-04	5.74E-03	3.80E-03	1.85E-02		
Absorbed Doses - Fish									
Internal Dose Factor	mGy/d per Bq	Idcff	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadfb	8.38E-07	1.42E-05	5.91E-05	5.64E-06	9.25E-05	1.7E-04	'=fcb*Idcff
Internal dose impacted	mGy/d	Iadf	1.36E-06	2.64E-05	8.75E-05	8.85E-06	2.26E-04	3.5E-04	'=fc*Idcff
Ext. dose factor	mGy/d per Bq	Edcff	8.57E-03	2.93E-05	3.68E-02	2.50E-03	1.40E-07		
Ext. dose bkgd pelagic	mGy/d	Eadfb	1.05E-07	1.76E-10	1.47E-07	2.75E-08	7.00E-13	2.8E-07	'=wcb*Edcff/1000000
Ext. dose impacted pelagic	mGy/d	Eadf	1.71E-07	3.26E-10	2.18E-07	4.31E-08	1.71E-12	4.3E-07	'=wc*Edcff/1000000
Ext. dose bkgd benthic	mGy/d	Eadfbenb	1.42E-04	5.86E-07	7.36E-04	1.25E-04	7.00E-09	1.0E-03	'=Edcff*(wcb/1000000+sedwcb)/2
Ext. dose impacted benthic	mGy/d	Eadfben	1.54E-04	6.96E-07	1.03E-03	1.52E-04	8.14E-09	1.3E-03	'=Edcff*(wc/1000000+sedwc)/2
Total dose - pelagic bkgd	mGy/d	Tadfbp	9.44E-07	1.42E-05	5.93E-05	5.67E-06	9.25E-05	1.7E-04	'=Iadfb+Eadfb
- pelagic impact	mGy/d	Tadfp	1.53E-06	2.64E-05	8.77E-05	8.89E-06	2.26E-04	3.5E-04	'=Iadf+Eadf
Total dose - benthic bkgd	mGy/d	Tadfbenb	1.43E-04	1.48E-05	7.95E-04	1.31E-04	9.25E-05	1.2E-03	'=Iadfb+Eadfbenb
- benthic impact	mGy/d	Tadfben	1.55E-04	2.71E-05	1.12E-03	1.61E-04	2.26E-04	1.7E-03	'=Iadf+Eadfben

Table H.1-1

Aquatic Dose Calculations

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Absorbed Doses - Aquatic Plants									
Internal Dose Factor	mGy/d per Bq	Idcfap	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadapb	9.55E-05	1.82E-04	7.63E-05	3.98E-05	5.92E-04	9.9E-04	'=apcb*Idcfap
Internal dose impacted	mGy/d	Iadap	1.55E-04	3.37E-04	1.13E-04	6.24E-05	1.44E-03	2.1E-03	'=apc*Idcfap
Ext. dose factor aq plan	mGy/d per Bq	Edcfap	1.29E-02	2.25E-04	3.67E-02	6.03E-03	1.10E-07		
Ext. dose to leaf bkgd	mGy/d	Eadpwb	1.59E-07	1.35E-09	1.47E-07	6.63E-08	5.50E-13	3.7E-07	'=wcb*Edcfap/1000000
Ext. dose to leaf impact	mGy/d	Eadpw	2.57E-07	2.51E-09	2.17E-07	1.04E-07	1.34E-12	5.8E-07	'=wc*Edcfap/1000000
Ext. dose to root bkgd	mGy/d	Eadpsb	4.28E-04	9.00E-06	1.47E-03	6.03E-04	1.10E-08	2.5E-03	'=sedwcb*Edcfap
Ext. dose to root impact	mGy/d	Eadps	4.64E-04	1.07E-05	2.05E-03	7.34E-04	1.28E-08	3.3E-03	'=sedwc*Edcfap
Total dose - leaf bkgd	mGy/d	Tadaplb	9.57E-05	1.82E-04	7.65E-05	3.99E-05	5.92E-04	9.9E-04	'=Iadapb+Eadpwb
- leaf impacted	mGy/d	Tadapl	1.55E-04	3.37E-04	1.13E-04	6.25E-05	1.44E-03	2.1E-03	'=Iadap+Eadpw
Total dose - root bkgd	mGy/d	Tadaprb	5.24E-04	1.91E-04	1.54E-03	6.43E-04	5.92E-04	3.5E-03	'=Iadapb+Eadpsb
- root impacted	mGy/d	Tadapr	6.18E-04	3.48E-04	2.16E-03	7.96E-04	1.44E-03	5.4E-03	'=Iadap+Eadps
Absorbed Doses - Benthic Invertebrates									
Internal Dose Factor	mGy/d per Bq	Idcfbi	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadbib	1.25E-03	2.35E-05	6.17E-04	1.46E-05	5.62E-04	2.5E-03	'=bicb*Idcfbi
Internal dose impacted	mGy/d	Iadbi	2.02E-03	4.36E-05	9.13E-04	2.29E-05	1.37E-03	4.4E-03	'=bic*Idcfbi
Ext. dose factor ben inv	mGy/d per Bq	Edcfbi	1.29E-02	2.25E-04	3.67E-02	6.03E-03	1.10E-07		
Ext. dose bkgd sedimer	mGy/d	Eadbenb	4.28E-04	9.00E-06	1.47E-03	6.03E-04	1.10E-08	2.5E-03	'=sedwcb*Edcfbi
Ext. dose impacted sedi	mGy/d	Eadben	4.64E-04	1.07E-05	2.05E-03	7.34E-04	1.28E-08	3.3E-03	'=sedwc*Edcfbi
Total dose - bkgd	mGy/d	Tadbenb	1.67E-03	3.25E-05	2.08E-03	6.18E-04	5.62E-04	5.0E-03	'=Iadbib+Eadbenb
Total dose - impacted	mGy/d	Tadben	2.48E-03	5.43E-05	2.96E-03	7.56E-04	1.37E-03	7.6E-03	'=Iadbi+Eadben
Equivalent Doses - Fish									
RBE for alpha	Sv/Gy	RBEf	10						
Total dose - pelagic bkg	mSv/d	Tedfpb	8.49E-06	1.42E-04	5.92E-04	5.67E-06	9.25E-04	1.7E-03	'=Iadfb*RBEf+Eadfb
- pelagic impact	mSv/d	Tedfp	1.38E-05	2.64E-04	8.75E-04	8.89E-06	2.26E-03	3.4E-03	'=Iadf*RBEf+Eadf
Total dose - benthic bkg	mSv/d	Tedfbenb	1.51E-04	1.43E-04	1.33E-03	1.31E-04	9.25E-04	2.7E-03	'=Iadfb*RBEf+Eadfbenb
- benthic impact	mSv/d	Tedfben	1.68E-04	2.65E-04	1.90E-03	1.61E-04	2.26E-03	4.8E-03	'=Iadf*RBEf+Eadfben
Equivalent Doses - Aquatic Plants									
RBE for alpha	Sv/Gy	RBEap	10						
Total dose - leaf bkgd	mSv/d	Tedaplb	9.56E-04	1.82E-03	7.63E-04	3.99E-05	5.92E-03	9.5E-03	'=Iadapb*RBEap+Eadpwb
- leaf impacted	mSv/d	Tedapl	1.55E-03	3.37E-03	1.13E-03	6.25E-05	1.44E-02	2.1E-02	'=Iadap*RBEap+Eadpw
Total dose - root bkgd	mSv/d	Tedaprb	1.38E-03	1.83E-03	2.23E-03	6.43E-04	5.92E-03	1.2E-02	'=Iadapb*RBEap+Eadpsb
- root impacted	mSv/d	Tedapr	2.01E-03	3.38E-03	3.18E-03	7.96E-04	1.44E-02	2.4E-02	'=Iadap*RBEap+Eadps

Table H.1-1

Aquatic Dose Calculations

Equivalent Doses - Benthic Invertebrates

RBE for alpha	Sv/Gy	RBEbi	10							
Total dose - bkgd	mSv/d	Tedbenb	1.29E-02	2.44E-04	7.64E-03	6.18E-04	5.62E-03	2.7E-02		'=Iadbib*RBEbi+Eadbenb
Total dose - impacted	mSv/d	Tedben	2.06E-02	4.47E-04	1.12E-02	7.56E-04	1.37E-02	4.7E-02		'=Iadbi*RBEbi+Eadben

0.6 Screening Criterion in mGy/d	3 6	Total Absorbed Dose mGy/d	Total Equivalent Dose mSv/d	Index (Absorbed Equivalent Dose)	Index (Absorbed Equivalent Dose)
Pelagic Fish - Background		1.7E-04	1.7E-03	2.9E-04	2.8E-03
Pelagic Fish - Impacted		3.5E-04	3.4E-03	5.8E-04	5.7E-03
Benthic Fish - Background		1.2E-03	2.7E-03	2.0E-03	4.5E-03
Benthic Fish - Impacted		1.7E-03	4.8E-03	2.8E-03	7.9E-03
Aquatic Plant Leaves - Background		9.9E-04	9.5E-03	3.3E-04	3.2E-03
Aquatic Plant Leaves - Impacted		2.1E-03	2.1E-02	7.0E-04	6.8E-03
Aquatic Plant Roots - Background		3.5E-03	1.2E-02	1.2E-03	4.0E-03
Aquatic Plant Roots - Impacted		5.4E-03	2.4E-02	1.8E-03	7.9E-03
Benthic Invertebrates - Background		5.0E-03	2.7E-02	8.3E-04	4.5E-03
Benthic Invertebrates - Impacted		7.6E-03	4.7E-02	1.3E-03	7.8E-03

U-238+	Internal	U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235
	External	U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235 (beta + gamma only)
Ra-226+	Internal	Ra-226 + 0.3* (Rn-222 + ...Po-214)
	External	Ra-226 + 1.0* (Rn-222 + ...Po-214) (beta + gamma only)
Th-232+	Internal	Th-232 + ...Po-212/Tl-208 (Th-232 + Th-228 are inputs)
	External	Th-232 + Po-212/Tl-208
Ra-228+	Internal	Ra-228 + ...Po-212/Tl-208

Table H.1-1
Aquatic Dose Calculations

JSL-4

Determination of Aquatic Dose - Average, RBE 40

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Water									
Background	Bq/m3	wcb	12.30	6.00	4.00	11.00	5.00		
Impacted water body	Bq/m3	wc	8.51	8.9	5.4	15.9	8.6		<<<< input concentrations in water
Sediment									
Background	Bq/g(wet)	sedwcb	3.32E-02	4.00E-02	4.00E-02	1.00E-01	1.00E-01		
Impacted water body	Bq/g(wet)	sedwc	3.46E-02	4.34E-02	4.88E-02	1.12E-01	1.08E-01		<<<< input concentrations in sediment
Fish									
Water-to-fish biocon fa	m3/gwet	bcff	4.80E-07	3.60E-05	9.30E-05	8.50E-05	2.50E-04		<<<< input transfer factor
Fish in bkgd water	Bq/g wet	fc	5.90E-06	2.16E-04	3.72E-04	9.35E-04	1.25E-03		
Fish in impacted water	Bq/g wet	fc	4.09E-06	3.22E-04	5.05E-04	1.35E-03	2.16E-03		
Aquatic Plants									
Water-to-plants biocon	m3/gwet	bcfb	5.47E-05	4.6E-04	1.2E-04	6.0E-04	1.6E-03		<<<< input transfer factor
Plants in bkgd water	Bq/g wet	apcb	6.73E-04	2.76E-03	4.80E-04	6.60E-03	8.00E-03		
Plants in impacted water	Bq/g wet	apc	4.66E-04	4.11E-03	6.51E-04	9.55E-03	1.38E-02		
Benthic Invertebrates									
Water-to-benthos bioco	m3/gwet	bcfbi	7.13E-04	5.95E-05	9.70E-04	2.20E-04	1.52E-03		<<<< input transfer factor
Benthos in bkgd water	Bq/g wet	bicb	8.77E-03	3.57E-04	3.88E-03	2.42E-03	7.60E-03		
Benthos in impacted water	Bq/g wet	bic	6.07E-03	5.32E-04	5.26E-03	3.50E-03	1.31E-02		
Absorbed Doses - Fish									
Internal Dose Factor	mGy/d per Bq	Idcff	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadfb	8.38E-07	1.42E-05	5.91E-05	5.64E-06	9.25E-05	1.7E-04	'=fcb*Idcff
Internal dose impacted	mGy/d	Iadf	5.80E-07	2.12E-05	8.02E-05	8.16E-06	1.60E-04	2.7E-04	'=fc*Idcff
Ext. dose factor	mGy/d per Bq	Edcff	8.57E-03	2.93E-05	3.68E-02	2.50E-03	1.40E-07		
Ext. dose bkgd pelagic	mGy/d	Eadfb	1.05E-07	1.76E-10	1.47E-07	2.75E-08	7.00E-13	2.8E-07	'=wcb*Edcff/1000000
Ext. dose impacted pelagic	mGy/d	Eadf	7.30E-08	2.62E-10	2.00E-07	3.98E-08	1.21E-12	3.1E-07	'=wc*Edcff/1000000
Ext. dose bkgd benthic	mGy/d	Eadfbenb	1.42E-04	5.86E-07	7.36E-04	1.25E-04	7.00E-09	1.0E-03	'=Edcff*(wcb/1000000+sedwcb)/2
Ext. dose impacted benthic	mGy/d	Eadfben	1.48E-04	6.36E-07	8.98E-04	1.40E-04	7.59E-09	1.2E-03	'=Edcff*(wc/1000000+sedwc)/2
Total dose - pelagic bkgd	mGy/d	Tadfb	9.44E-07	1.42E-05	5.93E-05	5.67E-06	9.25E-05	1.7E-04	'=Iadfb+Eadfb
- pelagic impact	mGy/d	Tadfp	6.53E-07	2.12E-05	8.04E-05	8.20E-06	1.60E-04	2.7E-04	'=Iadf+Eadf
Total dose - benthic bkgd	mGy/d	Tadfbenb	1.43E-04	1.48E-05	7.95E-04	1.31E-04	9.25E-05	1.2E-03	'=Iadfb+Eadfbenb
- benthic impact	mGy/d	Tadfben	1.49E-04	2.18E-05	9.78E-04	1.48E-04	1.60E-04	1.5E-03	'=Iadf+Eadfben

Table H.1-1

Aquatic Dose Calculations

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Absorbed Doses - Aquatic Plants									
Internal Dose Factor	mGy/d per Bq	Idcfap	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadapb	9.55E-05	1.82E-04	7.63E-05	3.98E-05	5.92E-04	9.9E-04	'=apcb*Idcfap
Internal dose impacted	mGy/d	Iadap	6.61E-05	2.70E-04	1.04E-04	5.76E-05	1.02E-03	1.5E-03	'=apc*Idcfap
Ext. dose factor aq plan	mGy/d per Bq	Edcfap	1.29E-02	2.25E-04	3.67E-02	6.03E-03	1.10E-07		
Ext. dose to leaf bkgd	mGy/d	Eadpwb	1.59E-07	1.35E-09	1.47E-07	6.63E-08	5.50E-13	3.7E-07	'=wcb*Edcfap/1000000
Ext. dose to leaf impact	mGy/d	Eadpw	1.10E-07	2.01E-09	1.99E-07	9.60E-08	9.50E-13	4.1E-07	'=wc*Edcfap/1000000
Ext. dose to root bkgd	mGy/d	Eadpsb	4.28E-04	9.00E-06	1.47E-03	6.03E-04	1.10E-08	2.5E-03	'=sedwcb*Edcfap
Ext. dose to root impact	mGy/d	Eadps	4.47E-04	9.77E-06	1.79E-03	6.75E-04	1.19E-08	2.9E-03	'=sedwc*Edcfap
Total dose - leaf bkgd	mGy/d	Tadaplb	9.57E-05	1.82E-04	7.65E-05	3.99E-05	5.92E-04	9.9E-04	'=Iadapb+Eadpwb
- leaf impacted	mGy/d	Tadapl	6.62E-05	2.70E-04	1.04E-04	5.77E-05	1.02E-03	1.5E-03	'=Iadap+Eadpw
Total dose - root bkgd	mGy/d	Tadaprb	5.24E-04	1.91E-04	1.54E-03	6.43E-04	5.92E-04	3.5E-03	'=Iadapb+Eadpsb
- root impacted	mGy/d	Tadapr	5.13E-04	2.80E-04	1.89E-03	7.33E-04	1.02E-03	4.4E-03	'=Iadap+Eadps
Absorbed Doses - Benthic Invertebrates									
Internal Dose Factor	mGy/d per Bq	Idcfbi	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadbib	1.25E-03	2.35E-05	6.17E-04	1.46E-05	5.62E-04	2.5E-03	'=bicb*Idcfbi
Internal dose impacted	mGy/d	Iadbi	8.62E-04	3.50E-05	8.37E-04	2.11E-05	9.71E-04	2.7E-03	'=bic*Idcfbi
Ext. dose factor ben inv	mGy/d per Bq	Edcfbi	1.29E-02	2.25E-04	3.67E-02	6.03E-03	1.10E-07		
Ext. dose bkgd sedimer	mGy/d	Eadbenb	4.28E-04	9.00E-06	1.47E-03	6.03E-04	1.10E-08	2.5E-03	'=sedwcb*Edcfbi
Ext. dose impacted sedi	mGy/d	Eadben	4.47E-04	9.77E-06	1.79E-03	6.75E-04	1.19E-08	2.9E-03	'=sedwc*Edcfbi
Total dose - bkgd	mGy/d	Tadbenb	1.67E-03	3.25E-05	2.08E-03	6.18E-04	5.62E-04	5.0E-03	'=Iadbib+Eadbenb
Total dose - impacted	mGy/d	Tadben	1.31E-03	4.48E-05	2.63E-03	6.97E-04	9.71E-04	5.6E-03	'=Iadbi+Eadben
Equivalent Doses - Fish									
RBE for alpha	Sv/Gy	RBEf	40						
Total dose - pelagic bkg	mSv/d	Tedfpb	3.36E-05	5.69E-04	2.37E-03	5.67E-06	3.70E-03	6.7E-03	'=Iadfb*RBEf+Eadfb
- pelagic impact	mSv/d	Tedfp	2.33E-05	8.47E-04	3.21E-03	3.26E-04	6.39E-03	1.1E-02	'=Iadf*RBEf+Eadf
Total dose - benthic bkg	mSv/d	Tedfbenb	1.76E-04	5.69E-04	3.10E-03	1.31E-04	3.70E-03	7.7E-03	'=Iadfb*RBEf+Eadfbenb
- benthic impact	mSv/d	Tedfben	1.72E-04	8.47E-04	4.11E-03	4.66E-04	6.39E-03	1.2E-02	'=Iadf*RBEf+Eadfben
Equivalent Doses - Aquatic Plants									
RBE for alpha	Sv/Gy	RBEap	40						
Total dose - leaf bkgd	mSv/d	Tedaplb	3.82E-03	7.26E-03	3.05E-03	3.99E-05	2.37E-02	3.8E-02	'=Iadapb*RBEap+Eadpwb
- leaf impacted	mSv/d	Tedapl	2.65E-03	1.08E-02	4.14E-03	2.30E-03	4.09E-02	6.1E-02	'=Iadap*RBEap+Eadpw
Total dose - root bkgd	mSv/d	Tedaprb	4.25E-03	7.27E-03	4.52E-03	6.43E-04	2.37E-02	4.0E-02	'=Iadapb*RBEap+Eadpsb
- root impacted	mSv/d	Tedapr	3.09E-03	1.08E-02	5.93E-03	2.98E-03	4.09E-02	6.4E-02	'=Iadap*RBEap+Eadps

Table H.1-1

Aquatic Dose Calculations

Equivalent Doses - Benthic Invertebrates

RBE for alpha	Sv/Gy	RBEbi	40							
Total dose - bkgd	mSv/d	Tedbenb	1.29E-02	2.44E-04	7.64E-03	6.18E-04	5.62E-03	2.7E-02		'=Iadbib*RBEbi+Eadbenb
Total dose - impacted	mSv/d	Tedben	3.49E-02	9.77E-06	1.79E-03	6.75E-04	1.19E-08	3.7E-02		'=Iadbi*RBEbi+Eadben

0.6 Screening Criterion in mGy/d	3 6	Total Absorbed Dose mGy/d	Total Equivalent Dose mSv/d	Index (Absorbed Equivalent Dose)	Index (Absorbed Equivalent Dose)
Pelagic Fish - Background		1.7E-04	6.7E-03	2.9E-04	1.1E-02
Pelagic Fish - Impacted		2.7E-04	1.1E-02	4.5E-04	1.8E-02
Benthic Fish - Background		1.2E-03	7.7E-03	2.0E-03	1.3E-02
Benthic Fish - Impacted		1.5E-03	1.2E-02	2.4E-03	2.0E-02
Aquatic Plant Leaves - Background		9.9E-04	3.8E-02	3.3E-04	1.3E-02
Aquatic Plant Leaves - Impacted		1.5E-03	6.1E-02	5.1E-04	2.0E-02
Aquatic Plant Roots - Background		3.5E-03	4.0E-02	1.2E-03	1.3E-02
Aquatic Plant Roots - Impacted		4.4E-03	6.4E-02	1.5E-03	2.1E-02
Benthic Invertebrates - Background		5.0E-03	2.7E-02	8.3E-04	4.5E-03
Benthic Invertebrates - Impacted		5.6E-03	3.7E-02	9.4E-04	6.2E-03

U-238+	Internal	U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235
	External	U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235 (beta + gamma only)
Ra-226+	Internal	Ra-226 + 0.3* (Rn-222 + ...Po-214)
	External	Ra-226 + 1.0* (Rn-222 + ...Po-214) (beta + gamma only)
Th-232+	Internal	Th-232 + ...Po-212/Tl-208 (Th-232 + Th-228 are inputs)
	External	Th-232 + Po-212/Tl-208
Ra-228+	Internal	Ra-228 + ...Po-212/Tl-208

Table H.1-1
Aquatic Dose Calculations

JSL-4

Determination of Aquatic Dose - 95th Percentile, RBE 40

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Water									
Background	Bq/m3	wcb	12.30	6.00	4.00	11.00	5.00		
Impacted water body	Bq/m3	wc	19.93	11.1	5.9	17.3	12.2		<<<< input concentrations in water
Sediment									
Background	Bq/g(wet)	sedwcb	3.32E-02	4.00E-02	4.00E-02	1.00E-01	1.00E-01		
Impacted water body	Bq/g(wet)	sedwc	3.59E-02	4.75E-02	5.58E-02	1.22E-01	1.16E-01		<<<< input concentrations in sediment
Fish									
Water-to-fish biocon fa	m3/gwet	bcff	4.80E-07	3.60E-05	9.30E-05	8.50E-05	2.50E-04		<<<< input transfer factor
Fish in bkgd water	Bq/g wet	fc	5.90E-06	2.16E-04	3.72E-04	9.35E-04	1.25E-03		
Fish in impacted water	Bq/g wet	fc	9.57E-06	4.01E-04	5.50E-04	1.47E-03	3.05E-03		
Aquatic Plants									
Water-to-plants biocon	m3/gwet	bcfb	5.47E-05	4.6E-04	1.2E-04	6.0E-04	1.6E-03		<<<< input transfer factor
Plants in bkgd water	Bq/g wet	apcb	6.73E-04	2.76E-03	4.80E-04	6.60E-03	8.00E-03		
Plants in impacted water	Bq/g wet	apc	1.09E-03	5.12E-03	7.10E-04	1.04E-02	1.95E-02		
Benthic Invertebrates									
Water-to-benthos biocon	m3/gwet	bcfbi	7.13E-04	5.95E-05	9.70E-04	2.20E-04	1.52E-03		<<<< input transfer factor
Benthos in bkgd water	Bq/g wet	bicb	8.77E-03	3.57E-04	3.88E-03	2.42E-03	7.60E-03		
Benthos in impacted water	Bq/g wet	bic	1.42E-02	6.63E-04	5.74E-03	3.80E-03	1.85E-02		
Absorbed Doses - Fish									
Internal Dose Factor	mGy/d per Bq	Idcff	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadfb	8.38E-07	1.42E-05	5.91E-05	5.64E-06	9.25E-05	1.7E-04	'=fcb*Idcff
Internal dose impacted	mGy/d	Iadf	1.36E-06	2.64E-05	8.75E-05	8.85E-06	2.26E-04	3.5E-04	'=fc*Idcff
Ext. dose factor	mGy/d per Bq	Edcff	8.57E-03	2.93E-05	3.68E-02	2.50E-03	1.40E-07		
Ext. dose bkgd pelagic	mGy/d	Eadfb	1.05E-07	1.76E-10	1.47E-07	2.75E-08	7.00E-13	2.8E-07	'=wcb*Edcff/1000000
Ext. dose impacted pelagic	mGy/d	Eadf	1.71E-07	3.26E-10	2.18E-07	4.31E-08	1.71E-12	4.3E-07	'=wc*Edcff/1000000
Ext. dose bkgd benthic	mGy/d	Eadfbenb	1.42E-04	5.86E-07	7.36E-04	1.25E-04	7.00E-09	1.0E-03	'=Edcff*(wcb/1000000+sedwcb)/2
Ext. dose impacted benthic	mGy/d	Eadfben	1.54E-04	6.96E-07	1.03E-03	1.52E-04	8.14E-09	1.3E-03	'=Edcff*(wc/1000000+sedwc)/2
Total dose - pelagic bkgd	mGy/d	Tadfb	9.44E-07	1.42E-05	5.93E-05	5.67E-06	9.25E-05	1.7E-04	'=Iadfb+Eadfb
- pelagic impact	mGy/d	Tadfp	1.53E-06	2.64E-05	8.77E-05	8.89E-06	2.26E-04	3.5E-04	'=Iadf+Eadf
Total dose - benthic bkgd	mGy/d	Tadfbenb	1.43E-04	1.48E-05	7.95E-04	1.31E-04	9.25E-05	1.2E-03	'=Iadfb+Eadfbenb
- benthic impact	mGy/d	Tadfben	1.55E-04	2.71E-05	1.12E-03	1.61E-04	2.26E-04	1.7E-03	'=Iadf+Eadfben

Table H.1-1

Aquatic Dose Calculations

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Absorbed Doses - Aquatic Plants									
Internal Dose Factor	mGy/d per Bq	Idcfap	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadapb	9.55E-05	1.82E-04	7.63E-05	3.98E-05	5.92E-04	9.9E-04	'=apcb*Idcfap
Internal dose impacted	mGy/d	Iadap	1.55E-04	3.37E-04	1.13E-04	6.24E-05	1.44E-03	2.1E-03	'=apc*Idcfap
Ext. dose factor aq plan	mGy/d per Bq	Edcfap	1.29E-02	2.25E-04	3.67E-02	6.03E-03	1.10E-07		
Ext. dose to leaf bkgd	mGy/d	Eadpwb	1.59E-07	1.35E-09	1.47E-07	6.63E-08	5.50E-13	3.7E-07	'=wcb*Edcfap/1000000
Ext. dose to leaf impact	mGy/d	Eadpw	2.57E-07	2.51E-09	2.17E-07	1.04E-07	1.34E-12	5.8E-07	'=wc*Edcfap/1000000
Ext. dose to root bkgd	mGy/d	Eadpsb	4.28E-04	9.00E-06	1.47E-03	6.03E-04	1.10E-08	2.5E-03	'=sedwcb*Edcfap
Ext. dose to root impact	mGy/d	Eadps	4.64E-04	1.07E-05	2.05E-03	7.34E-04	1.28E-08	3.3E-03	'=sedwc*Edcfap
Total dose - leaf bkgd	mGy/d	Tadaplb	9.57E-05	1.82E-04	7.65E-05	3.99E-05	5.92E-04	9.9E-04	'=Iadapb+Eadpwb
- leaf impacted	mGy/d	Tadapl	1.55E-04	3.37E-04	1.13E-04	6.25E-05	1.44E-03	2.1E-03	'=Iadap+Eadpw
Total dose - root bkgd	mGy/d	Tadaprb	5.24E-04	1.91E-04	1.54E-03	6.43E-04	5.92E-04	3.5E-03	'=Iadapb+Eadpsb
- root impacted	mGy/d	Tadapr	6.18E-04	3.48E-04	2.16E-03	7.96E-04	1.44E-03	5.4E-03	'=Iadap+Eadps
Absorbed Doses - Benthic Invertebrates									
Internal Dose Factor	mGy/d per Bq	Idcfbi	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadbib	1.25E-03	2.35E-05	6.17E-04	1.46E-05	5.62E-04	2.5E-03	'=bicb*Idcfbi
Internal dose impacted	mGy/d	Iadbi	2.02E-03	4.36E-05	9.13E-04	2.29E-05	1.37E-03	4.4E-03	'=bic*Idcfbi
Ext. dose factor ben inv	mGy/d per Bq	Edcfbi	1.29E-02	2.25E-04	3.67E-02	6.03E-03	1.10E-07		
Ext. dose bkgd sedimer	mGy/d	Eadbenb	4.28E-04	9.00E-06	1.47E-03	6.03E-04	1.10E-08	2.5E-03	'=sedwcb*Edcfbi
Ext. dose impacted sedi	mGy/d	Eadben	4.64E-04	1.07E-05	2.05E-03	7.34E-04	1.28E-08	3.3E-03	'=sedwc*Edcfbi
Total dose - bkgd	mGy/d	Tadbenb	1.67E-03	3.25E-05	2.08E-03	6.18E-04	5.62E-04	5.0E-03	'=Iadbib+Eadbenb
Total dose - impacted	mGy/d	Tadben	2.48E-03	5.43E-05	2.96E-03	7.56E-04	1.37E-03	7.6E-03	'=Iadbi+Eadben
Equivalent Doses - Fish									
RBE for alpha	Sv/Gy	RBEf	40						
Total dose - pelagic bkg	mSv/d	Tedfpb	3.36E-05	5.69E-04	2.37E-03	5.67E-06	3.70E-03	6.7E-03	'=Iadfb*RBEf+Eadfb
- pelagic impact	mSv/d	Tedfp	5.45E-05	1.06E-03	3.50E-03	8.89E-06	9.02E-03	1.4E-02	'=Iadf*RBEf+Eadf
Total dose - benthic bkg	mSv/d	Tedfbenb	1.76E-04	5.69E-04	3.10E-03	1.31E-04	3.70E-03	7.7E-03	'=Iadfb*RBEf+Eadfbenb
- benthic impact	mSv/d	Tedfben	2.08E-04	1.06E-03	4.53E-03	1.61E-04	9.02E-03	1.5E-02	'=Iadf*RBEf+Eadfben
Equivalent Doses - Aquatic Plants									
RBE for alpha	Sv/Gy	RBEap	40						
Total dose - leaf bkgd	mSv/d	Tedaplb	3.82E-03	7.26E-03	3.05E-03	3.99E-05	2.37E-02	3.8E-02	'=Iadapb*RBEap+Eadpwb
- leaf impacted	mSv/d	Tedapl	6.19E-03	1.35E-02	4.52E-03	6.25E-05	5.77E-02	8.2E-02	'=Iadap*RBEap+Eadpw
Total dose - root bkgd	mSv/d	Tedaprb	4.25E-03	7.27E-03	4.52E-03	6.43E-04	2.37E-02	4.0E-02	'=Iadapb*RBEap+Eadpsb
- root impacted	mSv/d	Tedapr	6.66E-03	1.35E-02	6.57E-03	7.96E-04	5.77E-02	8.5E-02	'=Iadap*RBEap+Eadps

Table H.1-1

Aquatic Dose Calculations

Equivalent Doses - Benthic Invertebrates

RBE for alpha	Sv/Gy	RBEbi	40							
Total dose - bkgd	mSv/d	Tedbenb	5.02E-02	9.49E-04	2.61E-02	6.18E-04	2.25E-02	1.0E-01		'=Iadbib*RBEbi+Eadbenb
Total dose - impacted	mSv/d	Tedben	8.12E-02	1.75E-03	3.86E-02	7.56E-04	5.48E-02	1.8E-01		'=Iadbi*RBEbi+Eadben

0.6 Screening Criterion in mGy/d	3 6	Total Absorbed Dose mGy/d	Total Equivalent Dose mSv/d	Index (Absorbed Equivalent Dose)	Index (Absorbed Equivalent Dose)
Pelagic Fish - Background		1.7E-04	6.7E-03	2.9E-04	1.1E-02
Pelagic Fish - Impacted		3.5E-04	1.4E-02	5.8E-04	2.3E-02
Benthic Fish - Background		1.2E-03	7.7E-03	2.0E-03	1.3E-02
Benthic Fish - Impacted		1.7E-03	1.5E-02	2.8E-03	2.5E-02
Aquatic Plant Leaves - Background		9.9E-04	3.8E-02	3.3E-04	1.3E-02
Aquatic Plant Leaves - Impacted		2.1E-03	8.2E-02	7.0E-04	2.7E-02
Aquatic Plant Roots - Background		3.5E-03	4.0E-02	1.2E-03	1.3E-02
Aquatic Plant Roots - Impacted		5.4E-03	8.5E-02	1.8E-03	2.8E-02
Benthic Invertebrates - Background		5.0E-03	1.0E-01	8.3E-04	1.7E-02
Benthic Invertebrates - Impacted		7.6E-03	1.8E-01	1.3E-03	3.0E-02

U-238+	Internal	U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235
	External	U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235 (beta + gamma only)
Ra-226+	Internal	Ra-226 + 0.3* (Rn-222 + ...Po-214)
	External	Ra-226 + 1.0* (Rn-222 + ...Po-214) (beta + gamma only)
Th-232+	Internal	Th-232 + ...Po-212/Tl-208 (Th-232 + Th-228 are inputs)
	External	Th-232 + Po-212/Tl-208
Ra-228+	Internal	Ra-228 + ...Po-212/Tl-208

Table H.1-1
Aquatic Dose Calculations

JSL-5 **Determination of Aquatic Dose - Average, RBE 10**

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Water									
Background	Bq/m3	wcb	12.30	6.00	4.00	11.00	5.00		
Impacted water body	Bq/m3	wc	7.83	9.5	5.9	17.1	8.8		<<<< input concentrations in water
Sediment									
Background	Bq/g(wet)	sedwcb	3.32E-02	4.00E-02	4.00E-02	1.00E-01	1.00E-01		
Impacted water body	Bq/g(wet)	sedwc	3.46E-02	4.35E-02	4.90E-02	1.12E-01	1.09E-01		<<<< input concentrations in sediment
Fish									
Water-to-fish biocon fa	m3/gwet	bcff	4.80E-07	3.60E-05	9.30E-05	8.50E-05	2.50E-04		<<<< input transfer factor
Fish in bkgd water	Bq/g wet	fc	5.90E-06	2.16E-04	3.72E-04	9.35E-04	1.25E-03		
Fish in impacted water	Bq/g wet	fc	3.76E-06	3.44E-04	5.52E-04	1.46E-03	2.21E-03		
Aquatic Plants									
Water-to-plants biocon	m3/gwet	bcfb	5.47E-05	4.6E-04	1.2E-04	6.0E-04	1.6E-03		<<<< input transfer factor
Plants in bkgd water	Bq/g wet	apcb	6.73E-04	2.76E-03	4.80E-04	6.60E-03	8.00E-03		
Plants in impacted water	Bq/g wet	apc	4.28E-04	4.39E-03	7.13E-04	1.03E-02	1.41E-02		
Benthic Invertebrates									
Water-to-benthos biocon	m3/gwet	bcfbi	7.13E-04	5.95E-05	9.70E-04	2.20E-04	1.52E-03		<<<< input transfer factor
Benthos in bkgd water	Bq/g wet	bicb	8.77E-03	3.57E-04	3.88E-03	2.42E-03	7.60E-03		
Benthos in impacted water	Bq/g wet	bic	5.58E-03	5.68E-04	5.76E-03	3.77E-03	1.34E-02		
Absorbed Doses - Fish									
Internal Dose Factor	mGy/d per Bq	Idcff	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadfb	8.38E-07	1.42E-05	5.91E-05	5.64E-06	9.25E-05	1.7E-04	'=fcb*Idcff
Internal dose impacted	mGy/d	Iadf	5.33E-07	2.26E-05	8.78E-05	8.78E-06	1.63E-04	2.8E-04	'=fc*Idcff
Ext. dose factor	mGy/d per Bq	Edcff	8.57E-03	2.93E-05	3.68E-02	2.50E-03	1.40E-07		
Ext. dose bkgd pelagic	mGy/d	Eadfb	1.05E-07	1.76E-10	1.47E-07	2.75E-08	7.00E-13	2.8E-07	'=wcb*Edcff/1000000
Ext. dose impacted pelagic	mGy/d	Eadf	6.71E-08	2.80E-10	2.19E-07	4.28E-08	1.24E-12	3.3E-07	'=wc*Edcff/1000000
Ext. dose bkgd benthic	mGy/d	Eadfbenb	1.42E-04	5.86E-07	7.36E-04	1.25E-04	7.00E-09	1.0E-03	'=Edcff*(wcb/1000000+sedwcb)/2
Ext. dose impacted benthic	mGy/d	Eadfben	1.48E-04	6.38E-07	9.03E-04	1.40E-04	7.61E-09	1.2E-03	'=Edcff*(wc/1000000+sedwc)/2
Total dose - pelagic bkgd	mGy/d	Tadfb	9.44E-07	1.42E-05	5.93E-05	5.67E-06	9.25E-05	1.7E-04	'=Iadfb+Eadfb
- pelagic impact	mGy/d	Tadfp	6.01E-07	2.26E-05	8.80E-05	8.83E-06	1.63E-04	2.8E-04	'=Iadf+Eadf
Total dose - benthic bkgd	mGy/d	Tadfbenb	1.43E-04	1.48E-05	7.95E-04	1.31E-04	9.25E-05	1.2E-03	'=Iadfb+Eadfbenb
- benthic impact	mGy/d	Tadfben	1.49E-04	2.33E-05	9.90E-04	1.49E-04	1.63E-04	1.5E-03	'=Iadf+Eadfben

Table H.1-1

Aquatic Dose Calculations

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Absorbed Doses - Aquatic Plants									
Internal Dose Factor	mGy/d per Bq	Idcfap	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadapb	9.55E-05	1.82E-04	7.63E-05	3.98E-05	5.92E-04	9.9E-04	'=apcb*Idcfap
Internal dose impacted	mGy/d	Iadap	6.08E-05	2.89E-04	1.13E-04	6.20E-05	1.05E-03	1.6E-03	'=apc*Idcfap
Ext. dose factor aq plan	mGy/d per Bq	Edcfap	1.29E-02	2.25E-04	3.67E-02	6.03E-03	1.10E-07		
Ext. dose to leaf bkgd	mGy/d	Eadpwb	1.59E-07	1.35E-09	1.47E-07	6.63E-08	5.50E-13	3.7E-07	'=wcb*Edcfap/1000000
Ext. dose to leaf impact	mGy/d	Eadpw	1.01E-07	2.15E-09	2.18E-07	1.03E-07	9.72E-13	4.2E-07	'=wc*Edcfap/1000000
Ext. dose to root bkgd	mGy/d	Eadpsb	4.28E-04	9.00E-06	1.47E-03	6.03E-04	1.10E-08	2.5E-03	'=sedwcb*Edcfap
Ext. dose to root impact	mGy/d	Eadps	4.46E-04	9.79E-06	1.80E-03	6.77E-04	1.20E-08	2.9E-03	'=sedwc*Edcfap
Total dose - leaf bkgd	mGy/d	Tadaplb	9.57E-05	1.82E-04	7.65E-05	3.99E-05	5.92E-04	9.9E-04	'=Iadapb+Eadpwb
- leaf impacted	mGy/d	Tadapl	6.09E-05	2.89E-04	1.14E-04	6.21E-05	1.05E-03	1.6E-03	'=Iadap+Eadpw
Total dose - root bkgd	mGy/d	Tadaprb	5.24E-04	1.91E-04	1.54E-03	6.43E-04	5.92E-04	3.5E-03	'=Iadapb+Eadpsb
- root impacted	mGy/d	Tadapr	5.07E-04	2.99E-04	1.91E-03	7.39E-04	1.05E-03	4.5E-03	'=Iadap+Eadps
Absorbed Doses - Benthic Invertebrates									
Internal Dose Factor	mGy/d per Bq	Idcfbi	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadbib	1.25E-03	2.35E-05	6.17E-04	1.46E-05	5.62E-04	2.5E-03	'=bicb*Idcfbi
Internal dose impacted	mGy/d	Iadbi	7.92E-04	3.74E-05	9.16E-04	2.27E-05	9.94E-04	2.8E-03	'=bic*Idcfbi
Ext. dose factor ben inv	mGy/d per Bq	Edcfbi	1.29E-02	2.25E-04	3.67E-02	6.03E-03	1.10E-07		
Ext. dose bkgd sedimer	mGy/d	Eadbenb	4.28E-04	9.00E-06	1.47E-03	6.03E-04	1.10E-08	2.5E-03	'=sedwcb*Edcfbi
Ext. dose impacted sedi	mGy/d	Eadben	4.46E-04	9.79E-06	1.80E-03	6.77E-04	1.20E-08	2.9E-03	'=sedwc*Edcfbi
Total dose - bkgd	mGy/d	Tadbenb	1.67E-03	3.25E-05	2.08E-03	6.18E-04	5.62E-04	5.0E-03	'=Iadbib+Eadbenb
Total dose - impacted	mGy/d	Tadben	1.24E-03	4.72E-05	2.72E-03	7.00E-04	9.94E-04	5.7E-03	'=Iadbi+Eadben
Equivalent Doses - Fish									
RBE for alpha	Sv/Gy	RBEf	10						
Total dose - pelagic bkg	mSv/d	Tedfpb	8.49E-06	1.42E-04	5.92E-04	5.67E-06	9.25E-04	1.7E-03	'=Iadfb*RBEf+Eadfb
- pelagic impact	mSv/d	Tedfp	5.40E-06	2.26E-04	8.79E-04	8.79E-05	1.63E-03	2.8E-03	'=Iadf*RBEf+Eadf
Total dose - benthic bkg	mSv/d	Tedfbenb	1.51E-04	1.43E-04	1.33E-03	1.31E-04	9.25E-04	2.7E-03	'=Iadfb*RBEf+Eadfbenb
- benthic impact	mSv/d	Tedfben	1.54E-04	2.27E-04	1.78E-03	2.28E-04	1.63E-03	4.0E-03	'=Iadf*RBEf+Eadfben
Equivalent Doses - Aquatic Plants									
RBE for alpha	Sv/Gy	RBEap	10						
Total dose - leaf bkgd	mSv/d	Tedaplb	9.56E-04	1.82E-03	7.63E-04	3.99E-05	5.92E-03	9.5E-03	'=Iadapb*RBEap+Eadpwb
- leaf impacted	mSv/d	Tedapl	6.08E-04	2.89E-03	1.13E-03	6.20E-04	1.05E-02	1.6E-02	'=Iadap*RBEap+Eadpw
Total dose - root bkgd	mSv/d	Tedaprb	1.38E-03	1.83E-03	2.23E-03	6.43E-04	5.92E-03	1.2E-02	'=Iadapb*RBEap+Eadpsb
- root impacted	mSv/d	Tedapr	1.05E-03	2.90E-03	2.93E-03	1.30E-03	1.05E-02	1.9E-02	'=Iadap*RBEap+Eadps

Table H.1-1

Aquatic Dose Calculations

Equivalent Doses - Benthic Invertebrates

RBE for alpha	Sv/Gy	RBEbi	10							
Total dose - bkgd	mSv/d	Tedbenb	1.29E-02	2.44E-04	7.64E-03	6.18E-04	5.62E-03	2.7E-02		'=Iadbib*RBEbi+Eadbenb
Total dose - impacted	mSv/d	Tedben	8.37E-03	3.84E-04	1.10E-02	9.05E-04	9.94E-03	3.1E-02		'=Iadbi*RBEbi+Eadben

0.6 Screening Criterion in mGy/d	3 6	Total Absorbed Dose mGy/d	Total Equivalent Dose mSv/d	Index (Absorbed Equivalent Dose)	Index (Absorbed Equivalent Dose)
Pelagic Fish - Background		1.7E-04	1.7E-03	2.9E-04	2.8E-03
Pelagic Fish - Impacted		2.8E-04	2.8E-03	4.7E-04	4.7E-03
Benthic Fish - Background		1.2E-03	2.7E-03	2.0E-03	4.5E-03
Benthic Fish - Impacted		1.5E-03	4.0E-03	2.5E-03	6.7E-03
Aquatic Plant Leaves - Background		9.9E-04	9.5E-03	3.3E-04	3.2E-03
Aquatic Plant Leaves - Impacted		1.6E-03	1.6E-02	5.2E-04	5.2E-03
Aquatic Plant Roots - Background		3.5E-03	1.2E-02	1.2E-03	4.0E-03
Aquatic Plant Roots - Impacted		4.5E-03	1.9E-02	1.5E-03	6.2E-03
Benthic Invertebrates - Background		5.0E-03	2.7E-02	8.3E-04	4.5E-03
Benthic Invertebrates - Impacted		5.7E-03	3.1E-02	9.5E-04	5.1E-03

U-238+	Internal	U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235
	External	U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235 (beta + gamma only)
Ra-226+	Internal	Ra-226 + 0.3* (Rn-222 + ...Po-214)
	External	Ra-226 + 1.0* (Rn-222 + ...Po-214) (beta + gamma only)
Th-232+	Internal	Th-232 + ...Po-212/Tl-208 (Th-232 + Th-228 are inputs)
	External	Th-232 + Po-212/Tl-208
Ra-228+	Internal	Ra-228 + ...Po-212/Tl-208

Table H.1-1
Aquatic Dose Calculations

JSL-5

Determination of Aquatic Dose - 95th Percentile, RBE 10

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Water									
Background	Bq/m3	wcb	12.30	6.00	4.00	11.00	5.00		
Impacted water body	Bq/m3	wc	18.17	11.5	6.5	18.5	12.1		<<<< input concentrations in water
Sediment									
Background	Bq/g(wet)	sedwcb	3.32E-02	4.00E-02	4.00E-02	1.00E-01	1.00E-01		
Impacted water body	Bq/g(wet)	sedwc	3.59E-02	4.77E-02	5.63E-02	1.22E-01	1.17E-01		<<<< input concentrations in sediment
Fish									
Water-to-fish biocon fa	m3/gwet	bcff	4.80E-07	3.60E-05	9.30E-05	8.50E-05	2.50E-04		<<<< input transfer factor
Fish in bkgd water	Bq/g wet	fc	5.90E-06	2.16E-04	3.72E-04	9.35E-04	1.25E-03		
Fish in impacted water	Bq/g wet	fc	8.72E-06	4.14E-04	6.00E-04	1.57E-03	3.03E-03		
Aquatic Plants									
Water-to-plants biocon m3/gwet		bcfb	5.47E-05	4.6E-04	1.2E-04	6.0E-04	1.6E-03		<<<< input transfer factor
Plants in bkgd water	Bq/g wet	apcb	6.73E-04	2.76E-03	4.80E-04	6.60E-03	8.00E-03		
Plants in impacted water	Bq/g wet	apc	9.94E-04	5.29E-03	7.75E-04	1.11E-02	1.94E-02		
Benthic Invertebrates									
Water-to-benthos biocon m3/gwet		bcfbi	7.13E-04	5.95E-05	9.70E-04	2.20E-04	1.52E-03		<<<< input transfer factor
Benthos in bkgd water	Bq/g wet	bicb	8.77E-03	3.57E-04	3.88E-03	2.42E-03	7.60E-03		
Benthos in impacted water	Bq/g wet	bic	1.30E-02	6.84E-04	6.26E-03	4.07E-03	1.84E-02		
Absorbed Doses - Fish									
Internal Dose Factor	mGy/d per Bq	Idc	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadfb	8.38E-07	1.42E-05	5.91E-05	5.64E-06	9.25E-05	1.7E-04	'=fcb*Idc
Internal dose impacted	mGy/d	Iadf	1.24E-06	2.72E-05	9.55E-05	9.49E-06	2.24E-04	3.6E-04	'=fc*Idc
Ext. dose factor	mGy/d per Bq	Edc	8.57E-03	2.93E-05	3.68E-02	2.50E-03	1.40E-07		
Ext. dose bkgd pelagic	mGy/d	Eadfb	1.05E-07	1.76E-10	1.47E-07	2.75E-08	7.00E-13	2.8E-07	'=wcb*Edc/1000000
Ext. dose impacted pelagic	mGy/d	Eadf	1.56E-07	3.37E-10	2.38E-07	4.63E-08	1.69E-12	4.4E-07	'=wc*Edc/1000000
Ext. dose bkgd benthic	mGy/d	Eadfbenb	1.42E-04	5.86E-07	7.36E-04	1.25E-04	7.00E-09	1.0E-03	'=Edc*((wcb/1000000+sedwcb)/2
Ext. dose impacted benthic	mGy/d	Eadfben	1.54E-04	6.99E-07	1.04E-03	1.53E-04	8.18E-09	1.3E-03	'=Edc*((wc/1000000+sedwc)/2
Total dose - pelagic bkgd	mGy/d	Tadfbp	9.44E-07	1.42E-05	5.93E-05	5.67E-06	9.25E-05	1.7E-04	'=Iadfb+Eadfb
- pelagic impact	mGy/d	Tadfp	1.39E-06	2.72E-05	9.57E-05	9.53E-06	2.24E-04	3.6E-04	'=Iadf+Eadf
Total dose - benthic bkgd	mGy/d	Tadfbenb	1.43E-04	1.48E-05	7.95E-04	1.31E-04	9.25E-05	1.2E-03	'=Iadfb+Eadfbenb
- benthic impact	mGy/d	Tadfben	1.55E-04	2.79E-05	1.13E-03	1.62E-04	2.24E-04	1.7E-03	'=Iadf+Eadfben

Table H.1-1

Aquatic Dose Calculations

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Absorbed Doses - Aquatic Plants									
Internal Dose Factor	mGy/d per Bq	Idcfap	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadapb	9.55E-05	1.82E-04	7.63E-05	3.98E-05	5.92E-04	9.9E-04	'=apcb*Idcfap
Internal dose impacted	mGy/d	Iadap	1.41E-04	3.48E-04	1.23E-04	6.70E-05	1.43E-03	2.1E-03	'=apc*Idcfap
Ext. dose factor aq plan	mGy/d per Bq	Edcfap	1.29E-02	2.25E-04	3.67E-02	6.03E-03	1.10E-07		
Ext. dose to leaf bkgd	mGy/d	Eadpwb	1.59E-07	1.35E-09	1.47E-07	6.63E-08	5.50E-13	3.7E-07	'=wcb*Edcfap/1000000
Ext. dose to leaf impact	mGy/d	Eadpw	2.34E-07	2.59E-09	2.37E-07	1.12E-07	1.33E-12	5.9E-07	'=wc*Edcfap/1000000
Ext. dose to root bkgd	mGy/d	Eadpsb	4.28E-04	9.00E-06	1.47E-03	6.03E-04	1.10E-08	2.5E-03	'=sedwcb*Edcfap
Ext. dose to root impact	mGy/d	Eadps	4.64E-04	1.07E-05	2.07E-03	7.38E-04	1.29E-08	3.3E-03	'=sedwc*Edcfap
Total dose - leaf bkgd	mGy/d	Tadaplb	9.57E-05	1.82E-04	7.65E-05	3.99E-05	5.92E-04	9.9E-04	'=Iadapb+Eadpwb
- leaf impacted	mGy/d	Tadapl	1.41E-04	3.48E-04	1.23E-04	6.71E-05	1.43E-03	2.1E-03	'=Iadap+Eadpw
Total dose - root bkgd	mGy/d	Tadaprb	5.24E-04	1.91E-04	1.54E-03	6.43E-04	5.92E-04	3.5E-03	'=Iadapb+Eadpsb
- root impacted	mGy/d	Tadapr	6.05E-04	3.59E-04	2.19E-03	8.04E-04	1.43E-03	5.4E-03	'=Iadap+Eadps
Absorbed Doses - Benthic Invertebrates									
Internal Dose Factor	mGy/d per Bq	Idcfbi	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadbib	1.25E-03	2.35E-05	6.17E-04	1.46E-05	5.62E-04	2.5E-03	'=bicb*Idcfbi
Internal dose impacted	mGy/d	Iadbi	1.84E-03	4.50E-05	9.96E-04	2.46E-05	1.36E-03	4.3E-03	'=bic*Idcfbi
Ext. dose factor ben inv	mGy/d per Bq	Edcfbi	1.29E-02	2.25E-04	3.67E-02	6.03E-03	1.10E-07		
Ext. dose bkgd sedimer	mGy/d	Eadbenb	4.28E-04	9.00E-06	1.47E-03	6.03E-04	1.10E-08	2.5E-03	'=sedwcb*Edcfbi
Ext. dose impacted sedi	mGy/d	Eadben	4.64E-04	1.07E-05	2.07E-03	7.38E-04	1.29E-08	3.3E-03	'=sedwc*Edcfbi
Total dose - bkgd	mGy/d	Tadbenb	1.67E-03	3.25E-05	2.08E-03	6.18E-04	5.62E-04	5.0E-03	'=Iadbib+Eadbenb
Total dose - impacted	mGy/d	Tadben	2.30E-03	5.57E-05	3.06E-03	7.62E-04	1.36E-03	7.5E-03	'=Iadbi+Eadben
Equivalent Doses - Fish									
RBE for alpha	Sv/Gy	RBEf	10						
Total dose - pelagic bkg	mSv/d	Tedfpb	8.49E-06	1.42E-04	5.92E-04	5.67E-06	9.25E-04	1.7E-03	'=Iadfb*RBEf+Eadfb
- pelagic impact	mSv/d	Tedfp	1.25E-05	2.72E-04	9.55E-04	9.53E-06	2.24E-03	3.5E-03	'=Iadf*RBEf+Eadf
Total dose - benthic bkg	mSv/d	Tedfbenb	1.51E-04	1.43E-04	1.33E-03	1.31E-04	9.25E-04	2.7E-03	'=Iadfb*RBEf+Eadfbenb
- benthic impact	mSv/d	Tedfben	1.66E-04	2.73E-04	1.99E-03	1.62E-04	2.24E-03	4.8E-03	'=Iadf*RBEf+Eadfben
Equivalent Doses - Aquatic Plants									
RBE for alpha	Sv/Gy	RBEap	10						
Total dose - leaf bkgd	mSv/d	Tedaplb	9.56E-04	1.82E-03	7.63E-04	3.99E-05	5.92E-03	9.5E-03	'=Iadapb*RBEap+Eadpwb
- leaf impacted	mSv/d	Tedapl	1.41E-03	3.48E-03	1.23E-03	6.71E-05	1.43E-02	2.1E-02	'=Iadap*RBEap+Eadpw
Total dose - root bkgd	mSv/d	Tedaprb	1.38E-03	1.83E-03	2.23E-03	6.43E-04	5.92E-03	1.2E-02	'=Iadapb*RBEap+Eadpsb
- root impacted	mSv/d	Tedapr	1.88E-03	3.49E-03	3.30E-03	8.04E-04	1.43E-02	2.4E-02	'=Iadap*RBEap+Eadps

Table H.1-1

Aquatic Dose Calculations

Equivalent Doses - Benthic Invertebrates

RBE for alpha	Sv/Gy	RBEbi	10							
Total dose - bkgd	mSv/d	Tedbenb	1.29E-02	2.44E-04	7.64E-03	6.18E-04	5.62E-03	2.7E-02		'=Iadbib*RBEbi+Eadbenb
Total dose - impacted	mSv/d	Tedben	1.89E-02	4.61E-04	1.20E-02	7.62E-04	1.36E-02	4.6E-02		'=Iadbi*RBEbi+Eadben

0.6 Screening Criterion in mGy/d	3 6	Total Absorbed Dose mGy/d	Total Equivalent Dose mSv/d	Index (Absorbed Equivalent Dose)	Index (Absorbed Equivalent Dose)
Pelagic Fish - Background		1.7E-04	1.7E-03	2.9E-04	2.8E-03
Pelagic Fish - Impacted		3.6E-04	3.5E-03	6.0E-04	5.8E-03
Benthic Fish - Background		1.2E-03	2.7E-03	2.0E-03	4.5E-03
Benthic Fish - Impacted		1.7E-03	4.8E-03	2.8E-03	8.1E-03
Aquatic Plant Leaves - Background		9.9E-04	9.5E-03	3.3E-04	3.2E-03
Aquatic Plant Leaves - Impacted		2.1E-03	2.1E-02	7.0E-04	6.8E-03
Aquatic Plant Roots - Background		3.5E-03	1.2E-02	1.2E-03	4.0E-03
Aquatic Plant Roots - Impacted		5.4E-03	2.4E-02	1.8E-03	7.9E-03
Benthic Invertebrates - Background		5.0E-03	2.7E-02	8.3E-04	4.5E-03
Benthic Invertebrates - Impacted		7.5E-03	4.6E-02	1.3E-03	7.6E-03

U-238+	Internal	U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235
	External	U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235 (beta + gamma only)
Ra-226+	Internal	Ra-226 + 0.3* (Rn-222 + ...Po-214)
	External	Ra-226 + 1.0* (Rn-222 + ...Po-214) (beta + gamma only)
Th-232+	Internal	Th-232 + ...Po-212/Tl-208 (Th-232 + Th-228 are inputs)
	External	Th-232 + Po-212/Tl-208
Ra-228+	Internal	Ra-228 + ...Po-212/Tl-208

Table H.1-1
Aquatic Dose Calculations

JSL-5

Determination of Aquatic Dose - Average, RBE 40

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Water									
Background	Bq/m3	wcb	12.30	6.00	4.00	11.00	5.00		
Impacted water body	Bq/m3	wc	7.83	9.5	5.9	17.1	8.8		<<<< input concentrations in water
Sediment									
Background	Bq/g(wet)	sedwcb	3.32E-02	4.00E-02	4.00E-02	1.00E-01	1.00E-01		
Impacted water body	Bq/g(wet)	sedwc	3.46E-02	4.35E-02	4.90E-02	1.12E-01	1.09E-01		<<<< input concentrations in sediment
Fish									
Water-to-fish biocon fa	m3/gwet	bcff	4.80E-07	3.60E-05	9.30E-05	8.50E-05	2.50E-04		<<<< input transfer factor
Fish in bkgd water	Bq/g wet	fc	5.90E-06	2.16E-04	3.72E-04	9.35E-04	1.25E-03		
Fish in impacted water	Bq/g wet	fc	3.76E-06	3.44E-04	5.52E-04	1.46E-03	2.21E-03		
Aquatic Plants									
Water-to-plants biocon	m3/gwet	bcfb	5.47E-05	4.6E-04	1.2E-04	6.0E-04	1.6E-03		<<<< input transfer factor
Plants in bkgd water	Bq/g wet	apcb	6.73E-04	2.76E-03	4.80E-04	6.60E-03	8.00E-03		
Plants in impacted water	Bq/g wet	apc	4.28E-04	4.39E-03	7.13E-04	1.03E-02	1.41E-02		
Benthic Invertebrates									
Water-to-benthos biocon	m3/gwet	bcfbi	7.13E-04	5.95E-05	9.70E-04	2.20E-04	1.52E-03		<<<< input transfer factor
Benthos in bkgd water	Bq/g wet	bicb	8.77E-03	3.57E-04	3.88E-03	2.42E-03	7.60E-03		
Benthos in impacted water	Bq/g wet	bic	5.58E-03	5.68E-04	5.76E-03	3.77E-03	1.34E-02		
Absorbed Doses - Fish									
Internal Dose Factor	mGy/d per Bq	Idc	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadfb	8.38E-07	1.42E-05	5.91E-05	5.64E-06	9.25E-05	1.7E-04	'=fcb*Idc
Internal dose impacted	mGy/d	Iadf	5.33E-07	2.26E-05	8.78E-05	8.78E-06	1.63E-04	2.8E-04	'=fc*Idc
Ext. dose factor	mGy/d per Bq	Edc	8.57E-03	2.93E-05	3.68E-02	2.50E-03	1.40E-07		
Ext. dose bkgd pelagic	mGy/d	Eadfb	1.05E-07	1.76E-10	1.47E-07	2.75E-08	7.00E-13	2.8E-07	'=wcb*Edc/1000000
Ext. dose impacted pelagic	mGy/d	Eadf	6.71E-08	2.80E-10	2.19E-07	4.28E-08	1.24E-12	3.3E-07	'=wc*Edc/1000000
Ext. dose bkgd benthic	mGy/d	Eadfbenb	1.42E-04	5.86E-07	7.36E-04	1.25E-04	7.00E-09	1.0E-03	'=Edc*((wcb/1000000+sedwcb)/2
Ext. dose impacted benthic	mGy/d	Eadfben	1.48E-04	6.38E-07	9.03E-04	1.40E-04	7.61E-09	1.2E-03	'=Edc*((wc/1000000+sedwc)/2
Total dose - pelagic bkgd	mGy/d	Tadfbp	9.44E-07	1.42E-05	5.93E-05	5.67E-06	9.25E-05	1.7E-04	'=Iadfb+Eadfb
- pelagic impact	mGy/d	Tadfp	6.01E-07	2.26E-05	8.80E-05	8.83E-06	1.63E-04	2.8E-04	'=Iadf+Eadf
Total dose - benthic bkgd	mGy/d	Tadfbenb	1.43E-04	1.48E-05	7.95E-04	1.31E-04	9.25E-05	1.2E-03	'=Iadfb+Eadfbenb
- benthic impact	mGy/d	Tadfben	1.49E-04	2.33E-05	9.90E-04	1.49E-04	1.63E-04	1.5E-03	'=Iadf+Eadfben

Table H.1-1

Aquatic Dose Calculations

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Absorbed Doses - Aquatic Plants									
Internal Dose Factor	mGy/d per Bq	Idcfap	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadapb	9.55E-05	1.82E-04	7.63E-05	3.98E-05	5.92E-04	9.9E-04	'=apcb*Idcfap
Internal dose impacted	mGy/d	Iadap	6.08E-05	2.89E-04	1.13E-04	6.20E-05	1.05E-03	1.6E-03	'=apc*Idcfap
Ext. dose factor aq plan	mGy/d per Bq	Edcfap	1.29E-02	2.25E-04	3.67E-02	6.03E-03	1.10E-07		
Ext. dose to leaf bkgd	mGy/d	Eadpwb	1.59E-07	1.35E-09	1.47E-07	6.63E-08	5.50E-13	3.7E-07	'=wcb*Edcfap/1000000
Ext. dose to leaf impact	mGy/d	Eadpw	1.01E-07	2.15E-09	2.18E-07	1.03E-07	9.72E-13	4.2E-07	'=wc*Edcfap/1000000
Ext. dose to root bkgd	mGy/d	Eadpsb	4.28E-04	9.00E-06	1.47E-03	6.03E-04	1.10E-08	2.5E-03	'=sedwcb*Edcfap
Ext. dose to root impact	mGy/d	Eadps	4.46E-04	9.79E-06	1.80E-03	6.77E-04	1.20E-08	2.9E-03	'=sedwc*Edcfap
Total dose - leaf bkgd	mGy/d	Tadaplb	9.57E-05	1.82E-04	7.65E-05	3.99E-05	5.92E-04	9.9E-04	'=Iadapb+Eadpwb
- leaf impacted	mGy/d	Tadapl	6.09E-05	2.89E-04	1.14E-04	6.21E-05	1.05E-03	1.6E-03	'=Iadap+Eadpw
Total dose - root bkgd	mGy/d	Tadaprb	5.24E-04	1.91E-04	1.54E-03	6.43E-04	5.92E-04	3.5E-03	'=Iadapb+Eadpsb
- root impacted	mGy/d	Tadapr	5.07E-04	2.99E-04	1.91E-03	7.39E-04	1.05E-03	4.5E-03	'=Iadap+Eadps
Absorbed Doses - Benthic Invertebrates									
Internal Dose Factor	mGy/d per Bq	Idcfbi	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadbib	1.25E-03	2.35E-05	6.17E-04	1.46E-05	5.62E-04	2.5E-03	'=bicb*Idcfbi
Internal dose impacted	mGy/d	Iadbi	7.92E-04	3.74E-05	9.16E-04	2.27E-05	9.94E-04	2.8E-03	'=bic*Idcfbi
Ext. dose factor ben inv	mGy/d per Bq	Edcfbi	1.29E-02	2.25E-04	3.67E-02	6.03E-03	1.10E-07		
Ext. dose bkgd sedimer	mGy/d	Eadbenb	4.28E-04	9.00E-06	1.47E-03	6.03E-04	1.10E-08	2.5E-03	'=sedwcb*Edcfbi
Ext. dose impacted sedi	mGy/d	Eadben	4.46E-04	9.79E-06	1.80E-03	6.77E-04	1.20E-08	2.9E-03	'=sedwc*Edcfbi
Total dose - bkgd	mGy/d	Tadbenb	1.67E-03	3.25E-05	2.08E-03	6.18E-04	5.62E-04	5.0E-03	'=Iadbib+Eadbenb
Total dose - impacted	mGy/d	Tadben	1.24E-03	4.72E-05	2.72E-03	7.00E-04	9.94E-04	5.7E-03	'=Iadbi+Eadben
Equivalent Doses - Fish									
RBE for alpha	Sv/Gy	RBEf	40						
Total dose - pelagic bkg	mSv/d	Tedfpb	3.36E-05	5.69E-04	2.37E-03	5.67E-06	3.70E-03	6.7E-03	'=Iadfb*RBEf+Eadfb
- pelagic impact	mSv/d	Tedfp	2.14E-05	9.05E-04	3.51E-03	3.51E-04	6.54E-03	1.1E-02	'=Iadf*RBEf+Eadf
Total dose - benthic bkg	mSv/d	Tedfbenb	1.76E-04	5.69E-04	3.10E-03	1.31E-04	3.70E-03	7.7E-03	'=Iadfb*RBEf+Eadfbenb
- benthic impact	mSv/d	Tedfben	1.70E-04	9.05E-04	4.42E-03	4.92E-04	6.54E-03	1.3E-02	'=Iadf*RBEf+Eadfben
Equivalent Doses - Aquatic Plants									
RBE for alpha	Sv/Gy	RBEap	40						
Total dose - leaf bkgd	mSv/d	Tedaplb	3.82E-03	7.26E-03	3.05E-03	3.99E-05	2.37E-02	3.8E-02	'=Iadapb*RBEap+Eadpwb
- leaf impacted	mSv/d	Tedapl	2.43E-03	1.16E-02	4.53E-03	2.48E-03	4.18E-02	6.3E-02	'=Iadap*RBEap+Eadpw
Total dose - root bkgd	mSv/d	Tedaprb	4.25E-03	7.27E-03	4.52E-03	6.43E-04	2.37E-02	4.0E-02	'=Iadapb*RBEap+Eadpsb
- root impacted	mSv/d	Tedapr	2.88E-03	1.16E-02	6.33E-03	3.16E-03	4.18E-02	6.6E-02	'=Iadap*RBEap+Eadps

Table H.1-1

Aquatic Dose Calculations

Equivalent Doses - Benthic Invertebrates

RBE for alpha	Sv/Gy	RBEbi	40							
Total dose - bkgd	mSv/d	Tedbenb	1.29E-02	2.44E-04	7.64E-03	6.18E-04	5.62E-03	2.7E-02		'=Iadbib*RBEbi+Eadbenb
Total dose - impacted	mSv/d	Tedben	3.21E-02	9.79E-06	1.80E-03	6.77E-04	1.20E-08	3.5E-02		'=Iadbi*RBEbi+Eadben

0.6 Screening Criterion in mGy/d	3 6	Total Absorbed Dose mGy/d	Total Equivalent Dose mSv/d	Index (Absorbed Equivalent Dose)	Index (Absorbed Equivalent Dose)
Pelagic Fish - Background		1.7E-04	6.7E-03	2.9E-04	1.1E-02
Pelagic Fish - Impacted		2.8E-04	1.1E-02	4.7E-04	1.9E-02
Benthic Fish - Background		1.2E-03	7.7E-03	2.0E-03	1.3E-02
Benthic Fish - Impacted		1.5E-03	1.3E-02	2.5E-03	2.1E-02
Aquatic Plant Leaves - Background		9.9E-04	3.8E-02	3.3E-04	1.3E-02
Aquatic Plant Leaves - Impacted		1.6E-03	6.3E-02	5.2E-04	2.1E-02
Aquatic Plant Roots - Background		3.5E-03	4.0E-02	1.2E-03	1.3E-02
Aquatic Plant Roots - Impacted		4.5E-03	6.6E-02	1.5E-03	2.2E-02
Benthic Invertebrates - Background		5.0E-03	2.7E-02	8.3E-04	4.5E-03
Benthic Invertebrates - Impacted		5.7E-03	3.5E-02	9.5E-04	5.8E-03

U-238+	Internal	U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235
	External	U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235 (beta + gamma only)
Ra-226+	Internal	Ra-226 + 0.3* (Rn-222 + ...Po-214)
	External	Ra-226 + 1.0* (Rn-222 + ...Po-214) (beta + gamma only)
Th-232+	Internal	Th-232 + ...Po-212/Tl-208 (Th-232 + Th-228 are inputs)
	External	Th-232 + Po-212/Tl-208
Ra-228+	Internal	Ra-228 + ...Po-212/Tl-208

Table H.1-1
Aquatic Dose Calculations

JSL-5

Determination of Aquatic Dose - 95th Percentile, RBE 40

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Water									
Background	Bq/m3	wcb	12.30	6.00	4.00	11.00	5.00		
Impacted water body	Bq/m3	wc	18.17	11.5	6.5	18.5	12.1		<<<< input concentrations in water
Sediment									
Background	Bq/g(wet)	sedwcb	3.32E-02	4.00E-02	4.00E-02	1.00E-01	1.00E-01		
Impacted water body	Bq/g(wet)	sedwc	3.59E-02	4.77E-02	5.63E-02	1.22E-01	1.17E-01		<<<< input concentrations in sediment
Fish									
Water-to-fish biocon fa	m3/gwet	bcff	4.80E-07	3.60E-05	9.30E-05	8.50E-05	2.50E-04		<<<< input transfer factor
Fish in bkgd water	Bq/g wet	fc	5.90E-06	2.16E-04	3.72E-04	9.35E-04	1.25E-03		
Fish in impacted water	Bq/g wet	fc	8.72E-06	4.14E-04	6.00E-04	1.57E-03	3.03E-03		
Aquatic Plants									
Water-to-plants biocon	m3/gwet	bcfb	5.47E-05	4.6E-04	1.2E-04	6.0E-04	1.6E-03		<<<< input transfer factor
Plants in bkgd water	Bq/g wet	apcb	6.73E-04	2.76E-03	4.80E-04	6.60E-03	8.00E-03		
Plants in impacted water	Bq/g wet	apc	9.94E-04	5.29E-03	7.75E-04	1.11E-02	1.94E-02		
Benthic Invertebrates									
Water-to-benthos biocon	m3/gwet	bcfbi	7.13E-04	5.95E-05	9.70E-04	2.20E-04	1.52E-03		<<<< input transfer factor
Benthos in bkgd water	Bq/g wet	bicb	8.77E-03	3.57E-04	3.88E-03	2.42E-03	7.60E-03		
Benthos in impacted water	Bq/g wet	bic	1.30E-02	6.84E-04	6.26E-03	4.07E-03	1.84E-02		
Absorbed Doses - Fish									
Internal Dose Factor	mGy/d per Bq	Idc	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadfb	8.38E-07	1.42E-05	5.91E-05	5.64E-06	9.25E-05	1.7E-04	'=fcb*Ic
Internal dose impacted	mGy/d	Iadf	1.24E-06	2.72E-05	9.55E-05	9.49E-06	2.24E-04	3.6E-04	'=fc*Ic
Ext. dose factor	mGy/d per Bq	Edc	8.57E-03	2.93E-05	3.68E-02	2.50E-03	1.40E-07		
Ext. dose bkgd pelagic	mGy/d	Eadfb	1.05E-07	1.76E-10	1.47E-07	2.75E-08	7.00E-13	2.8E-07	'=wcb*Edc/1000000
Ext. dose impacted pelagic	mGy/d	Eadf	1.56E-07	3.37E-10	2.38E-07	4.63E-08	1.69E-12	4.4E-07	'=wc*Edc/1000000
Ext. dose bkgd benthic	mGy/d	Eadfbenb	1.42E-04	5.86E-07	7.36E-04	1.25E-04	7.00E-09	1.0E-03	'=Edc*((wcb/1000000+sedwcb)/2
Ext. dose impacted benthic	mGy/d	Eadfben	1.54E-04	6.99E-07	1.04E-03	1.53E-04	8.18E-09	1.3E-03	'=Edc*((wc/1000000+sedwc)/2
Total dose - pelagic bkgd	mGy/d	Tadfbp	9.44E-07	1.42E-05	5.93E-05	5.67E-06	9.25E-05	1.7E-04	'=Iadfb+Eadfb
- pelagic impact	mGy/d	Tadfp	1.39E-06	2.72E-05	9.57E-05	9.53E-06	2.24E-04	3.6E-04	'=Iadf+Eadf
Total dose - benthic bkgd	mGy/d	Tadfbenb	1.43E-04	1.48E-05	7.95E-04	1.31E-04	9.25E-05	1.2E-03	'=Iadfb+Eadfbenb
- benthic impact	mGy/d	Tadfben	1.55E-04	2.79E-05	1.13E-03	1.62E-04	2.24E-04	1.7E-03	'=Iadf+Eadfben

Table H.1-1

Aquatic Dose Calculations

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Absorbed Doses - Aquatic Plants									
Internal Dose Factor	mGy/d per Bq	Idcfap	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadapb	9.55E-05	1.82E-04	7.63E-05	3.98E-05	5.92E-04	9.9E-04	'=apcb*Idcfap
Internal dose impacted	mGy/d	Iadap	1.41E-04	3.48E-04	1.23E-04	6.70E-05	1.43E-03	2.1E-03	'=apc*Idcfap
Ext. dose factor aq plan	mGy/d per Bq	Edcfap	1.29E-02	2.25E-04	3.67E-02	6.03E-03	1.10E-07		
Ext. dose to leaf bkgd	mGy/d	Eadpwb	1.59E-07	1.35E-09	1.47E-07	6.63E-08	5.50E-13	3.7E-07	'=wcb*Edcfap/1000000
Ext. dose to leaf impact	mGy/d	Eadpw	2.34E-07	2.59E-09	2.37E-07	1.12E-07	1.33E-12	5.9E-07	'=wc*Edcfap/1000000
Ext. dose to root bkgd	mGy/d	Eadpsb	4.28E-04	9.00E-06	1.47E-03	6.03E-04	1.10E-08	2.5E-03	'=sedwcb*Edcfap
Ext. dose to root impact	mGy/d	Eadps	4.64E-04	1.07E-05	2.07E-03	7.38E-04	1.29E-08	3.3E-03	'=sedwc*Edcfap
Total dose - leaf bkgd	mGy/d	Tadaplb	9.57E-05	1.82E-04	7.65E-05	3.99E-05	5.92E-04	9.9E-04	'=Iadapb+Eadpwb
- leaf impacted	mGy/d	Tadapl	1.41E-04	3.48E-04	1.23E-04	6.71E-05	1.43E-03	2.1E-03	'=Iadap+Eadpw
Total dose - root bkgd	mGy/d	Tadaprb	5.24E-04	1.91E-04	1.54E-03	6.43E-04	5.92E-04	3.5E-03	'=Iadapb+Eadpsb
- root impacted	mGy/d	Tadapr	6.05E-04	3.59E-04	2.19E-03	8.04E-04	1.43E-03	5.4E-03	'=Iadap+Eadps
Absorbed Doses - Benthic Invertebrates									
Internal Dose Factor	mGy/d per Bq	Idcfbi	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadbib	1.25E-03	2.35E-05	6.17E-04	1.46E-05	5.62E-04	2.5E-03	'=bicb*Idcfbi
Internal dose impacted	mGy/d	Iadbi	1.84E-03	4.50E-05	9.96E-04	2.46E-05	1.36E-03	4.3E-03	'=bic*Idcfbi
Ext. dose factor ben inv	mGy/d per Bq	Edcfbi	1.29E-02	2.25E-04	3.67E-02	6.03E-03	1.10E-07		
Ext. dose bkgd sedimer	mGy/d	Eadbenb	4.28E-04	9.00E-06	1.47E-03	6.03E-04	1.10E-08	2.5E-03	'=sedwcb*Edcfbi
Ext. dose impacted sedi	mGy/d	Eadben	4.64E-04	1.07E-05	2.07E-03	7.38E-04	1.29E-08	3.3E-03	'=sedwc*Edcfbi
Total dose - bkgd	mGy/d	Tadbenb	1.67E-03	3.25E-05	2.08E-03	6.18E-04	5.62E-04	5.0E-03	'=Iadbib+Eadbenb
Total dose - impacted	mGy/d	Tadben	2.30E-03	5.57E-05	3.06E-03	7.62E-04	1.36E-03	7.5E-03	'=Iadbi+Eadben
Equivalent Doses - Fish									
RBE for alpha	Sv/Gy	RBEf	40						
Total dose - pelagic bkg	mSv/d	Tedfpb	3.36E-05	5.69E-04	2.37E-03	5.67E-06	3.70E-03	6.7E-03	'=Iadfb*RBEf+Eadfb
- pelagic impact	mSv/d	Tedfp	4.97E-05	1.09E-03	3.82E-03	9.53E-06	8.96E-03	1.4E-02	'=Iadf*RBEf+Eadf
Total dose - benthic bkg	mSv/d	Tedfbenb	1.76E-04	5.69E-04	3.10E-03	1.31E-04	3.70E-03	7.7E-03	'=Iadfb*RBEf+Eadfbenb
- benthic impact	mSv/d	Tedfben	2.04E-04	1.09E-03	4.85E-03	1.62E-04	8.96E-03	1.5E-02	'=Iadf*RBEf+Eadfben
Equivalent Doses - Aquatic Plants									
RBE for alpha	Sv/Gy	RBEap	40						
Total dose - leaf bkgd	mSv/d	Tedaplb	3.82E-03	7.26E-03	3.05E-03	3.99E-05	2.37E-02	3.8E-02	'=Iadapb*RBEap+Eadpwb
- leaf impacted	mSv/d	Tedapl	5.65E-03	1.39E-02	4.93E-03	6.71E-05	5.73E-02	8.2E-02	'=Iadap*RBEap+Eadpw
Total dose - root bkgd	mSv/d	Tedaprb	4.25E-03	7.27E-03	4.52E-03	6.43E-04	2.37E-02	4.0E-02	'=Iadapb*RBEap+Eadpsb
- root impacted	mSv/d	Tedapr	6.11E-03	1.39E-02	6.99E-03	8.04E-04	5.73E-02	8.5E-02	'=Iadap*RBEap+Eadps

Table H.1-1

Aquatic Dose Calculations

Equivalent Doses - Benthic Invertebrates

RBE for alpha	Sv/Gy	RBEbi	40							
Total dose - bkgd	mSv/d	Tedbenb	5.02E-02	9.49E-04	2.61E-02	6.18E-04	2.25E-02	1.0E-01		'=Iadbib*RBEbi+Eadbenb
Total dose - impacted	mSv/d	Tedben	7.41E-02	1.81E-03	4.19E-02	7.62E-04	5.45E-02	1.7E-01		'=Iadbi*RBEbi+Eadben

0.6 Screening Criterion in mGy/d	3 6	Total Absorbed Dose mGy/d	Total Equivalent Dose mSv/d	Index (Absorbed Equivalent Dose)	Index (Absorbed Equivalent Dose)
Pelagic Fish - Background		1.7E-04	6.7E-03	2.9E-04	1.1E-02
Pelagic Fish - Impacted		3.6E-04	1.4E-02	6.0E-04	2.3E-02
Benthic Fish - Background		1.2E-03	7.7E-03	2.0E-03	1.3E-02
Benthic Fish - Impacted		1.7E-03	1.5E-02	2.8E-03	2.5E-02
Aquatic Plant Leaves - Background		9.9E-04	3.8E-02	3.3E-04	1.3E-02
Aquatic Plant Leaves - Impacted		2.1E-03	8.2E-02	7.0E-04	2.7E-02
Aquatic Plant Roots - Background		3.5E-03	4.0E-02	1.2E-03	1.3E-02
Aquatic Plant Roots - Impacted		5.4E-03	8.5E-02	1.8E-03	2.8E-02
Benthic Invertebrates - Background		5.0E-03	1.0E-01	8.3E-04	1.7E-02
Benthic Invertebrates - Impacted		7.5E-03	1.7E-01	1.3E-03	2.9E-02

U-238+	Internal	U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235
	External	U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235 (beta + gamma only)
Ra-226+	Internal	Ra-226 + 0.3* (Rn-222 + ...Po-214)
	External	Ra-226 + 1.0* (Rn-222 + ...Po-214) (beta + gamma only)
Th-232+	Internal	Th-232 + ...Po-212/Tl-208 (Th-232 + Th-228 are inputs)
	External	Th-232 + Po-212/Tl-208
Ra-228+	Internal	Ra-228 + ...Po-212/Tl-208

Table H.1-1
Aquatic Dose Calculations

JSL-6 **Determination of Aquatic Dose - Average, RBE 10**

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Water									
Background	Bq/m3	wcb	12.30	6.00	4.00	11.00	5.00		
Impacted water body	Bq/m3	wc	4.36	10.6	7.0	19.4	9.0		<<<< input concentrations in water
Sediment									
Background	Bq/g(wet)	sedwcb	3.32E-02	4.00E-02	4.00E-02	1.00E-01	1.00E-01		
Impacted water body	Bq/g(wet)	sedwc	3.41E-02	4.35E-02	4.85E-02	1.12E-01	1.08E-01		<<<< input concentrations in sediment
Fish									
Water-to-fish biocon fa	m3/gwet	bcff	4.80E-07	3.60E-05	9.30E-05	8.50E-05	2.50E-04		<<<< input transfer factor
Fish in bkgd water	Bq/g wet	fc	5.90E-06	2.16E-04	3.72E-04	9.35E-04	1.25E-03		
Fish in impacted water	Bq/g wet	fc	2.09E-06	3.81E-04	6.49E-04	1.65E-03	2.25E-03		
Aquatic Plants									
Water-to-plants biocon	m3/gwet	bcfap	5.47E-05	4.6E-04	1.2E-04	6.0E-04	1.6E-03		<<<< input transfer factor
Plants in bkgd water	Bq/g wet	apcb	6.73E-04	2.76E-03	4.80E-04	6.60E-03	8.00E-03		
Plants in impacted water	Bq/g wet	apc	2.39E-04	4.87E-03	8.38E-04	1.16E-02	1.44E-02		
Benthic Invertebrates									
Water-to-benthos bioco	m3/gwet	bcfbi	7.13E-04	5.95E-05	9.70E-04	2.20E-04	1.52E-03		<<<< input transfer factor
Benthos in bkgd water	Bq/g wet	bicb	8.77E-03	3.57E-04	3.88E-03	2.42E-03	7.60E-03		
Benthos in impacted water	Bq/g wet	bic	3.11E-03	6.29E-04	6.77E-03	4.27E-03	1.37E-02		
Absorbed Doses - Fish									
Internal Dose Factor	mGy/d per Bq	Idcff	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadfb	8.38E-07	1.42E-05	5.91E-05	5.64E-06	9.25E-05	1.7E-04	'=fcb*Idcff
Internal dose impacted	mGy/d	Iadf	2.97E-07	2.51E-05	1.03E-04	9.94E-06	1.66E-04	3.0E-04	'=fc*Idcff
Ext. dose factor	mGy/d per Bq	Edcff	8.57E-03	2.93E-05	3.68E-02	2.50E-03	1.40E-07		
Ext. dose bkgd pelagic	mGy/d	Eadfb	1.05E-07	1.76E-10	1.47E-07	2.75E-08	7.00E-13	2.8E-07	'=wcb*Edcff/1000000
Ext. dose impacted pelagic	mGy/d	Eadf	3.74E-08	3.10E-10	2.57E-07	4.85E-08	1.26E-12	3.4E-07	'=wc*Edcff/1000000
Ext. dose bkgd benthic	mGy/d	Eadfbenb	1.42E-04	5.86E-07	7.36E-04	1.25E-04	7.00E-09	1.0E-03	'=Edcff*(wcb/1000000+sedwcb)/2
Ext. dose impacted benthic	mGy/d	Eadfben	1.46E-04	6.38E-07	8.92E-04	1.40E-04	7.57E-09	1.2E-03	'=Edcff*(wc/1000000+sedwc)/2
Total dose - pelagic bkgd	mGy/d	Tadfbp	9.44E-07	1.42E-05	5.93E-05	5.67E-06	9.25E-05	1.7E-04	'=Iadfb+Eadfb
- pelagic impact	mGy/d	Tadfp	3.35E-07	2.51E-05	1.04E-04	9.99E-06	1.66E-04	3.1E-04	'=Iadf+Eadf
Total dose - benthic bkgd	mGy/d	Tadfbenb	1.43E-04	1.48E-05	7.95E-04	1.31E-04	9.25E-05	1.2E-03	'=Iadfb+Eadfbenb
- benthic impact	mGy/d	Tadfben	1.47E-04	2.57E-05	9.95E-04	1.50E-04	1.66E-04	1.5E-03	'=Iadf+Eadfben

Table H.1-1

Aquatic Dose Calculations

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Absorbed Doses - Aquatic Plants									
Internal Dose Factor	mGy/d per Bq	Idcfap	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadapb	9.55E-05	1.82E-04	7.63E-05	3.98E-05	5.92E-04	9.9E-04	'=apcb*Idcfap
Internal dose impacted	mGy/d	Iadap	3.39E-05	3.20E-04	1.33E-04	7.02E-05	1.06E-03	1.6E-03	'=apc*Idcfap
Ext. dose factor aq plan	mGy/d per Bq	Edcfap	1.29E-02	2.25E-04	3.67E-02	6.03E-03	1.10E-07		
Ext. dose to leaf bkgd	mGy/d	Eadpwb	1.59E-07	1.35E-09	1.47E-07	6.63E-08	5.50E-13	3.7E-07	'=wcb*Edcfap/1000000
Ext. dose to leaf impact	mGy/d	Eadpw	5.63E-08	2.38E-09	2.56E-07	1.17E-07	9.88E-13	4.3E-07	'=wc*Edcfap/1000000
Ext. dose to root bkgd	mGy/d	Eadpsb	4.28E-04	9.00E-06	1.47E-03	6.03E-04	1.10E-08	2.5E-03	'=sedwcb*Edcfap
Ext. dose to root impact	mGy/d	Eadps	4.40E-04	9.79E-06	1.78E-03	6.73E-04	1.19E-08	2.9E-03	'=sedwc*Edcfap
Total dose - leaf bkgd	mGy/d	Tadaplb	9.57E-05	1.82E-04	7.65E-05	3.99E-05	5.92E-04	9.9E-04	'=Iadapb+Eadpwb
- leaf impacted	mGy/d	Tadapl	3.39E-05	3.20E-04	1.33E-04	7.03E-05	1.06E-03	1.6E-03	'=Iadap+Eadpw
Total dose - root bkgd	mGy/d	Tadaprb	5.24E-04	1.91E-04	1.54E-03	6.43E-04	5.92E-04	3.5E-03	'=Iadapb+Eadpsb
- root impacted	mGy/d	Tadapr	4.74E-04	3.30E-04	1.91E-03	7.43E-04	1.06E-03	4.5E-03	'=Iadap+Eadps
Absorbed Doses - Benthic Invertebrates									
Internal Dose Factor	mGy/d per Bq	Idcfbi	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadbib	1.25E-03	2.35E-05	6.17E-04	1.46E-05	5.62E-04	2.5E-03	'=bicb*Idcfbi
Internal dose impacted	mGy/d	Iadbi	4.41E-04	4.14E-05	1.08E-03	2.57E-05	1.01E-03	2.6E-03	'=bic*Idcfbi
Ext. dose factor ben inv	mGy/d per Bq	Edcfbi	1.29E-02	2.25E-04	3.67E-02	6.03E-03	1.10E-07		
Ext. dose bkgd sedimer	mGy/d	Eadbenb	4.28E-04	9.00E-06	1.47E-03	6.03E-04	1.10E-08	2.5E-03	'=sedwcb*Edcfbi
Ext. dose impacted sedi	mGy/d	Eadben	4.40E-04	9.79E-06	1.78E-03	6.73E-04	1.19E-08	2.9E-03	'=sedwc*Edcfbi
Total dose - bkgd	mGy/d	Tadbenb	1.67E-03	3.25E-05	2.08E-03	6.18E-04	5.62E-04	5.0E-03	'=Iadbib+Eadbenb
Total dose - impacted	mGy/d	Tadben	8.82E-04	5.12E-05	2.86E-03	6.99E-04	1.01E-03	5.5E-03	'=Iadbi+Eadben
Equivalent Doses - Fish									
RBE for alpha	Sv/Gy	RBEf	10						
Total dose - pelagic bkg	mSv/d	Tedfpb	8.49E-06	1.42E-04	5.92E-04	5.67E-06	9.25E-04	1.7E-03	'=Iadfb*RBEf+Eadfb
- pelagic impact	mSv/d	Tedfp	3.01E-06	2.51E-04	1.03E-03	9.94E-05	1.66E-03	3.0E-03	'=Iadf*RBEf+Eadf
Total dose - benthic bkg	mSv/d	Tedfbenb	1.51E-04	1.43E-04	1.33E-03	1.31E-04	9.25E-04	2.7E-03	'=Iadfb*RBEf+Eadfbenb
- benthic impact	mSv/d	Tedfben	1.49E-04	2.51E-04	1.92E-03	2.39E-04	1.66E-03	4.2E-03	'=Iadf*RBEf+Eadfben
Equivalent Doses - Aquatic Plants									
RBE for alpha	Sv/Gy	RBEap	10						
Total dose - leaf bkgd	mSv/d	Tedaplb	9.56E-04	1.82E-03	7.63E-04	3.99E-05	5.92E-03	9.5E-03	'=Iadapb*RBEap+Eadpwb
- leaf impacted	mSv/d	Tedapl	3.39E-04	3.20E-03	1.33E-03	7.02E-04	1.06E-02	1.6E-02	'=Iadap*RBEap+Eadpw
Total dose - root bkgd	mSv/d	Tedaprb	1.38E-03	1.83E-03	2.23E-03	6.43E-04	5.92E-03	1.2E-02	'=Iadapb*RBEap+Eadpsb
- root impacted	mSv/d	Tedapr	7.79E-04	3.21E-03	3.11E-03	1.37E-03	1.06E-02	1.9E-02	'=Iadap*RBEap+Eadps

Table H.1-1

Aquatic Dose Calculations

Equivalent Doses - Benthic Invertebrates

RBE for alpha	Sv/Gy	RBEbi	10							
Total dose - bkgd	mSv/d	Tedbenb	1.29E-02	2.44E-04	7.64E-03	6.18E-04	5.62E-03	2.7E-02		'=Iadbib*RBEbi+Eadbenb
Total dose - impacted	mSv/d	Tedben	4.86E-03	4.24E-04	1.25E-02	9.30E-04	1.01E-02	2.9E-02		'=Iadbi*RBEbi+Eadben

0.6 Screening Criterion in mGy/d	3 6	Total Absorbed Dose mGy/d	Total Equivalent Dose mSv/d	Index (Absorbed Equivalent Dose)	Index (Absorbed Equivalent Dose)
Pelagic Fish - Background		1.7E-04	1.7E-03	2.9E-04	2.8E-03
Pelagic Fish - Impacted		3.1E-04	3.0E-03	5.1E-04	5.1E-03
Benthic Fish - Background		1.2E-03	2.7E-03	2.0E-03	4.5E-03
Benthic Fish - Impacted		1.5E-03	4.2E-03	2.5E-03	7.0E-03
Aquatic Plant Leaves - Background		9.9E-04	9.5E-03	3.3E-04	3.2E-03
Aquatic Plant Leaves - Impacted		1.6E-03	1.6E-02	5.4E-04	5.4E-03
Aquatic Plant Roots - Background		3.5E-03	1.2E-02	1.2E-03	4.0E-03
Aquatic Plant Roots - Impacted		4.5E-03	1.9E-02	1.5E-03	6.4E-03
Benthic Invertebrates - Background		5.0E-03	2.7E-02	8.3E-04	4.5E-03
Benthic Invertebrates - Impacted		5.5E-03	2.9E-02	9.2E-04	4.8E-03

U-238+	Internal	U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235
	External	U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235 (beta + gamma only)
Ra-226+	Internal	Ra-226 + 0.3* (Rn-222 + ...Po-214)
	External	Ra-226 + 1.0* (Rn-222 + ...Po-214) (beta + gamma only)
Th-232+	Internal	Th-232 + ...Po-212/Tl-208 (Th-232 + Th-228 are inputs)
	External	Th-232 + Po-212/Tl-208
Ra-228+	Internal	Ra-228 + ...Po-212/Tl-208

Table H.1-1
Aquatic Dose Calculations

JSL-6

Determination of Aquatic Dose - 95th Percentile, RBE 10

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Water									
Background	Bq/m3	wcb	12.30	6.00	4.00	11.00	5.00		
Impacted water body	Bq/m3	wc	7.77	11.3	7.3	20.0	10.0		<<<< input concentrations in water
Sediment									
Background	Bq/g(wet)	sedwcb	3.32E-02	4.00E-02	4.00E-02	1.00E-01	1.00E-01		
Impacted water body	Bq/g(wet)	sedwc	3.52E-02	4.75E-02	5.39E-02	1.21E-01	1.16E-01		<<<< input concentrations in sediment
Fish									
Water-to-fish biocon fa	m3/gwet	bcff	4.80E-07	3.60E-05	9.30E-05	8.50E-05	2.50E-04		<<<< input transfer factor
Fish in bkgd water	Bq/g wet	fc	5.90E-06	2.16E-04	3.72E-04	9.35E-04	1.25E-03		
Fish in impacted water	Bq/g wet	fc	3.73E-06	4.06E-04	6.77E-04	1.70E-03	2.51E-03		
Aquatic Plants									
Water-to-plants biocon m3/gwet		bcfb	5.47E-05	4.6E-04	1.2E-04	6.0E-04	1.6E-03		<<<< input transfer factor
Plants in bkgd water	Bq/g wet	apcb	6.73E-04	2.76E-03	4.80E-04	6.60E-03	8.00E-03		
Plants in impacted water	Bq/g wet	apc	4.25E-04	5.19E-03	8.73E-04	1.20E-02	1.60E-02		
Benthic Invertebrates									
Water-to-benthos biocon m3/gwet		bcfbi	7.13E-04	5.95E-05	9.70E-04	2.20E-04	1.52E-03		<<<< input transfer factor
Benthos in bkgd water	Bq/g wet	bicb	8.77E-03	3.57E-04	3.88E-03	2.42E-03	7.60E-03		
Benthos in impacted water	Bq/g wet	bic	5.54E-03	6.71E-04	7.06E-03	4.41E-03	1.52E-02		
Absorbed Doses - Fish									
Internal Dose Factor	mGy/d per Bq	Idc	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadfb	8.38E-07	1.42E-05	5.91E-05	5.64E-06	9.25E-05	1.7E-04	'=fcb*Idc
Internal dose impacted	mGy/d	Iadf	5.30E-07	2.67E-05	1.08E-04	1.03E-05	1.86E-04	3.3E-04	'=fc*Idc
Ext. dose factor	mGy/d per Bq	Edc	8.57E-03	2.93E-05	3.68E-02	2.50E-03	1.40E-07		
Ext. dose bkgd pelagic	mGy/d	Eadfb	1.05E-07	1.76E-10	1.47E-07	2.75E-08	7.00E-13	2.8E-07	'=wcb*Edc/1000000
Ext. dose impacted pelagic	mGy/d	Eadf	6.66E-08	3.30E-10	2.68E-07	5.01E-08	1.40E-12	3.8E-07	'=wc*Edc/1000000
Ext. dose bkgd benthic	mGy/d	Eadfbenb	1.42E-04	5.86E-07	7.36E-04	1.25E-04	7.00E-09	1.0E-03	'=Edc*((wcb/1000000+sedwcb)/2
Ext. dose impacted benthic	mGy/d	Eadfben	1.51E-04	6.96E-07	9.92E-04	1.52E-04	8.12E-09	1.3E-03	'=Edc*((wc/1000000+sedwc)/2
Total dose - pelagic bkgd	mGy/d	Tadfbp	9.44E-07	1.42E-05	5.93E-05	5.67E-06	9.25E-05	1.7E-04	'=Iadfb+Eadfb
- pelagic impact	mGy/d	Tadfp	5.96E-07	2.67E-05	1.08E-04	1.03E-05	1.86E-04	3.3E-04	'=Iadf+Eadf
Total dose - benthic bkgd	mGy/d	Tadfbenb	1.43E-04	1.48E-05	7.95E-04	1.31E-04	9.25E-05	1.2E-03	'=Iadfb+Eadfbenb
- benthic impact	mGy/d	Tadfben	1.52E-04	2.74E-05	1.10E-03	1.62E-04	1.86E-04	1.6E-03	'=Iadf+Eadfben

Table H.1-1

Aquatic Dose Calculations

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Absorbed Doses - Aquatic Plants									
Internal Dose Factor	mGy/d per Bq	Idcfap	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadapb	9.55E-05	1.82E-04	7.63E-05	3.98E-05	5.92E-04	9.9E-04	'=apcb*Idcfap
Internal dose impacted	mGy/d	Iadap	6.03E-05	3.41E-04	1.39E-04	7.25E-05	1.19E-03	1.8E-03	'=apc*Idcfap
Ext. dose factor aq plan	mGy/d per Bq	Edcfap	1.29E-02	2.25E-04	3.67E-02	6.03E-03	1.10E-07		
Ext. dose to leaf bkgd	mGy/d	Eadpwb	1.59E-07	1.35E-09	1.47E-07	6.63E-08	5.50E-13	3.7E-07	'=wcb*Edcfap/1000000
Ext. dose to leaf impact	mGy/d	Eadpw	1.00E-07	2.54E-09	2.67E-07	1.21E-07	1.10E-12	4.9E-07	'=wc*Edcfap/1000000
Ext. dose to root bkgd	mGy/d	Eadpsb	4.28E-04	9.00E-06	1.47E-03	6.03E-04	1.10E-08	2.5E-03	'=sedwcb*Edcfap
Ext. dose to root impact	mGy/d	Eadps	4.55E-04	1.07E-05	1.98E-03	7.31E-04	1.28E-08	3.2E-03	'=sedwc*Edcfap
Total dose - leaf bkgd	mGy/d	Tadaplb	9.57E-05	1.82E-04	7.65E-05	3.99E-05	5.92E-04	9.9E-04	'=Iadapb+Eadpwb
- leaf impacted	mGy/d	Tadapl	6.05E-05	3.41E-04	1.39E-04	7.27E-05	1.19E-03	1.8E-03	'=Iadap+Eadpw
Total dose - root bkgd	mGy/d	Tadaprb	5.24E-04	1.91E-04	1.54E-03	6.43E-04	5.92E-04	3.5E-03	'=Iadapb+Eadpsb
- root impacted	mGy/d	Tadapr	5.15E-04	3.52E-04	2.12E-03	8.04E-04	1.19E-03	5.0E-03	'=Iadap+Eadps
Absorbed Doses - Benthic Invertebrates									
Internal Dose Factor	mGy/d per Bq	Idcfbi	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadbib	1.25E-03	2.35E-05	6.17E-04	1.46E-05	5.62E-04	2.5E-03	'=bicb*Idcfbi
Internal dose impacted	mGy/d	Iadbi	7.87E-04	4.41E-05	1.12E-03	2.66E-05	1.13E-03	3.1E-03	'=bic*Idcfbi
Ext. dose factor ben inv	mGy/d per Bq	Edcfbi	1.29E-02	2.25E-04	3.67E-02	6.03E-03	1.10E-07		
Ext. dose bkgd sedimer	mGy/d	Eadbenb	4.28E-04	9.00E-06	1.47E-03	6.03E-04	1.10E-08	2.5E-03	'=sedwcb*Edcfbi
Ext. dose impacted sedi	mGy/d	Eadben	4.55E-04	1.07E-05	1.98E-03	7.31E-04	1.28E-08	3.2E-03	'=sedwc*Edcfbi
Total dose - bkgd	mGy/d	Tadbenb	1.67E-03	3.25E-05	2.08E-03	6.18E-04	5.62E-04	5.0E-03	'=Iadbib+Eadbenb
Total dose - impacted	mGy/d	Tadben	1.24E-03	5.48E-05	3.10E-03	7.58E-04	1.13E-03	6.3E-03	'=Iadbi+Eadben
Equivalent Doses - Fish									
RBE for alpha	Sv/Gy	RBEf	10						
Total dose - pelagic bkg	mSv/d	Tedfpb	8.49E-06	1.42E-04	5.92E-04	5.67E-06	9.25E-04	1.7E-03	'=Iadfb*RBEf+Eadfb
- pelagic impact	mSv/d	Tedfp	5.36E-06	2.67E-04	1.08E-03	1.03E-05	1.86E-03	3.2E-03	'=Iadf*RBEf+Eadf
Total dose - benthic bkg	mSv/d	Tedfbenb	1.51E-04	1.43E-04	1.33E-03	1.31E-04	9.25E-04	2.7E-03	'=Iadfb*RBEf+Eadfbenb
- benthic impact	mSv/d	Tedfben	1.56E-04	2.68E-04	2.07E-03	1.62E-04	1.86E-03	4.5E-03	'=Iadf*RBEf+Eadfben
Equivalent Doses - Aquatic Plants									
RBE for alpha	Sv/Gy	RBEap	10						
Total dose - leaf bkgd	mSv/d	Tedaplb	9.56E-04	1.82E-03	7.63E-04	3.99E-05	5.92E-03	9.5E-03	'=Iadapb*RBEap+Eadpwb
- leaf impacted	mSv/d	Tedapl	6.04E-04	3.41E-03	1.39E-03	7.27E-05	1.19E-02	1.7E-02	'=Iadap*RBEap+Eadpw
Total dose - root bkgd	mSv/d	Tedaprb	1.38E-03	1.83E-03	2.23E-03	6.43E-04	5.92E-03	1.2E-02	'=Iadapb*RBEap+Eadpsb
- root impacted	mSv/d	Tedapr	1.06E-03	3.42E-03	3.37E-03	8.04E-04	1.19E-02	2.1E-02	'=Iadap*RBEap+Eadps

Table H.1-1

Aquatic Dose Calculations

Equivalent Doses - Benthic Invertebrates

RBE for alpha	Sv/Gy	RBEbi	10							
Total dose - bkgd	mSv/d	Tedbenb	1.29E-02	2.44E-04	7.64E-03	6.18E-04	5.62E-03	2.7E-02		'=Iadbib*RBEbi+Eadbenb
Total dose - impacted	mSv/d	Tedben	8.32E-03	4.52E-04	1.32E-02	7.58E-04	1.13E-02	3.4E-02		'=Iadbi*RBEbi+Eadben

0.6 Screening Criterion in mGy/d	3 6	Total Absorbed Dose mGy/d	Total Equivalent Dose mSv/d	Index (Absorbed Equivalent Dose)	Index (Absorbed Equivalent Dose)
Pelagic Fish - Background		1.7E-04	1.7E-03	2.9E-04	2.8E-03
Pelagic Fish - Impacted		3.3E-04	3.2E-03	5.5E-04	5.4E-03
Benthic Fish - Background		1.2E-03	2.7E-03	2.0E-03	4.5E-03
Benthic Fish - Impacted		1.6E-03	4.5E-03	2.7E-03	7.5E-03
Aquatic Plant Leaves - Background		9.9E-04	9.5E-03	3.3E-04	3.2E-03
Aquatic Plant Leaves - Impacted		1.8E-03	1.7E-02	6.0E-04	5.8E-03
Aquatic Plant Roots - Background		3.5E-03	1.2E-02	1.2E-03	4.0E-03
Aquatic Plant Roots - Impacted		5.0E-03	2.1E-02	1.7E-03	6.8E-03
Benthic Invertebrates - Background		5.0E-03	2.7E-02	8.3E-04	4.5E-03
Benthic Invertebrates - Impacted		6.3E-03	3.4E-02	1.0E-03	5.7E-03

U-238+	Internal	U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235
	External	U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235 (beta + gamma only)
Ra-226+	Internal	Ra-226 + 0.3* (Rn-222 + ...Po-214)
	External	Ra-226 + 1.0* (Rn-222 + ...Po-214) (beta + gamma only)
Th-232+	Internal	Th-232 + ...Po-212/Tl-208 (Th-232 + Th-228 are inputs)
	External	Th-232 + Po-212/Tl-208
Ra-228+	Internal	Ra-228 + ...Po-212/Tl-208

Table H.1-1
Aquatic Dose Calculations

JSL-6

Determination of Aquatic Dose - Average, RBE 40

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Water									
Background	Bq/m3	wcb	12.30	6.00	4.00	11.00	5.00		
Impacted water body	Bq/m3	wc	4.36	10.6	7.0	19.4	9.0		<<<< input concentrations in water
Sediment									
Background	Bq/g(wet)	sedwcb	3.32E-02	4.00E-02	4.00E-02	1.00E-01	1.00E-01		
Impacted water body	Bq/g(wet)	sedwc	3.41E-02	4.35E-02	4.85E-02	1.12E-01	1.08E-01		<<<< input concentrations in sediment
Fish									
Water-to-fish biocon fa	m3/gwet	bcff	4.80E-07	3.60E-05	9.30E-05	8.50E-05	2.50E-04		<<<< input transfer factor
Fish in bkgd water	Bq/g wet	fc	5.90E-06	2.16E-04	3.72E-04	9.35E-04	1.25E-03		
Fish in impacted water	Bq/g wet	fc	2.09E-06	3.81E-04	6.49E-04	1.65E-03	2.25E-03		
Aquatic Plants									
Water-to-plants biocon m3/gwet		bcfb	5.47E-05	4.6E-04	1.2E-04	6.0E-04	1.6E-03		<<<< input transfer factor
Plants in bkgd water	Bq/g wet	apcb	6.73E-04	2.76E-03	4.80E-04	6.60E-03	8.00E-03		
Plants in impacted water	Bq/g wet	apc	2.39E-04	4.87E-03	8.38E-04	1.16E-02	1.44E-02		
Benthic Invertebrates									
Water-to-benthos biocon m3/gwet		bcfbi	7.13E-04	5.95E-05	9.70E-04	2.20E-04	1.52E-03		<<<< input transfer factor
Benthos in bkgd water	Bq/g wet	bicb	8.77E-03	3.57E-04	3.88E-03	2.42E-03	7.60E-03		
Benthos in impacted water	Bq/g wet	bic	3.11E-03	6.29E-04	6.77E-03	4.27E-03	1.37E-02		
Absorbed Doses - Fish									
Internal Dose Factor	mGy/d per Bq	Idc	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadfb	8.38E-07	1.42E-05	5.91E-05	5.64E-06	9.25E-05	1.7E-04	'=fcb*Ic
Internal dose impacted	mGy/d	Iadf	2.97E-07	2.51E-05	1.03E-04	9.94E-06	1.66E-04	3.0E-04	'=fc*Ic
Ext. dose factor	mGy/d per Bq	Edc	8.57E-03	2.93E-05	3.68E-02	2.50E-03	1.40E-07		
Ext. dose bkgd pelagic	mGy/d	Eadfb	1.05E-07	1.76E-10	1.47E-07	2.75E-08	7.00E-13	2.8E-07	'=wcb*Edc
Ext. dose impacted pelagic	mGy/d	Eadf	3.74E-08	3.10E-10	2.57E-07	4.85E-08	1.26E-12	3.4E-07	'=wc*Edc
Ext. dose bkgd benthic	mGy/d	Eadfbenb	1.42E-04	5.86E-07	7.36E-04	1.25E-04	7.00E-09	1.0E-03	'=Edc*(wcb/1000000+sedwcb)/2
Ext. dose impacted benthic	mGy/d	Eadfben	1.46E-04	6.38E-07	8.92E-04	1.40E-04	7.57E-09	1.2E-03	'=Edc*(wc/1000000+sedwc)/2
Total dose - pelagic bkgd	mGy/d	Tadfbp	9.44E-07	1.42E-05	5.93E-05	5.67E-06	9.25E-05	1.7E-04	'=Iadfb+Eadfb
- pelagic impact	mGy/d	Tadfp	3.35E-07	2.51E-05	1.04E-04	9.99E-06	1.66E-04	3.1E-04	'=Iadf+Eadf
Total dose - benthic bkgd	mGy/d	Tadfbenb	1.43E-04	1.48E-05	7.95E-04	1.31E-04	9.25E-05	1.2E-03	'=Iadfb+Eadfbenb
- benthic impact	mGy/d	Tadfben	1.47E-04	2.57E-05	9.95E-04	1.50E-04	1.66E-04	1.5E-03	'=Iadf+Eadfben

Table H.1-1

Aquatic Dose Calculations

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Absorbed Doses - Aquatic Plants									
Internal Dose Factor	mGy/d per Bq	Idcfap	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadapb	9.55E-05	1.82E-04	7.63E-05	3.98E-05	5.92E-04	9.9E-04	'=apcb*Idcfap
Internal dose impacted	mGy/d	Iadap	3.39E-05	3.20E-04	1.33E-04	7.02E-05	1.06E-03	1.6E-03	'=apc*Idcfap
Ext. dose factor aq plan	mGy/d per Bq	Edcfap	1.29E-02	2.25E-04	3.67E-02	6.03E-03	1.10E-07		
Ext. dose to leaf bkgd	mGy/d	Eadpwb	1.59E-07	1.35E-09	1.47E-07	6.63E-08	5.50E-13	3.7E-07	'=wcb*Edcfap/1000000
Ext. dose to leaf impact	mGy/d	Eadpw	5.63E-08	2.38E-09	2.56E-07	1.17E-07	9.88E-13	4.3E-07	'=wc*Edcfap/1000000
Ext. dose to root bkgd	mGy/d	Eadpsb	4.28E-04	9.00E-06	1.47E-03	6.03E-04	1.10E-08	2.5E-03	'=sedwcb*Edcfap
Ext. dose to root impact	mGy/d	Eadps	4.40E-04	9.79E-06	1.78E-03	6.73E-04	1.19E-08	2.9E-03	'=sedwc*Edcfap
Total dose - leaf bkgd	mGy/d	Tadaplb	9.57E-05	1.82E-04	7.65E-05	3.99E-05	5.92E-04	9.9E-04	'=Iadapb+Eadpwb
- leaf impacted	mGy/d	Tadapl	3.39E-05	3.20E-04	1.33E-04	7.03E-05	1.06E-03	1.6E-03	'=Iadap+Eadpw
Total dose - root bkgd	mGy/d	Tadaprb	5.24E-04	1.91E-04	1.54E-03	6.43E-04	5.92E-04	3.5E-03	'=Iadapb+Eadpsb
- root impacted	mGy/d	Tadapr	4.74E-04	3.30E-04	1.91E-03	7.43E-04	1.06E-03	4.5E-03	'=Iadap+Eadps
Absorbed Doses - Benthic Invertebrates									
Internal Dose Factor	mGy/d per Bq	Idcfbi	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadbib	1.25E-03	2.35E-05	6.17E-04	1.46E-05	5.62E-04	2.5E-03	'=bicb*Idcfbi
Internal dose impacted	mGy/d	Iadbi	4.41E-04	4.14E-05	1.08E-03	2.57E-05	1.01E-03	2.6E-03	'=bic*Idcfbi
Ext. dose factor ben inv	mGy/d per Bq	Edcfbi	1.29E-02	2.25E-04	3.67E-02	6.03E-03	1.10E-07		
Ext. dose bkgd sedimer	mGy/d	Eadbenb	4.28E-04	9.00E-06	1.47E-03	6.03E-04	1.10E-08	2.5E-03	'=sedwcb*Edcfbi
Ext. dose impacted sedi	mGy/d	Eadben	4.40E-04	9.79E-06	1.78E-03	6.73E-04	1.19E-08	2.9E-03	'=sedwc*Edcfbi
Total dose - bkgd	mGy/d	Tadbenb	1.67E-03	3.25E-05	2.08E-03	6.18E-04	5.62E-04	5.0E-03	'=Iadbib+Eadbenb
Total dose - impacted	mGy/d	Tadben	8.82E-04	5.12E-05	2.86E-03	6.99E-04	1.01E-03	5.5E-03	'=Iadbi+Eadben
Equivalent Doses - Fish									
RBE for alpha	Sv/Gy	RBEf	40						
Total dose - pelagic bkg	mSv/d	Tedfpb	3.36E-05	5.69E-04	2.37E-03	5.67E-06	3.70E-03	6.7E-03	'=Iadfb*RBEf+Eadfb
- pelagic impact	mSv/d	Tedfp	1.19E-05	1.00E-03	4.13E-03	3.98E-04	6.65E-03	1.2E-02	'=Iadf*RBEf+Eadf
Total dose - benthic bkg	mSv/d	Tedfbenb	1.76E-04	5.69E-04	3.10E-03	1.31E-04	3.70E-03	7.7E-03	'=Iadfb*RBEf+Eadfbenb
- benthic impact	mSv/d	Tedfben	1.58E-04	1.00E-03	5.02E-03	5.37E-04	6.65E-03	1.3E-02	'=Iadf*RBEf+Eadfben
Equivalent Doses - Aquatic Plants									
RBE for alpha	Sv/Gy	RBEap	40						
Total dose - leaf bkgd	mSv/d	Tedaplb	3.82E-03	7.26E-03	3.05E-03	3.99E-05	2.37E-02	3.8E-02	'=Iadapb*RBEap+Eadpwb
- leaf impacted	mSv/d	Tedapl	1.35E-03	1.28E-02	5.33E-03	2.81E-03	4.25E-02	6.5E-02	'=Iadap*RBEap+Eadpw
Total dose - root bkgd	mSv/d	Tedaprb	4.25E-03	7.27E-03	4.52E-03	6.43E-04	2.37E-02	4.0E-02	'=Iadapb*RBEap+Eadpsb
- root impacted	mSv/d	Tedapr	1.80E-03	1.28E-02	7.11E-03	3.48E-03	4.25E-02	6.8E-02	'=Iadap*RBEap+Eadps

Table H.1-1

Aquatic Dose Calculations

Equivalent Doses - Benthic Invertebrates

RBE for alpha	Sv/Gy	RBEbi	40							
Total dose - bkgd	mSv/d	Tedbenb	1.29E-02	2.44E-04	7.64E-03	6.18E-04	5.62E-03	2.7E-02		'=Iadbib*RBEbi+Eadbenb
Total dose - impacted	mSv/d	Tedben	1.81E-02	9.79E-06	1.78E-03	6.73E-04	1.19E-08	2.1E-02		'=Iadbi*RBEbi+Eadben

0.6 Screening Criterion in mGy/d	3 6	Total Absorbed Dose mGy/d	Total Equivalent Dose mSv/d	Index (Absorbed Equivalent Dose)	Index (Absorbed Equivalent Dose)
Pelagic Fish - Background		1.7E-04	6.7E-03	2.9E-04	1.1E-02
Pelagic Fish - Impacted		3.1E-04	1.2E-02	5.1E-04	2.0E-02
Benthic Fish - Background		1.2E-03	7.7E-03	2.0E-03	1.3E-02
Benthic Fish - Impacted		1.5E-03	1.3E-02	2.5E-03	2.2E-02
Aquatic Plant Leaves - Background		9.9E-04	3.8E-02	3.3E-04	1.3E-02
Aquatic Plant Leaves - Impacted		1.6E-03	6.5E-02	5.4E-04	2.2E-02
Aquatic Plant Roots - Background		3.5E-03	4.0E-02	1.2E-03	1.3E-02
Aquatic Plant Roots - Impacted		4.5E-03	6.8E-02	1.5E-03	2.3E-02
Benthic Invertebrates - Background		5.0E-03	2.7E-02	8.3E-04	4.5E-03
Benthic Invertebrates - Impacted		5.5E-03	2.1E-02	9.2E-04	3.4E-03

U-238+	Internal	U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235
	External	U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235 (beta + gamma only)
Ra-226+	Internal	Ra-226 + 0.3* (Rn-222 + ...Po-214)
	External	Ra-226 + 1.0* (Rn-222 + ...Po-214) (beta + gamma only)
Th-232+	Internal	Th-232 + ...Po-212/Tl-208 (Th-232 + Th-228 are inputs)
	External	Th-232 + Po-212/Tl-208
Ra-228+	Internal	Ra-228 + ...Po-212/Tl-208

Table H.1-1
Aquatic Dose Calculations

JSL-6

Determination of Aquatic Dose - 95th Percentile, RBE 40

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Water									
Background	Bq/m3	wcb	12.30	6.00	4.00	11.00	5.00		
Impacted water body	Bq/m3	wc	7.77	11.3	7.3	20.0	10.0		<<<< input concentrations in water
Sediment									
Background	Bq/g(wet)	sedwcb	3.32E-02	4.00E-02	4.00E-02	1.00E-01	1.00E-01		
Impacted water body	Bq/g(wet)	sedwc	3.52E-02	4.75E-02	5.39E-02	1.21E-01	1.16E-01		<<<< input concentrations in sediment
Fish									
Water-to-fish biocon fa	m3/gwet	bcff	4.80E-07	3.60E-05	9.30E-05	8.50E-05	2.50E-04		<<<< input transfer factor
Fish in bkgd water	Bq/g wet	fc	5.90E-06	2.16E-04	3.72E-04	9.35E-04	1.25E-03		
Fish in impacted water	Bq/g wet	fc	3.73E-06	4.06E-04	6.77E-04	1.70E-03	2.51E-03		
Aquatic Plants									
Water-to-plants biocon	m3/gwet	bcfb	5.47E-05	4.6E-04	1.2E-04	6.0E-04	1.6E-03		<<<< input transfer factor
Plants in bkgd water	Bq/g wet	apcb	6.73E-04	2.76E-03	4.80E-04	6.60E-03	8.00E-03		
Plants in impacted water	Bq/g wet	apc	4.25E-04	5.19E-03	8.73E-04	1.20E-02	1.60E-02		
Benthic Invertebrates									
Water-to-benthos biocon	m3/gwet	bcfbi	7.13E-04	5.95E-05	9.70E-04	2.20E-04	1.52E-03		<<<< input transfer factor
Benthos in bkgd water	Bq/g wet	bicb	8.77E-03	3.57E-04	3.88E-03	2.42E-03	7.60E-03		
Benthos in impacted water	Bq/g wet	bic	5.54E-03	6.71E-04	7.06E-03	4.41E-03	1.52E-02		
Absorbed Doses - Fish									
Internal Dose Factor	mGy/d per Bq	Idc	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadfb	8.38E-07	1.42E-05	5.91E-05	5.64E-06	9.25E-05	1.7E-04	'=fcb*Idc
Internal dose impacted	mGy/d	Iadf	5.30E-07	2.67E-05	1.08E-04	1.03E-05	1.86E-04	3.3E-04	'=fc*Idc
Ext. dose factor	mGy/d per Bq	Edc	8.57E-03	2.93E-05	3.68E-02	2.50E-03	1.40E-07		
Ext. dose bkgd pelagic	mGy/d	Eadfb	1.05E-07	1.76E-10	1.47E-07	2.75E-08	7.00E-13	2.8E-07	'=wcb*Edc/1000000
Ext. dose impacted pelagic	mGy/d	Eadf	6.66E-08	3.30E-10	2.68E-07	5.01E-08	1.40E-12	3.8E-07	'=wc*Edc/1000000
Ext. dose bkgd benthic	mGy/d	Eadfbenb	1.42E-04	5.86E-07	7.36E-04	1.25E-04	7.00E-09	1.0E-03	'=Edc*((wcb/1000000+sedwcb)/2
Ext. dose impacted benthic	mGy/d	Eadfben	1.51E-04	6.96E-07	9.92E-04	1.52E-04	8.12E-09	1.3E-03	'=Edc*((wc/1000000+sedwc)/2
Total dose - pelagic bkgd	mGy/d	Tadfbp	9.44E-07	1.42E-05	5.93E-05	5.67E-06	9.25E-05	1.7E-04	'=Iadfb+Eadfb
- pelagic impact	mGy/d	Tadfp	5.96E-07	2.67E-05	1.08E-04	1.03E-05	1.86E-04	3.3E-04	'=Iadf+Eadf
Total dose - benthic bkgd	mGy/d	Tadfbenb	1.43E-04	1.48E-05	7.95E-04	1.31E-04	9.25E-05	1.2E-03	'=Iadfb+Eadfbenb
- benthic impact	mGy/d	Tadfben	1.52E-04	2.74E-05	1.10E-03	1.62E-04	1.86E-04	1.6E-03	'=Iadf+Eadfben

Table H.1-1

Aquatic Dose Calculations

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Absorbed Doses - Aquatic Plants									
Internal Dose Factor	mGy/d per Bq	Idcfap	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadapb	9.55E-05	1.82E-04	7.63E-05	3.98E-05	5.92E-04	9.9E-04	'=apcb*Idcfap
Internal dose impacted	mGy/d	Iadap	6.03E-05	3.41E-04	1.39E-04	7.25E-05	1.19E-03	1.8E-03	'=apc*Idcfap
Ext. dose factor aq plan	mGy/d per Bq	Edcfap	1.29E-02	2.25E-04	3.67E-02	6.03E-03	1.10E-07		
Ext. dose to leaf bkgd	mGy/d	Eadpwb	1.59E-07	1.35E-09	1.47E-07	6.63E-08	5.50E-13	3.7E-07	'=wcb*Edcfap/1000000
Ext. dose to leaf impact	mGy/d	Eadpw	1.00E-07	2.54E-09	2.67E-07	1.21E-07	1.10E-12	4.9E-07	'=wc*Edcfap/1000000
Ext. dose to root bkgd	mGy/d	Eadpsb	4.28E-04	9.00E-06	1.47E-03	6.03E-04	1.10E-08	2.5E-03	'=sedwcb*Edcfap
Ext. dose to root impact	mGy/d	Eadps	4.55E-04	1.07E-05	1.98E-03	7.31E-04	1.28E-08	3.2E-03	'=sedwc*Edcfap
Total dose - leaf bkgd	mGy/d	Tadaplb	9.57E-05	1.82E-04	7.65E-05	3.99E-05	5.92E-04	9.9E-04	'=Iadapb+Eadpwb
- leaf impacted	mGy/d	Tadapl	6.05E-05	3.41E-04	1.39E-04	7.27E-05	1.19E-03	1.8E-03	'=Iadap+Eadpw
Total dose - root bkgd	mGy/d	Tadaprb	5.24E-04	1.91E-04	1.54E-03	6.43E-04	5.92E-04	3.5E-03	'=Iadapb+Eadpsb
- root impacted	mGy/d	Tadapr	5.15E-04	3.52E-04	2.12E-03	8.04E-04	1.19E-03	5.0E-03	'=Iadap+Eadps
Absorbed Doses - Benthic Invertebrates									
Internal Dose Factor	mGy/d per Bq	Idcfbi	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadbib	1.25E-03	2.35E-05	6.17E-04	1.46E-05	5.62E-04	2.5E-03	'=bicb*Idcfbi
Internal dose impacted	mGy/d	Iadbi	7.87E-04	4.41E-05	1.12E-03	2.66E-05	1.13E-03	3.1E-03	'=bic*Idcfbi
Ext. dose factor ben inv	mGy/d per Bq	Edcfbi	1.29E-02	2.25E-04	3.67E-02	6.03E-03	1.10E-07		
Ext. dose bkgd sedimer	mGy/d	Eadbenb	4.28E-04	9.00E-06	1.47E-03	6.03E-04	1.10E-08	2.5E-03	'=sedwcb*Edcfbi
Ext. dose impacted sedi	mGy/d	Eadben	4.55E-04	1.07E-05	1.98E-03	7.31E-04	1.28E-08	3.2E-03	'=sedwc*Edcfbi
Total dose - bkgd	mGy/d	Tadbenb	1.67E-03	3.25E-05	2.08E-03	6.18E-04	5.62E-04	5.0E-03	'=Iadbib+Eadbenb
Total dose - impacted	mGy/d	Tadben	1.24E-03	5.48E-05	3.10E-03	7.58E-04	1.13E-03	6.3E-03	'=Iadbi+Eadben
Equivalent Doses - Fish									
RBE for alpha	Sv/Gy	RBEf	40						
Total dose - pelagic bkg	mSv/d	Tedfpb	3.36E-05	5.69E-04	2.37E-03	5.67E-06	3.70E-03	6.7E-03	'=Iadfb*RBEf+Eadfb
- pelagic impact	mSv/d	Tedfp	2.12E-05	1.07E-03	4.30E-03	1.03E-05	7.42E-03	1.3E-02	'=Iadf*RBEf+Eadf
Total dose - benthic bkg	mSv/d	Tedfbenb	1.76E-04	5.69E-04	3.10E-03	1.31E-04	3.70E-03	7.7E-03	'=Iadfb*RBEf+Eadfbenb
- benthic impact	mSv/d	Tedfben	1.72E-04	1.07E-03	5.30E-03	1.62E-04	7.42E-03	1.4E-02	'=Iadf*RBEf+Eadfben
Equivalent Doses - Aquatic Plants									
RBE for alpha	Sv/Gy	RBEap	40						
Total dose - leaf bkgd	mSv/d	Tedaplb	3.82E-03	7.26E-03	3.05E-03	3.99E-05	2.37E-02	3.8E-02	'=Iadapb*RBEap+Eadpwb
- leaf impacted	mSv/d	Tedapl	2.41E-03	1.37E-02	5.55E-03	7.27E-05	4.75E-02	6.9E-02	'=Iadap*RBEap+Eadpw
Total dose - root bkgd	mSv/d	Tedaprb	4.25E-03	7.27E-03	4.52E-03	6.43E-04	2.37E-02	4.0E-02	'=Iadapb*RBEap+Eadpsb
- root impacted	mSv/d	Tedapr	2.87E-03	1.37E-02	7.53E-03	8.04E-04	4.75E-02	7.2E-02	'=Iadap*RBEap+Eadps

Table H.1-1

Aquatic Dose Calculations

Equivalent Doses - Benthic Invertebrates

RBE for alpha	Sv/Gy	RBEbi	40							
Total dose - bkgd	mSv/d	Tedbenb	5.02E-02	9.49E-04	2.61E-02	6.18E-04	2.25E-02	1.0E-01		'=Iadbib*RBEbi+Eadbenb
Total dose - impacted	mSv/d	Tedben	3.19E-02	1.78E-03	4.69E-02	7.58E-04	4.51E-02	1.3E-01		'=Iadbi*RBEbi+Eadben

0.6 Screening Criterion in mGy/d	3 6	Total Absorbed Dose mGy/d	Total Equivalent Dose mSv/d	Index (Absorbed Equivalent Dose)	Index (Absorbed Equivalent Dose)
Pelagic Fish - Background		1.7E-04	6.7E-03	2.9E-04	1.1E-02
Pelagic Fish - Impacted		3.3E-04	1.3E-02	5.5E-04	2.1E-02
Benthic Fish - Background		1.2E-03	7.7E-03	2.0E-03	1.3E-02
Benthic Fish - Impacted		1.6E-03	1.4E-02	2.7E-03	2.4E-02
Aquatic Plant Leaves - Background		9.9E-04	3.8E-02	3.3E-04	1.3E-02
Aquatic Plant Leaves - Impacted		1.8E-03	6.9E-02	6.0E-04	2.3E-02
Aquatic Plant Roots - Background		3.5E-03	4.0E-02	1.2E-03	1.3E-02
Aquatic Plant Roots - Impacted		5.0E-03	7.2E-02	1.7E-03	2.4E-02
Benthic Invertebrates - Background		5.0E-03	1.0E-01	8.3E-04	1.7E-02
Benthic Invertebrates - Impacted		6.3E-03	1.3E-01	1.0E-03	2.1E-02

U-238+	Internal	U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235
	External	U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235 (beta + gamma only)
Ra-226+	Internal	Ra-226 + 0.3* (Rn-222 + ...Po-214)
	External	Ra-226 + 1.0* (Rn-222 + ...Po-214) (beta + gamma only)
Th-232+	Internal	Th-232 + ...Po-212/Tl-208 (Th-232 + Th-228 are inputs)
	External	Th-232 + Po-212/Tl-208
Ra-228+	Internal	Ra-228 + ...Po-212/Tl-208

Table H.1-1
Aquatic Dose Calculations

JSL-7

Determination of Aquatic Dose - Average, RBE 10

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Water									
Background	Bq/m3	wcb	12.30	6.00	4.00	11.00	5.00		
Impacted water body	Bq/m3	wc	17.77	40.3	26.6	74.3	34.2		<<<< input concentrations in water
Sediment									
Background	Bq/g(wet)	sedwcb	3.32E-02	4.00E-02	4.00E-02	1.00E-01	1.00E-01		
Impacted water body	Bq/g(wet)	sedwc	3.50E-02	4.63E-02	5.38E-02	1.21E-01	1.16E-01		<<<< input concentrations in sediment
Fish									
Water-to-fish biocon fa	m3/gwet	bcff	4.80E-07	3.60E-05	9.30E-05	8.50E-05	2.50E-04		<<<< input transfer factor
Fish in bkgd water	Bq/g wet	fc	5.90E-06	2.16E-04	3.72E-04	9.35E-04	1.25E-03		
Fish in impacted water	Bq/g wet	fc	8.53E-06	1.45E-03	2.47E-03	6.31E-03	8.54E-03		
Aquatic Plants									
Water-to-plants biocon	m3/gwet	bcfb	5.47E-05	4.6E-04	1.2E-04	6.0E-04	1.6E-03		<<<< input transfer factor
Plants in bkgd water	Bq/g wet	apcb	6.73E-04	2.76E-03	4.80E-04	6.60E-03	8.00E-03		
Plants in impacted water	Bq/g wet	apc	9.72E-04	1.85E-02	3.19E-03	4.46E-02	5.47E-02		
Benthic Invertebrates									
Water-to-benthos bioco	m3/gwet	bcfbi	7.13E-04	5.95E-05	9.70E-04	2.20E-04	1.52E-03		<<<< input transfer factor
Benthos in bkgd water	Bq/g wet	bicb	8.77E-03	3.57E-04	3.88E-03	2.42E-03	7.60E-03		
Benthos in impacted water	Bq/g wet	bic	1.27E-02	2.40E-03	2.58E-02	1.63E-02	5.19E-02		
Absorbed Doses - Fish									
Internal Dose Factor	mGy/d per Bq	Idcff	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadfb	8.38E-07	1.42E-05	5.91E-05	5.64E-06	9.25E-05	1.7E-04	'=fcb*Idcff
Internal dose impacted	mGy/d	Iadf	1.21E-06	9.55E-05	3.93E-04	3.81E-05	6.32E-04	1.2E-03	'=fc*Idcff
Ext. dose factor	mGy/d per Bq	Edcff	8.57E-03	2.93E-05	3.68E-02	2.50E-03	1.40E-07		
Ext. dose bkgd pelagic	mGy/d	Eadfb	1.05E-07	1.76E-10	1.47E-07	2.75E-08	7.00E-13	2.8E-07	'=wcb*Edcff/1000000
Ext. dose impacted pelagic	mGy/d	Eadf	1.52E-07	1.18E-09	9.78E-07	1.86E-07	4.78E-12	1.3E-06	'=wc*Edcff/1000000
Ext. dose bkgd benthic	mGy/d	Eadfbenb	1.42E-04	5.86E-07	7.36E-04	1.25E-04	7.00E-09	1.0E-03	'=Edcff*(wcb/1000000+sedwcb)/2
Ext. dose impacted benthic	mGy/d	Eadfben	1.50E-04	6.78E-07	9.91E-04	1.52E-04	8.15E-09	1.3E-03	'=Edcff*(wc/1000000+sedwc)/2
Total dose - pelagic bkgd	mGy/d	Tadfbp	9.44E-07	1.42E-05	5.93E-05	5.67E-06	9.25E-05	1.7E-04	'=Iadfb+Eadfb
- pelagic impact	mGy/d	Tadfp	1.36E-06	9.55E-05	3.94E-04	3.83E-05	6.32E-04	1.2E-03	'=Iadf+Eadf
Total dose - benthic bkgd	mGy/d	Tadfbenb	1.43E-04	1.48E-05	7.95E-04	1.31E-04	9.25E-05	1.2E-03	'=Iadfb+Eadfbenb
- benthic impact	mGy/d	Tadfben	1.51E-04	9.61E-05	1.38E-03	1.90E-04	6.32E-04	2.5E-03	'=Iadf+Eadfben

Table H.1-1

Aquatic Dose Calculations

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Absorbed Doses - Aquatic Plants									
Internal Dose Factor	mGy/d per Bq	Idcfap	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadapb	9.55E-05	1.82E-04	7.63E-05	3.98E-05	5.92E-04	9.9E-04	'=apcb*Idcfap
Internal dose impacted	mGy/d	Iadap	1.38E-04	1.22E-03	5.07E-04	2.69E-04	4.04E-03	6.2E-03	'=apc*Idcfap
Ext. dose factor aq plan	mGy/d per Bq	Edcfap	1.29E-02	2.25E-04	3.67E-02	6.03E-03	1.10E-07		
Ext. dose to leaf bkgd	mGy/d	Eadpwb	1.59E-07	1.35E-09	1.47E-07	6.63E-08	5.50E-13	3.7E-07	'=wcb*Edcfap/1000000
Ext. dose to leaf impact	mGy/d	Eadpw	2.29E-07	9.07E-09	9.76E-07	4.48E-07	3.76E-12	1.7E-06	'=wc*Edcfap/1000000
Ext. dose to root bkgd	mGy/d	Eadpsb	4.28E-04	9.00E-06	1.47E-03	6.03E-04	1.10E-08	2.5E-03	'=sedwcb*Edcfap
Ext. dose to root impact	mGy/d	Eadps	4.51E-04	1.04E-05	1.98E-03	7.33E-04	1.28E-08	3.2E-03	'=sedwc*Edcfap
Total dose - leaf bkgd	mGy/d	Tadaplb	9.57E-05	1.82E-04	7.65E-05	3.99E-05	5.92E-04	9.9E-04	'=Iadapb+Eadpwb
- leaf impacted	mGy/d	Tadapl	1.38E-04	1.22E-03	5.08E-04	2.69E-04	4.04E-03	6.2E-03	'=Iadap+Eadpw
Total dose - root bkgd	mGy/d	Tadaprb	5.24E-04	1.91E-04	1.54E-03	6.43E-04	5.92E-04	3.5E-03	'=Iadapb+Eadpsb
- root impacted	mGy/d	Tadapr	5.89E-04	1.23E-03	2.48E-03	1.00E-03	4.04E-03	9.3E-03	'=Iadap+Eadps
Absorbed Doses - Benthic Invertebrates									
Internal Dose Factor	mGy/d per Bq	Idcfbi	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadbib	1.25E-03	2.35E-05	6.17E-04	1.46E-05	5.62E-04	2.5E-03	'=bicb*Idcfbi
Internal dose impacted	mGy/d	Iadbi	1.80E-03	1.58E-04	4.10E-03	9.85E-05	3.84E-03	1.0E-02	'=bic*Idcfbi
Ext. dose factor ben inv	mGy/d per Bq	Edcfbi	1.29E-02	2.25E-04	3.67E-02	6.03E-03	1.10E-07		
Ext. dose bkgd sedimer	mGy/d	Eadbenb	4.28E-04	9.00E-06	1.47E-03	6.03E-04	1.10E-08	2.5E-03	'=sedwcb*Edcfbi
Ext. dose impacted sedi	mGy/d	Eadben	4.51E-04	1.04E-05	1.98E-03	7.33E-04	1.28E-08	3.2E-03	'=sedwc*Edcfbi
Total dose - bkgd	mGy/d	Tadbenb	1.67E-03	3.25E-05	2.08E-03	6.18E-04	5.62E-04	5.0E-03	'=Iadbib+Eadbenb
Total dose - impacted	mGy/d	Tadben	2.25E-03	1.68E-04	6.08E-03	8.31E-04	3.84E-03	1.3E-02	'=Iadbi+Eadben
Equivalent Doses - Fish									
RBE for alpha	Sv/Gy	RBEf	10						
Total dose - pelagic bkg	mSv/d	Tedfpb	8.49E-06	1.42E-04	5.92E-04	5.67E-06	9.25E-04	1.7E-03	'=Iadfb*RBEf+Eadfb
- pelagic impact	mSv/d	Tedfp	1.23E-05	9.55E-04	3.93E-03	3.81E-04	6.32E-03	1.2E-02	'=Iadf*RBEf+Eadf
Total dose - benthic bkg	mSv/d	Tedfbenb	1.51E-04	1.43E-04	1.33E-03	1.31E-04	9.25E-04	2.7E-03	'=Iadfb*RBEf+Eadfbenb
- benthic impact	mSv/d	Tedfben	1.62E-04	9.55E-04	4.92E-03	5.33E-04	6.32E-03	1.3E-02	'=Iadf*RBEf+Eadfben
Equivalent Doses - Aquatic Plants									
RBE for alpha	Sv/Gy	RBEap	10						
Total dose - leaf bkgd	mSv/d	Tedaplb	9.56E-04	1.82E-03	7.63E-04	3.99E-05	5.92E-03	9.5E-03	'=Iadapb*RBEap+Eadpwb
- leaf impacted	mSv/d	Tedapl	1.38E-03	1.22E-02	5.07E-03	2.69E-03	4.04E-02	6.2E-02	'=Iadap*RBEap+Eadpw
Total dose - root bkgd	mSv/d	Tedaprb	1.38E-03	1.83E-03	2.23E-03	6.43E-04	5.92E-03	1.2E-02	'=Iadapb*RBEap+Eadpsb
- root impacted	mSv/d	Tedapr	1.83E-03	1.22E-02	7.05E-03	3.42E-03	4.04E-02	6.5E-02	'=Iadap*RBEap+Eadps

Table H.1-1

Aquatic Dose Calculations

Equivalent Doses - Benthic Invertebrates

RBE for alpha	Sv/Gy	RBEbi	10							
Total dose - bkgd	mSv/d	Tedbenb	1.29E-02	2.44E-04	7.64E-03	6.18E-04	5.62E-03	2.7E-02		'=Iadbib*RBEbi+Eadbenb
Total dose - impacted	mSv/d	Tedben	1.84E-02	1.59E-03	4.30E-02	1.72E-03	3.84E-02	1.0E-01		'=Iadbi*RBEbi+Eadben

0.6 Screening Criterion in mGy/d	3 6	Total Absorbed Dose mGy/d	Total Equivalent Dose mSv/d	Index (Absorbed Equivalent Dose)	Index (Absorbed Equivalent Dose)
Pelagic Fish - Background		1.7E-04	1.7E-03	2.9E-04	2.8E-03
Pelagic Fish - Impacted		1.2E-03	1.2E-02	1.9E-03	1.9E-02
Benthic Fish - Background		1.2E-03	2.7E-03	2.0E-03	4.5E-03
Benthic Fish - Impacted		2.5E-03	1.3E-02	4.1E-03	2.1E-02
Aquatic Plant Leaves - Background		9.9E-04	9.5E-03	3.3E-04	3.2E-03
Aquatic Plant Leaves - Impacted		6.2E-03	6.2E-02	2.1E-03	2.1E-02
Aquatic Plant Roots - Background		3.5E-03	1.2E-02	1.2E-03	4.0E-03
Aquatic Plant Roots - Impacted		9.3E-03	6.5E-02	3.1E-03	2.2E-02
Benthic Invertebrates - Background		5.0E-03	2.7E-02	8.3E-04	4.5E-03
Benthic Invertebrates - Impacted		1.3E-02	1.0E-01	2.2E-03	1.7E-02

U-238+	Internal	U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235
	External	U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235 (beta + gamma only)
Ra-226+	Internal	Ra-226 + 0.3* (Rn-222 + ...Po-214)
	External	Ra-226 + 1.0* (Rn-222 + ...Po-214) (beta + gamma only)
Th-232+	Internal	Th-232 + ...Po-212/Tl-208 (Th-232 + Th-228 are inputs)
	External	Th-232 + Po-212/Tl-208
Ra-228+	Internal	Ra-228 + ...Po-212/Tl-208

Table H.1-1
Aquatic Dose Calculations

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Determination of Aquatic Dose - 95th Percentile, RBE 10

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Water									
Background	Bq/m3	wcb	12.30	6.00	4.00	11.00	5.00		
Impacted water body	Bq/m3	wc	33.79	44.1	28.5	78.4	38.8		<<<< input concentrations in water
Sediment									
Background	Bq/g(wet)	sedwcb	3.32E-02	4.00E-02	4.00E-02	1.00E-01	1.00E-01		
Impacted water body	Bq/g(wet)	sedwc	3.71E-02	5.30E-02	6.26E-02	1.36E-01	1.28E-01		<<<< input concentrations in sediment
Fish									
Water-to-fish biocon fa	m3/gwet	bcff	4.80E-07	3.60E-05	9.30E-05	8.50E-05	2.50E-04		<<<< input transfer factor
Fish in bkgd water	Bq/g wet	fc	5.90E-06	2.16E-04	3.72E-04	9.35E-04	1.25E-03		
Fish in impacted water	Bq/g wet	fc	1.62E-05	1.59E-03	2.65E-03	6.66E-03	9.70E-03		
Aquatic Plants									
Water-to-plants biocon	m3/gwet	bcfap	5.47E-05	4.6E-04	1.2E-04	6.0E-04	1.6E-03		<<<< input transfer factor
Plants in bkgd water	Bq/g wet	apcb	6.73E-04	2.76E-03	4.80E-04	6.60E-03	8.00E-03		
Plants in impacted water	Bq/g wet	apc	1.85E-03	2.03E-02	3.42E-03	4.70E-02	6.21E-02		
Benthic Invertebrates									
Water-to-benthos bioco	m3/gwet	bcfbi	7.13E-04	5.95E-05	9.70E-04	2.20E-04	1.52E-03		<<<< input transfer factor
Benthos in bkgd water	Bq/g wet	bicb	8.77E-03	3.57E-04	3.88E-03	2.42E-03	7.60E-03		
Benthos in impacted water	Bq/g wet	bic	2.41E-02	2.62E-03	2.76E-02	1.72E-02	5.90E-02		
Absorbed Doses - Fish									
Internal Dose Factor	mGy/d per Bq	Idcff	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadfb	8.38E-07	1.42E-05	5.91E-05	5.64E-06	9.25E-05	1.7E-04	'=fcb*Idcff
Internal dose impacted	mGy/d	Iadf	2.30E-06	1.04E-04	4.21E-04	4.02E-05	7.18E-04	1.3E-03	'=fc*Idcff
Ext. dose factor	mGy/d per Bq	Edcff	8.57E-03	2.93E-05	3.68E-02	2.50E-03	1.40E-07		
Ext. dose bkgd pelagic	mGy/d	Eadfb	1.05E-07	1.76E-10	1.47E-07	2.75E-08	7.00E-13	2.8E-07	'=wcb*Edcff/1000000
Ext. dose impacted pelagic	mGy/d	Eadf	2.90E-07	1.29E-09	1.05E-06	1.96E-07	5.43E-12	1.5E-06	'=wc*Edcff/1000000
Ext. dose bkgd benthic	mGy/d	Eadfbenb	1.42E-04	5.86E-07	7.36E-04	1.25E-04	7.00E-09	1.0E-03	'=Edcff*(wcb/1000000+sedwcb)/2
Ext. dose impacted benthic	mGy/d	Eadfben	1.59E-04	7.77E-07	1.15E-03	1.70E-04	8.96E-09	1.5E-03	'=Edcff*(wc/1000000+sedwc)/2
Total dose - pelagic bkgd	mGy/d	Tadfbp	9.44E-07	1.42E-05	5.93E-05	5.67E-06	9.25E-05	1.7E-04	'=Iadfb+Eadfb
- pelagic impact	mGy/d	Tadfp	2.59E-06	1.04E-04	4.22E-04	4.04E-05	7.18E-04	1.3E-03	'=Iadf+Eadf
Total dose - benthic bkgd	mGy/d	Tadfbenb	1.43E-04	1.48E-05	7.95E-04	1.31E-04	9.25E-05	1.2E-03	'=Iadfb+Eadfbenb
- benthic impact	mGy/d	Tadfben	1.62E-04	1.05E-04	1.57E-03	2.10E-04	7.18E-04	2.8E-03	'=Iadf+Eadfben

Table H.1-1

Aquatic Dose Calculations

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Absorbed Doses - Aquatic Plants									
Internal Dose Factor	mGy/d per Bq	Idcfap	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadapb	9.55E-05	1.82E-04	7.63E-05	3.98E-05	5.92E-04	9.9E-04	'=apcb*Idcfap
Internal dose impacted	mGy/d	Iadap	2.62E-04	1.33E-03	5.43E-04	2.84E-04	4.59E-03	7.0E-03	'=apc*Idcfap
Ext. dose factor aq plan	mGy/d per Bq	Edcfap	1.29E-02	2.25E-04	3.67E-02	6.03E-03	1.10E-07		
Ext. dose to leaf bkgd	mGy/d	Eadpwb	1.59E-07	1.35E-09	1.47E-07	6.63E-08	5.50E-13	3.7E-07	'=wcb*Edcfap/1000000
Ext. dose to leaf impact	mGy/d	Eadpw	4.36E-07	9.92E-09	1.04E-06	4.73E-07	4.27E-12	2.0E-06	'=wc*Edcfap/1000000
Ext. dose to root bkgd	mGy/d	Eadpsb	4.28E-04	9.00E-06	1.47E-03	6.03E-04	1.10E-08	2.5E-03	'=sedwcb*Edcfap
Ext. dose to root impact	mGy/d	Eadps	4.79E-04	1.19E-05	2.30E-03	8.18E-04	1.41E-08	3.6E-03	'=sedwc*Edcfap
Total dose - leaf bkgd	mGy/d	Tadaplb	9.57E-05	1.82E-04	7.65E-05	3.99E-05	5.92E-04	9.9E-04	'=Iadapb+Eadpwb
- leaf impacted	mGy/d	Tadapl	2.63E-04	1.33E-03	5.44E-04	2.84E-04	4.59E-03	7.0E-03	'=Iadap+Eadpw
Total dose - root bkgd	mGy/d	Tadaprb	5.24E-04	1.91E-04	1.54E-03	6.43E-04	5.92E-04	3.5E-03	'=Iadapb+Eadpsb
- root impacted	mGy/d	Tadapr	7.41E-04	1.35E-03	2.84E-03	1.10E-03	4.59E-03	1.1E-02	'=Iadap+Eadps
Absorbed Doses - Benthic Invertebrates									
Internal Dose Factor	mGy/d per Bq	Idcfbi	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadbib	1.25E-03	2.35E-05	6.17E-04	1.46E-05	5.62E-04	2.5E-03	'=bicb*Idcfbi
Internal dose impacted	mGy/d	Iadbi	3.42E-03	1.73E-04	4.39E-03	1.04E-04	4.36E-03	1.2E-02	'=bic*Idcfbi
Ext. dose factor ben inv	mGy/d per Bq	Edcfbi	1.29E-02	2.25E-04	3.67E-02	6.03E-03	1.10E-07		
Ext. dose bkgd sedimer	mGy/d	Eadbenb	4.28E-04	9.00E-06	1.47E-03	6.03E-04	1.10E-08	2.5E-03	'=sedwcb*Edcfbi
Ext. dose impacted sedi	mGy/d	Eadben	4.79E-04	1.19E-05	2.30E-03	8.18E-04	1.41E-08	3.6E-03	'=sedwc*Edcfbi
Total dose - bkgd	mGy/d	Tadbenb	1.67E-03	3.25E-05	2.08E-03	6.18E-04	5.62E-04	5.0E-03	'=Iadbib+Eadbenb
Total dose - impacted	mGy/d	Tadben	3.90E-03	1.85E-04	6.69E-03	9.22E-04	4.36E-03	1.6E-02	'=Iadbi+Eadben
Equivalent Doses - Fish									
RBE for alpha	Sv/Gy	RBEf	10						
Total dose - pelagic bkg	mSv/d	Tedfpb	8.49E-06	1.42E-04	5.92E-04	5.67E-06	9.25E-04	1.7E-03	'=Iadfb*RBEf+Eadfb
- pelagic impact	mSv/d	Tedfp	2.33E-05	1.04E-03	4.21E-03	4.04E-05	7.18E-03	1.2E-02	'=Iadf*RBEf+Eadf
Total dose - benthic bkg	mSv/d	Tedfbenb	1.51E-04	1.43E-04	1.33E-03	1.31E-04	9.25E-04	2.7E-03	'=Iadfb*RBEf+Eadfbenb
- benthic impact	mSv/d	Tedfben	1.82E-04	1.05E-03	5.36E-03	2.10E-04	7.18E-03	1.4E-02	'=Iadf*RBEf+Eadfben
Equivalent Doses - Aquatic Plants									
RBE for alpha	Sv/Gy	RBEap	10						
Total dose - leaf bkgd	mSv/d	Tedaplb	9.56E-04	1.82E-03	7.63E-04	3.99E-05	5.92E-03	9.5E-03	'=Iadapb*RBEap+Eadpwb
- leaf impacted	mSv/d	Tedapl	2.63E-03	1.33E-02	5.43E-03	2.84E-04	4.59E-02	6.8E-02	'=Iadap*RBEap+Eadpw
Total dose - root bkgd	mSv/d	Tedaprb	1.38E-03	1.83E-03	2.23E-03	6.43E-04	5.92E-03	1.2E-02	'=Iadapb*RBEap+Eadpsb
- root impacted	mSv/d	Tedapr	3.10E-03	1.34E-02	7.73E-03	1.10E-03	4.59E-02	7.1E-02	'=Iadap*RBEap+Eadps

Table H.1-1

Aquatic Dose Calculations

Equivalent Doses - Benthic Invertebrates

RBE for alpha	Sv/Gy	RBEbi	10							
Total dose - bkgd	mSv/d	Tedbenb	1.29E-02	2.44E-04	7.64E-03	6.18E-04	5.62E-03	2.7E-02		'=Iadbib*RBEbi+Eadbenb
Total dose - impacted	mSv/d	Tedben	3.47E-02	1.74E-03	4.62E-02	9.22E-04	4.36E-02	1.3E-01		'=Iadbi*RBEbi+Eadben

0.6 Screening Criterion in mGy/d	3 6	Total Absorbed Dose mGy/d	Total Equivalent Dose mSv/d	Index (Absorbed Equivalent Dose)	Index (Absorbed Equivalent Dose)
Pelagic Fish - Background		1.7E-04	1.7E-03	2.9E-04	2.8E-03
Pelagic Fish - Impacted		1.3E-03	1.2E-02	2.1E-03	2.1E-02
Benthic Fish - Background		1.2E-03	2.7E-03	2.0E-03	4.5E-03
Benthic Fish - Impacted		2.8E-03	1.4E-02	4.6E-03	2.3E-02
Aquatic Plant Leaves - Background		9.9E-04	9.5E-03	3.3E-04	3.2E-03
Aquatic Plant Leaves - Impacted		7.0E-03	6.8E-02	2.3E-03	2.3E-02
Aquatic Plant Roots - Background		3.5E-03	1.2E-02	1.2E-03	4.0E-03
Aquatic Plant Roots - Impacted		1.1E-02	7.1E-02	3.5E-03	2.4E-02
Benthic Invertebrates - Background		5.0E-03	2.7E-02	8.3E-04	4.5E-03
Benthic Invertebrates - Impacted		1.6E-02	1.3E-01	2.7E-03	2.1E-02

U-238+	Internal	U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235
	External	U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235 (beta + gamma only)
Ra-226+	Internal	Ra-226 + 0.3* (Rn-222 + ...Po-214)
	External	Ra-226 + 1.0* (Rn-222 + ...Po-214) (beta + gamma only)
Th-232+	Internal	Th-232 + ...Po-212/Tl-208 (Th-232 + Th-228 are inputs)
	External	Th-232 + Po-212/Tl-208
Ra-228+	Internal	Ra-228 + ...Po-212/Tl-208

Table H.1-1
Aquatic Dose Calculations

JSL-7

Determination of Aquatic Dose - Average, RBE 40

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Water									
Background	Bq/m3	wcb	12.30	6.00	4.00	11.00	5.00		
Impacted water body	Bq/m3	wc	17.77	40.3	26.6	74.3	34.2		<<<< input concentrations in water
Sediment									
Background	Bq/g(wet)	sedwcb	3.32E-02	4.00E-02	4.00E-02	1.00E-01	1.00E-01		
Impacted water body	Bq/g(wet)	sedwc	3.50E-02	4.63E-02	5.38E-02	1.21E-01	1.16E-01		<<<< input concentrations in sediment
Fish									
Water-to-fish biocon fa	m3/gwet	bcff	4.80E-07	3.60E-05	9.30E-05	8.50E-05	2.50E-04		<<<< input transfer factor
Fish in bkgd water	Bq/g wet	fc	5.90E-06	2.16E-04	3.72E-04	9.35E-04	1.25E-03		
Fish in impacted water	Bq/g wet	fc	8.53E-06	1.45E-03	2.47E-03	6.31E-03	8.54E-03		
Aquatic Plants									
Water-to-plants biocon	m3/gwet	bcfb	5.47E-05	4.6E-04	1.2E-04	6.0E-04	1.6E-03		<<<< input transfer factor
Plants in bkgd water	Bq/g wet	apcb	6.73E-04	2.76E-03	4.80E-04	6.60E-03	8.00E-03		
Plants in impacted water	Bq/g wet	apc	9.72E-04	1.85E-02	3.19E-03	4.46E-02	5.47E-02		
Benthic Invertebrates									
Water-to-benthos bioco	m3/gwet	bcfbi	7.13E-04	5.95E-05	9.70E-04	2.20E-04	1.52E-03		<<<< input transfer factor
Benthos in bkgd water	Bq/g wet	bicb	8.77E-03	3.57E-04	3.88E-03	2.42E-03	7.60E-03		
Benthos in impacted water	Bq/g wet	bic	1.27E-02	2.40E-03	2.58E-02	1.63E-02	5.19E-02		
Absorbed Doses - Fish									
Internal Dose Factor	mGy/d per Bq	Idcff	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadfb	8.38E-07	1.42E-05	5.91E-05	5.64E-06	9.25E-05	1.7E-04	'=fcb*Idcff
Internal dose impacted	mGy/d	Iadf	1.21E-06	9.55E-05	3.93E-04	3.81E-05	6.32E-04	1.2E-03	'=fc*Idcff
Ext. dose factor	mGy/d per Bq	Edcff	8.57E-03	2.93E-05	3.68E-02	2.50E-03	1.40E-07		
Ext. dose bkgd pelagic	mGy/d	Eadfb	1.05E-07	1.76E-10	1.47E-07	2.75E-08	7.00E-13	2.8E-07	'=wcb*Edcff/1000000
Ext. dose impacted pelagic	mGy/d	Eadf	1.52E-07	1.18E-09	9.78E-07	1.86E-07	4.78E-12	1.3E-06	'=wc*Edcff/1000000
Ext. dose bkgd benthic	mGy/d	Eadfbenb	1.42E-04	5.86E-07	7.36E-04	1.25E-04	7.00E-09	1.0E-03	'=Edcff*(wcb/1000000+sedwcb)/2
Ext. dose impacted benthic	mGy/d	Eadfben	1.50E-04	6.78E-07	9.91E-04	1.52E-04	8.15E-09	1.3E-03	'=Edcff*(wc/1000000+sedwc)/2
Total dose - pelagic bkgd	mGy/d	Tadfbp	9.44E-07	1.42E-05	5.93E-05	5.67E-06	9.25E-05	1.7E-04	'=Iadfb+Eadfb
- pelagic impact	mGy/d	Tadfp	1.36E-06	9.55E-05	3.94E-04	3.83E-05	6.32E-04	1.2E-03	'=Iadf+Eadf
Total dose - benthic bkgd	mGy/d	Tadfbenb	1.43E-04	1.48E-05	7.95E-04	1.31E-04	9.25E-05	1.2E-03	'=Iadfb+Eadfbenb
- benthic impact	mGy/d	Tadfben	1.51E-04	9.61E-05	1.38E-03	1.90E-04	6.32E-04	2.5E-03	'=Iadf+Eadfben

Table H.1-1

Aquatic Dose Calculations

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Absorbed Doses - Aquatic Plants									
Internal Dose Factor	mGy/d per Bq	Idcfap	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadapb	9.55E-05	1.82E-04	7.63E-05	3.98E-05	5.92E-04	9.9E-04	'=apcb*Idcfap
Internal dose impacted	mGy/d	Iadap	1.38E-04	1.22E-03	5.07E-04	2.69E-04	4.04E-03	6.2E-03	'=apc*Idcfap
Ext. dose factor aq plan	mGy/d per Bq	Edcfap	1.29E-02	2.25E-04	3.67E-02	6.03E-03	1.10E-07		
Ext. dose to leaf bkgd	mGy/d	Eadpwb	1.59E-07	1.35E-09	1.47E-07	6.63E-08	5.50E-13	3.7E-07	'=wcb*Edcfap/1000000
Ext. dose to leaf impact	mGy/d	Eadpw	2.29E-07	9.07E-09	9.76E-07	4.48E-07	3.76E-12	1.7E-06	'=wc*Edcfap/1000000
Ext. dose to root bkgd	mGy/d	Eadpsb	4.28E-04	9.00E-06	1.47E-03	6.03E-04	1.10E-08	2.5E-03	'=sedwcb*Edcfap
Ext. dose to root impact	mGy/d	Eadps	4.51E-04	1.04E-05	1.98E-03	7.33E-04	1.28E-08	3.2E-03	'=sedwc*Edcfap
Total dose - leaf bkgd	mGy/d	Tadaplb	9.57E-05	1.82E-04	7.65E-05	3.99E-05	5.92E-04	9.9E-04	'=Iadapb+Eadpwb
- leaf impacted	mGy/d	Tadapl	1.38E-04	1.22E-03	5.08E-04	2.69E-04	4.04E-03	6.2E-03	'=Iadap+Eadpw
Total dose - root bkgd	mGy/d	Tadaprb	5.24E-04	1.91E-04	1.54E-03	6.43E-04	5.92E-04	3.5E-03	'=Iadapb+Eadpsb
- root impacted	mGy/d	Tadapr	5.89E-04	1.23E-03	2.48E-03	1.00E-03	4.04E-03	9.3E-03	'=Iadap+Eadps
Absorbed Doses - Benthic Invertebrates									
Internal Dose Factor	mGy/d per Bq	Idcfbi	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadbib	1.25E-03	2.35E-05	6.17E-04	1.46E-05	5.62E-04	2.5E-03	'=bicb*Idcfbi
Internal dose impacted	mGy/d	Iadbi	1.80E-03	1.58E-04	4.10E-03	9.85E-05	3.84E-03	1.0E-02	'=bic*Idcfbi
Ext. dose factor ben inv	mGy/d per Bq	Edcfbi	1.29E-02	2.25E-04	3.67E-02	6.03E-03	1.10E-07		
Ext. dose bkgd sedimer	mGy/d	Eadbenb	4.28E-04	9.00E-06	1.47E-03	6.03E-04	1.10E-08	2.5E-03	'=sedwcb*Edcfbi
Ext. dose impacted sedi	mGy/d	Eadben	4.51E-04	1.04E-05	1.98E-03	7.33E-04	1.28E-08	3.2E-03	'=sedwc*Edcfbi
Total dose - bkgd	mGy/d	Tadbenb	1.67E-03	3.25E-05	2.08E-03	6.18E-04	5.62E-04	5.0E-03	'=Iadbib+Eadbenb
Total dose - impacted	mGy/d	Tadben	2.25E-03	1.68E-04	6.08E-03	8.31E-04	3.84E-03	1.3E-02	'=Iadbi+Eadben
Equivalent Doses - Fish									
RBE for alpha	Sv/Gy	RBEf	40						
Total dose - pelagic bkg	mSv/d	Tedfpb	3.36E-05	5.69E-04	2.37E-03	5.67E-06	3.70E-03	6.7E-03	'=Iadfb*RBEf+Eadfb
- pelagic impact	mSv/d	Tedfp	4.86E-05	3.82E-03	1.57E-02	1.52E-03	2.53E-02	4.6E-02	'=Iadf*RBEf+Eadf
Total dose - benthic bkg	mSv/d	Tedfbenb	1.76E-04	5.69E-04	3.10E-03	1.31E-04	3.70E-03	7.7E-03	'=Iadfb*RBEf+Eadfbenb
- benthic impact	mSv/d	Tedfben	1.98E-04	3.82E-03	1.67E-02	1.67E-03	2.53E-02	4.8E-02	'=Iadf*RBEf+Eadfben
Equivalent Doses - Aquatic Plants									
RBE for alpha	Sv/Gy	RBEap	40						
Total dose - leaf bkgd	mSv/d	Tedaplb	3.82E-03	7.26E-03	3.05E-03	3.99E-05	2.37E-02	3.8E-02	'=Iadapb*RBEap+Eadpwb
- leaf impacted	mSv/d	Tedapl	5.52E-03	4.88E-02	2.03E-02	1.08E-02	1.62E-01	2.5E-01	'=Iadap*RBEap+Eadpw
Total dose - root bkgd	mSv/d	Tedaprb	4.25E-03	7.27E-03	4.52E-03	6.43E-04	2.37E-02	4.0E-02	'=Iadapb*RBEap+Eadpsb
- root impacted	mSv/d	Tedapr	5.97E-03	4.88E-02	2.23E-02	1.15E-02	1.62E-01	2.5E-01	'=Iadap*RBEap+Eadps

Table H.1-1

Aquatic Dose Calculations

Equivalent Doses - Benthic Invertebrates

RBE for alpha	Sv/Gy	RBEbi	40							
Total dose - bkgd	mSv/d	Tedbenb	1.29E-02	2.44E-04	7.64E-03	6.18E-04	5.62E-03	2.7E-02		'=Iadbib*RBEbi+Eadbenb
Total dose - impacted	mSv/d	Tedben	7.24E-02	1.04E-05	1.98E-03	7.33E-04	1.28E-08	7.5E-02		'=Iadbi*RBEbi+Eadben

0.6 Screening Criterion in mGy/d	3 6	Total Absorbed Dose mGy/d	Total Equivalent Dose mSv/d	Index (Absorbed Equivalent Dose)	Index (Absorbed Equivalent Dose)
Pelagic Fish - Background		1.7E-04	6.7E-03	2.9E-04	1.1E-02
Pelagic Fish - Impacted		1.2E-03	4.6E-02	1.9E-03	7.7E-02
Benthic Fish - Background		1.2E-03	7.7E-03	2.0E-03	1.3E-02
Benthic Fish - Impacted		2.5E-03	4.8E-02	4.1E-03	7.9E-02
Aquatic Plant Leaves - Background		9.9E-04	3.8E-02	3.3E-04	1.3E-02
Aquatic Plant Leaves - Impacted		6.2E-03	2.5E-01	2.1E-03	8.2E-02
Aquatic Plant Roots - Background		3.5E-03	4.0E-02	1.2E-03	1.3E-02
Aquatic Plant Roots - Impacted		9.3E-03	2.5E-01	3.1E-03	8.3E-02
Benthic Invertebrates - Background		5.0E-03	2.7E-02	8.3E-04	4.5E-03
Benthic Invertebrates - Impacted		1.3E-02	7.5E-02	2.2E-03	1.3E-02

U-238+	Internal	U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235
	External	U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235 (beta + gamma only)
Ra-226+	Internal	Ra-226 + 0.3* (Rn-222 + ...Po-214)
	External	Ra-226 + 1.0* (Rn-222 + ...Po-214) (beta + gamma only)
Th-232+	Internal	Th-232 + ...Po-212/Tl-208 (Th-232 + Th-228 are inputs)
	External	Th-232 + Po-212/Tl-208
Ra-228+	Internal	Ra-228 + ...Po-212/Tl-208

Table H.1-1
Aquatic Dose Calculations

JSL-7

Determination of Aquatic Dose - 95th Percentile, RBE 40

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Water									
Background	Bq/m3	wcb	12.30	6.00	4.00	11.00	5.00		
Impacted water body	Bq/m3	wc	33.79	44.1	28.5	78.4	38.8		<<<< input concentrations in water
Sediment									
Background	Bq/g(wet)	sedwcb	3.32E-02	4.00E-02	4.00E-02	1.00E-01	1.00E-01		
Impacted water body	Bq/g(wet)	sedwc	3.71E-02	5.30E-02	6.26E-02	1.36E-01	1.28E-01		<<<< input concentrations in sediment
Fish									
Water-to-fish biocon fa	m3/gwet	bcff	4.80E-07	3.60E-05	9.30E-05	8.50E-05	2.50E-04		<<<< input transfer factor
Fish in bkgd water	Bq/g wet	fc	5.90E-06	2.16E-04	3.72E-04	9.35E-04	1.25E-03		
Fish in impacted water	Bq/g wet	fc	1.62E-05	1.59E-03	2.65E-03	6.66E-03	9.70E-03		
Aquatic Plants									
Water-to-plants biocon	m3/gwet	bcfap	5.47E-05	4.6E-04	1.2E-04	6.0E-04	1.6E-03		<<<< input transfer factor
Plants in bkgd water	Bq/g wet	apcb	6.73E-04	2.76E-03	4.80E-04	6.60E-03	8.00E-03		
Plants in impacted water	Bq/g wet	apc	1.85E-03	2.03E-02	3.42E-03	4.70E-02	6.21E-02		
Benthic Invertebrates									
Water-to-benthos bioco	m3/gwet	bcfbi	7.13E-04	5.95E-05	9.70E-04	2.20E-04	1.52E-03		<<<< input transfer factor
Benthos in bkgd water	Bq/g wet	bicb	8.77E-03	3.57E-04	3.88E-03	2.42E-03	7.60E-03		
Benthos in impacted water	Bq/g wet	bic	2.41E-02	2.62E-03	2.76E-02	1.72E-02	5.90E-02		
Absorbed Doses - Fish									
Internal Dose Factor	mGy/d per Bq	Idcff	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadfb	8.38E-07	1.42E-05	5.91E-05	5.64E-06	9.25E-05	1.7E-04	'=fcb*Idcff
Internal dose impacted	mGy/d	Iadf	2.30E-06	1.04E-04	4.21E-04	4.02E-05	7.18E-04	1.3E-03	'=fc*Idcff
Ext. dose factor	mGy/d per Bq	Edcff	8.57E-03	2.93E-05	3.68E-02	2.50E-03	1.40E-07		
Ext. dose bkgd pelagic	mGy/d	Eadfb	1.05E-07	1.76E-10	1.47E-07	2.75E-08	7.00E-13	2.8E-07	'=wcb*Edcff/1000000
Ext. dose impacted pelagic	mGy/d	Eadf	2.90E-07	1.29E-09	1.05E-06	1.96E-07	5.43E-12	1.5E-06	'=wc*Edcff/1000000
Ext. dose bkgd benthic	mGy/d	Eadfbenb	1.42E-04	5.86E-07	7.36E-04	1.25E-04	7.00E-09	1.0E-03	'=Edcff*(wcb/1000000+sedwcb)/2
Ext. dose impacted benthic	mGy/d	Eadfben	1.59E-04	7.77E-07	1.15E-03	1.70E-04	8.96E-09	1.5E-03	'=Edcff*(wc/1000000+sedwc)/2
Total dose - pelagic bkgd	mGy/d	Tadfbp	9.44E-07	1.42E-05	5.93E-05	5.67E-06	9.25E-05	1.7E-04	'=Iadfb+Eadfb
- pelagic impact	mGy/d	Tadfp	2.59E-06	1.04E-04	4.22E-04	4.04E-05	7.18E-04	1.3E-03	'=Iadf+Eadf
Total dose - benthic bkgd	mGy/d	Tadfbenb	1.43E-04	1.48E-05	7.95E-04	1.31E-04	9.25E-05	1.2E-03	'=Iadfb+Eadfbenb
- benthic impact	mGy/d	Tadfben	1.62E-04	1.05E-04	1.57E-03	2.10E-04	7.18E-04	2.8E-03	'=Iadf+Eadfben

Table H.1-1

Aquatic Dose Calculations

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Absorbed Doses - Aquatic Plants									
Internal Dose Factor	mGy/d per Bq	Idcfap	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadapb	9.55E-05	1.82E-04	7.63E-05	3.98E-05	5.92E-04	9.9E-04	'=apcb*Idcfap
Internal dose impacted	mGy/d	Iadap	2.62E-04	1.33E-03	5.43E-04	2.84E-04	4.59E-03	7.0E-03	'=apc*Idcfap
Ext. dose factor aq plan	mGy/d per Bq	Edcfap	1.29E-02	2.25E-04	3.67E-02	6.03E-03	1.10E-07		
Ext. dose to leaf bkgd	mGy/d	Eadpwb	1.59E-07	1.35E-09	1.47E-07	6.63E-08	5.50E-13	3.7E-07	'=wcb*Edcfap/1000000
Ext. dose to leaf impact	mGy/d	Eadpw	4.36E-07	9.92E-09	1.04E-06	4.73E-07	4.27E-12	2.0E-06	'=wc*Edcfap/1000000
Ext. dose to root bkgd	mGy/d	Eadpsb	4.28E-04	9.00E-06	1.47E-03	6.03E-04	1.10E-08	2.5E-03	'=sedwcb*Edcfap
Ext. dose to root impact	mGy/d	Eadps	4.79E-04	1.19E-05	2.30E-03	8.18E-04	1.41E-08	3.6E-03	'=sedwc*Edcfap
Total dose - leaf bkgd	mGy/d	Tadaplb	9.57E-05	1.82E-04	7.65E-05	3.99E-05	5.92E-04	9.9E-04	'=Iadapb+Eadpwb
- leaf impacted	mGy/d	Tadapl	2.63E-04	1.33E-03	5.44E-04	2.84E-04	4.59E-03	7.0E-03	'=Iadap+Eadpw
Total dose - root bkgd	mGy/d	Tadaprb	5.24E-04	1.91E-04	1.54E-03	6.43E-04	5.92E-04	3.5E-03	'=Iadapb+Eadpsb
- root impacted	mGy/d	Tadapr	7.41E-04	1.35E-03	2.84E-03	1.10E-03	4.59E-03	1.1E-02	'=Iadap+Eadps
Absorbed Doses - Benthic Invertebrates									
Internal Dose Factor	mGy/d per Bq	Idcfbi	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadbib	1.25E-03	2.35E-05	6.17E-04	1.46E-05	5.62E-04	2.5E-03	'=bicb*Idcfbi
Internal dose impacted	mGy/d	Iadbi	3.42E-03	1.73E-04	4.39E-03	1.04E-04	4.36E-03	1.2E-02	'=bic*Idcfbi
Ext. dose factor ben inv	mGy/d per Bq	Edcfbi	1.29E-02	2.25E-04	3.67E-02	6.03E-03	1.10E-07		
Ext. dose bkgd sedimer	mGy/d	Eadbenb	4.28E-04	9.00E-06	1.47E-03	6.03E-04	1.10E-08	2.5E-03	'=sedwcb*Edcfbi
Ext. dose impacted sedi	mGy/d	Eadben	4.79E-04	1.19E-05	2.30E-03	8.18E-04	1.41E-08	3.6E-03	'=sedwc*Edcfbi
Total dose - bkgd	mGy/d	Tadbenb	1.67E-03	3.25E-05	2.08E-03	6.18E-04	5.62E-04	5.0E-03	'=Iadbib+Eadbenb
Total dose - impacted	mGy/d	Tadben	3.90E-03	1.85E-04	6.69E-03	9.22E-04	4.36E-03	1.6E-02	'=Iadbi+Eadben
Equivalent Doses - Fish									
RBE for alpha	Sv/Gy	RBEf	40						
Total dose - pelagic bkg	mSv/d	Tedfpb	3.36E-05	5.69E-04	2.37E-03	5.67E-06	3.70E-03	6.7E-03	'=Iadfb*RBEf+Eadfb
- pelagic impact	mSv/d	Tedfp	9.24E-05	4.18E-03	1.68E-02	4.04E-05	2.87E-02	5.0E-02	'=Iadf*RBEf+Eadf
Total dose - benthic bkg	mSv/d	Tedfbenb	1.76E-04	5.69E-04	3.10E-03	1.31E-04	3.70E-03	7.7E-03	'=Iadfb*RBEf+Eadfbenb
- benthic impact	mSv/d	Tedfben	2.51E-04	4.18E-03	1.80E-02	2.10E-04	2.87E-02	5.1E-02	'=Iadf*RBEf+Eadfben
Equivalent Doses - Aquatic Plants									
RBE for alpha	Sv/Gy	RBEap	40						
Total dose - leaf bkgd	mSv/d	Tedaplb	3.82E-03	7.26E-03	3.05E-03	3.99E-05	2.37E-02	3.8E-02	'=Iadapb*RBEap+Eadpwb
- leaf impacted	mSv/d	Tedapl	1.05E-02	5.34E-02	2.17E-02	2.84E-04	1.84E-01	2.7E-01	'=Iadap*RBEap+Eadpw
Total dose - root bkgd	mSv/d	Tedaprb	4.25E-03	7.27E-03	4.52E-03	6.43E-04	2.37E-02	4.0E-02	'=Iadapb*RBEap+Eadpsb
- root impacted	mSv/d	Tedapr	1.10E-02	5.34E-02	2.40E-02	1.10E-03	1.84E-01	2.7E-01	'=Iadap*RBEap+Eadps

Table H.1-1

Aquatic Dose Calculations

Equivalent Doses - Benthic Invertebrates

RBE for alpha	Sv/Gy	RBEbi	40							
Total dose - bkgd	mSv/d	Tedbenb	5.02E-02	9.49E-04	2.61E-02	6.18E-04	2.25E-02	1.0E-01		'=Iadbib*RBEbi+Eadbenb
Total dose - impacted	mSv/d	Tedben	1.37E-01	6.92E-03	1.78E-01	9.22E-04	1.75E-01	5.0E-01		'=Iadbi*RBEbi+Eadben

0.6 Screening Criterion in mGy/d	3 6	Total Absorbed Dose mGy/d	Total Equivalent Dose mSv/d	Index (Absorbed Equivalent Dose)	Index (Absorbed Equivalent Dose)
Pelagic Fish - Background		1.7E-04	6.7E-03	2.9E-04	1.1E-02
Pelagic Fish - Impacted		1.3E-03	5.0E-02	2.1E-03	8.3E-02
Benthic Fish - Background		1.2E-03	7.7E-03	2.0E-03	1.3E-02
Benthic Fish - Impacted		2.8E-03	5.1E-02	4.6E-03	8.6E-02
Aquatic Plant Leaves - Background		9.9E-04	3.8E-02	3.3E-04	1.3E-02
Aquatic Plant Leaves - Impacted		7.0E-03	2.7E-01	2.3E-03	9.0E-02
Aquatic Plant Roots - Background		3.5E-03	4.0E-02	1.2E-03	1.3E-02
Aquatic Plant Roots - Impacted		1.1E-02	2.7E-01	3.5E-03	9.1E-02
Benthic Invertebrates - Background		5.0E-03	1.0E-01	8.3E-04	1.7E-02
Benthic Invertebrates - Impacted		1.6E-02	5.0E-01	2.7E-03	8.3E-02

U-238+	Internal	U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235
	External	U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235 (beta + gamma only)
Ra-226+	Internal	Ra-226 + 0.3* (Rn-222 + ...Po-214)
	External	Ra-226 + 1.0* (Rn-222 + ...Po-214) (beta + gamma only)
Th-232+	Internal	Th-232 + ...Po-212/Tl-208 (Th-232 + Th-228 are inputs)
	External	Th-232 + Po-212/Tl-208
Ra-228+	Internal	Ra-228 + ...Po-212/Tl-208

Table H.1-1
Aquatic Dose Calculations

JSL-8

Determination of Aquatic Dose - Average, RBE 10

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Water									
Background	Bq/m3	wcb	12.30	6.00	4.00	11.00	5.00		
Impacted water body	Bq/m3	wc	11.05	13.9	9.1	25.7	12.0		<<<< input concentrations in water
Sediment									
Background	Bq/g(wet)	sedwcb	3.32E-02	4.00E-02	4.00E-02	1.00E-01	1.00E-01		
Impacted water body	Bq/g(wet)	sedwc	3.53E-02	4.41E-02	4.94E-02	1.14E-01	1.10E-01		<<<< input concentrations in sediment
Fish									
Water-to-fish biocon fa	m3/gwet	bcff	4.80E-07	3.60E-05	9.30E-05	8.50E-05	2.50E-04		<<<< input transfer factor
Fish in bkgd water	Bq/g wet	fc	5.90E-06	2.16E-04	3.72E-04	9.35E-04	1.25E-03		
Fish in impacted water	Bq/g wet	fc	5.30E-06	5.00E-04	8.42E-04	2.18E-03	3.00E-03		
Aquatic Plants									
Water-to-plants biocon	m3/gwet	bcfap	5.47E-05	4.6E-04	1.2E-04	6.0E-04	1.6E-03		<<<< input transfer factor
Plants in bkgd water	Bq/g wet	apcb	6.73E-04	2.76E-03	4.80E-04	6.60E-03	8.00E-03		
Plants in impacted water	Bq/g wet	apc	6.04E-04	6.39E-03	1.09E-03	1.54E-02	1.92E-02		
Benthic Invertebrates									
Water-to-benthos bioco	m3/gwet	bcfbi	7.13E-04	5.95E-05	9.70E-04	2.20E-04	1.52E-03		<<<< input transfer factor
Benthos in bkgd water	Bq/g wet	bicb	8.77E-03	3.57E-04	3.88E-03	2.42E-03	7.60E-03		
Benthos in impacted water	Bq/g wet	bic	7.88E-03	8.27E-04	8.78E-03	5.65E-03	1.83E-02		
Absorbed Doses - Fish									
Internal Dose Factor	mGy/d per Bq	Idcff	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadfb	8.38E-07	1.42E-05	5.91E-05	5.64E-06	9.25E-05	1.7E-04	'=fcb*Idcff
Internal dose impacted	mGy/d	Iadf	7.53E-07	3.29E-05	1.34E-04	1.32E-05	2.22E-04	4.0E-04	'=fc*Idcff
Ext. dose factor	mGy/d per Bq	Edcff	8.57E-03	2.93E-05	3.68E-02	2.50E-03	1.40E-07		
Ext. dose bkgd pelagic	mGy/d	Eadfb	1.05E-07	1.76E-10	1.47E-07	2.75E-08	7.00E-13	2.8E-07	'=wcb*Edcff/1000000
Ext. dose impacted pelagic	mGy/d	Eadf	9.47E-08	4.07E-10	3.33E-07	6.42E-08	1.68E-12	4.9E-07	'=wc*Edcff/1000000
Ext. dose bkgd benthic	mGy/d	Eadfbenb	1.42E-04	5.86E-07	7.36E-04	1.25E-04	7.00E-09	1.0E-03	'=Edcff*(wcb/1000000+sedwcb)/2
Ext. dose impacted benthic	mGy/d	Eadfben	1.51E-04	6.46E-07	9.09E-04	1.42E-04	7.70E-09	1.2E-03	'=Edcff*(wc/1000000+sedwc)/2
Total dose - pelagic bkgd	mGy/d	Tadfbp	9.44E-07	1.42E-05	5.93E-05	5.67E-06	9.25E-05	1.7E-04	'=Iadfb+Eadfb
- pelagic impact	mGy/d	Tadfp	8.48E-07	3.29E-05	1.34E-04	1.32E-05	2.22E-04	4.0E-04	'=Iadf+Eadf
Total dose - benthic bkgd	mGy/d	Tadfbenb	1.43E-04	1.48E-05	7.95E-04	1.31E-04	9.25E-05	1.2E-03	'=Iadfb+Eadfbenb
- benthic impact	mGy/d	Tadfben	1.52E-04	3.36E-05	1.04E-03	1.56E-04	2.22E-04	1.6E-03	'=Iadf+Eadfben

Table H.1-1

Aquatic Dose Calculations

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Absorbed Doses - Aquatic Plants									
Internal Dose Factor	mGy/d per Bq	Idcfap	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadapb	9.55E-05	1.82E-04	7.63E-05	3.98E-05	5.92E-04	9.9E-04	'=apcb*Idcfap
Internal dose impacted	mGy/d	Iadap	8.58E-05	4.21E-04	1.73E-04	9.29E-05	1.42E-03	2.2E-03	'=apc*Idcfap
Ext. dose factor aq plan	mGy/d per Bq	Edcfap	1.29E-02	2.25E-04	3.67E-02	6.03E-03	1.10E-07		
Ext. dose to leaf bkgd	mGy/d	Eadpwb	1.59E-07	1.35E-09	1.47E-07	6.63E-08	5.50E-13	3.7E-07	'=wcb*Edcfap/1000000
Ext. dose to leaf impact	mGy/d	Eadpw	1.43E-07	3.13E-09	3.32E-07	1.55E-07	1.32E-12	6.3E-07	'=wc*Edcfap/1000000
Ext. dose to root bkgd	mGy/d	Eadpsb	4.28E-04	9.00E-06	1.47E-03	6.03E-04	1.10E-08	2.5E-03	'=sedwcb*Edcfap
Ext. dose to root impact	mGy/d	Eadps	4.55E-04	9.92E-06	1.81E-03	6.87E-04	1.21E-08	3.0E-03	'=sedwc*Edcfap
Total dose - leaf bkgd	mGy/d	Tadaplb	9.57E-05	1.82E-04	7.65E-05	3.99E-05	5.92E-04	9.9E-04	'=Iadapb+Eadpwb
- leaf impacted	mGy/d	Tadapl	8.60E-05	4.21E-04	1.73E-04	9.31E-05	1.42E-03	2.2E-03	'=Iadap+Eadpw
Total dose - root bkgd	mGy/d	Tadaprb	5.24E-04	1.91E-04	1.54E-03	6.43E-04	5.92E-04	3.5E-03	'=Iadapb+Eadpsb
- root impacted	mGy/d	Tadapr	5.41E-04	4.31E-04	1.99E-03	7.80E-04	1.42E-03	5.2E-03	'=Iadap+Eadps
Absorbed Doses - Benthic Invertebrates									
Internal Dose Factor	mGy/d per Bq	Idcfbi	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadbib	1.25E-03	2.35E-05	6.17E-04	1.46E-05	5.62E-04	2.5E-03	'=bicb*Idcfbi
Internal dose impacted	mGy/d	Iadbi	1.12E-03	5.44E-05	1.40E-03	3.41E-05	1.35E-03	4.0E-03	'=bic*Idcfbi
Ext. dose factor ben inv	mGy/d per Bq	Edcfbi	1.29E-02	2.25E-04	3.67E-02	6.03E-03	1.10E-07		
Ext. dose bkgd sedimer	mGy/d	Eadbenb	4.28E-04	9.00E-06	1.47E-03	6.03E-04	1.10E-08	2.5E-03	'=sedwcb*Edcfbi
Ext. dose impacted sedi	mGy/d	Eadben	4.55E-04	9.92E-06	1.81E-03	6.87E-04	1.21E-08	3.0E-03	'=sedwc*Edcfbi
Total dose - bkgd	mGy/d	Tadbenb	1.67E-03	3.25E-05	2.08E-03	6.18E-04	5.62E-04	5.0E-03	'=Iadbib+Eadbenb
Total dose - impacted	mGy/d	Tadben	1.57E-03	6.43E-05	3.21E-03	7.21E-04	1.35E-03	6.9E-03	'=Iadbi+Eadben
Equivalent Doses - Fish									
RBE for alpha	Sv/Gy	RBEf	10						
Total dose - pelagic bkg	mSv/d	Tedfpb	8.49E-06	1.42E-04	5.92E-04	5.67E-06	9.25E-04	1.7E-03	'=Iadfb*RBEf+Eadfb
- pelagic impact	mSv/d	Tedfp	7.63E-06	3.29E-04	1.34E-03	1.32E-04	2.22E-03	4.0E-03	'=Iadf*RBEf+Eadf
Total dose - benthic bkg	mSv/d	Tedfbenb	1.51E-04	1.43E-04	1.33E-03	1.31E-04	9.25E-04	2.7E-03	'=Iadfb*RBEf+Eadfbenb
- benthic impact	mSv/d	Tedfben	1.59E-04	3.30E-04	2.25E-03	2.74E-04	2.22E-03	5.2E-03	'=Iadf*RBEf+Eadfben
Equivalent Doses - Aquatic Plants									
RBE for alpha	Sv/Gy	RBEap	10						
Total dose - leaf bkgd	mSv/d	Tedaplb	9.56E-04	1.82E-03	7.63E-04	3.99E-05	5.92E-03	9.5E-03	'=Iadapb*RBEap+Eadpwb
- leaf impacted	mSv/d	Tedapl	8.58E-04	4.21E-03	1.73E-03	9.29E-04	1.42E-02	2.2E-02	'=Iadap*RBEap+Eadpw
Total dose - root bkgd	mSv/d	Tedaprb	1.38E-03	1.83E-03	2.23E-03	6.43E-04	5.92E-03	1.2E-02	'=Iadapb*RBEap+Eadpsb
- root impacted	mSv/d	Tedapr	1.31E-03	4.22E-03	3.54E-03	1.62E-03	1.42E-02	2.5E-02	'=Iadap*RBEap+Eadps

Table H.1-1

Aquatic Dose Calculations

Equivalent Doses - Benthic Invertebrates

RBE for alpha	Sv/Gy	RBEbi	10							
Total dose - bkgd	mSv/d	Tedbenb	1.29E-02	2.44E-04	7.64E-03	6.18E-04	5.62E-03	2.7E-02		'=Iadbib*RBEbi+Eadbenb
Total dose - impacted	mSv/d	Tedben	1.16E-02	5.54E-04	1.58E-02	1.03E-03	1.35E-02	4.3E-02		'=Iadbi*RBEbi+Eadben

0.6 Screening Criterion in mGy/d	3 6	Total Absorbed Dose mGy/d	Total Equivalent Dose mSv/d	Index (Absorbed Equivalent Dose)	Index (Absorbed Equivalent Dose)
Pelagic Fish - Background		1.7E-04	1.7E-03	2.9E-04	2.8E-03
Pelagic Fish - Impacted		4.0E-04	4.0E-03	6.7E-04	6.7E-03
Benthic Fish - Background		1.2E-03	2.7E-03	2.0E-03	4.5E-03
Benthic Fish - Impacted		1.6E-03	5.2E-03	2.7E-03	8.7E-03
Aquatic Plant Leaves - Background		9.9E-04	9.5E-03	3.3E-04	3.2E-03
Aquatic Plant Leaves - Impacted		2.2E-03	2.2E-02	7.3E-04	7.3E-03
Aquatic Plant Roots - Background		3.5E-03	1.2E-02	1.2E-03	4.0E-03
Aquatic Plant Roots - Impacted		5.2E-03	2.5E-02	1.7E-03	8.3E-03
Benthic Invertebrates - Background		5.0E-03	2.7E-02	8.3E-04	4.5E-03
Benthic Invertebrates - Impacted		6.9E-03	4.3E-02	1.2E-03	7.1E-03

U-238+	Internal	U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235
	External	U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235 (beta + gamma only)
Ra-226+	Internal	Ra-226 + 0.3* (Rn-222 + ...Po-214)
	External	Ra-226 + 1.0* (Rn-222 + ...Po-214) (beta + gamma only)
Th-232+	Internal	Th-232 + ...Po-212/Tl-208 (Th-232 + Th-228 are inputs)
	External	Th-232 + Po-212/Tl-208
Ra-228+	Internal	Ra-228 + ...Po-212/Tl-208

Table H.1-1
Aquatic Dose Calculations

JSL-8

Determination of Aquatic Dose - 95th Percentile, RBE 10

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Water									
Background	Bq/m3	wcb	12.30	6.00	4.00	11.00	5.00		
Impacted water body	Bq/m3	wc	23.22	17.4	11.2	29.5	16.0		<<<< input concentrations in water
Sediment									
Background	Bq/g(wet)	sedwcb	3.32E-02	4.00E-02	4.00E-02	1.00E-01	1.00E-01		
Impacted water body	Bq/g(wet)	sedwc	3.82E-02	4.88E-02	5.58E-02	1.24E-01	1.18E-01		<<<< input concentrations in sediment
Fish									
Water-to-fish biocon fa	m3/gwet	bcff	4.80E-07	3.60E-05	9.30E-05	8.50E-05	2.50E-04		<<<< input transfer factor
Fish in bkgd water	Bq/g wet	fc	5.90E-06	2.16E-04	3.72E-04	9.35E-04	1.25E-03		
Fish in impacted water	Bq/g wet	fc	1.11E-05	6.26E-04	1.04E-03	2.51E-03	4.00E-03		
Aquatic Plants									
Water-to-plants biocon	m3/gwet	bcfap	5.47E-05	4.6E-04	1.2E-04	6.0E-04	1.6E-03		<<<< input transfer factor
Plants in bkgd water	Bq/g wet	apcb	6.73E-04	2.76E-03	4.80E-04	6.60E-03	8.00E-03		
Plants in impacted water	Bq/g wet	apc	1.27E-03	8.00E-03	1.35E-03	1.77E-02	2.56E-02		
Benthic Invertebrates									
Water-to-benthos bioco	m3/gwet	bcfbi	7.13E-04	5.95E-05	9.70E-04	2.20E-04	1.52E-03		<<<< input transfer factor
Benthos in bkgd water	Bq/g wet	bicb	8.77E-03	3.57E-04	3.88E-03	2.42E-03	7.60E-03		
Benthos in impacted water	Bq/g wet	bic	1.66E-02	1.04E-03	1.09E-02	6.49E-03	2.43E-02		
Absorbed Doses - Fish									
Internal Dose Factor	mGy/d per Bq	Idcff	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadfb	8.38E-07	1.42E-05	5.91E-05	5.64E-06	9.25E-05	1.7E-04	'=fcb*Idcff
Internal dose impacted	mGy/d	Iadf	1.58E-06	4.12E-05	1.66E-04	1.51E-05	2.96E-04	5.2E-04	'=fc*Idcff
Ext. dose factor	mGy/d per Bq	Edcff	8.57E-03	2.93E-05	3.68E-02	2.50E-03	1.40E-07		
Ext. dose bkgd pelagic	mGy/d	Eadfb	1.05E-07	1.76E-10	1.47E-07	2.75E-08	7.00E-13	2.8E-07	'=wcb*Edcff/1000000
Ext. dose impacted pelagic	mGy/d	Eadf	1.99E-07	5.10E-10	4.13E-07	7.37E-08	2.24E-12	6.9E-07	'=wc*Edcff/1000000
Ext. dose bkgd benthic	mGy/d	Eadfbenb	1.42E-04	5.86E-07	7.36E-04	1.25E-04	7.00E-09	1.0E-03	'=Edcff*(wcb/1000000+sedwcb)/2
Ext. dose impacted benthic	mGy/d	Eadfben	1.64E-04	7.16E-07	1.03E-03	1.55E-04	8.26E-09	1.3E-03	'=Edcff*(wc/1000000+sedwc)/2
Total dose - pelagic bkgd	mGy/d	Tadfbp	9.44E-07	1.42E-05	5.93E-05	5.67E-06	9.25E-05	1.7E-04	'=Iadfb+Eadfb
- pelagic impact	mGy/d	Tadfp	1.78E-06	4.12E-05	1.66E-04	1.52E-05	2.96E-04	5.2E-04	'=Iadf+Eadf
Total dose - benthic bkgd	mGy/d	Tadfbenb	1.43E-04	1.48E-05	7.95E-04	1.31E-04	9.25E-05	1.2E-03	'=Iadfb+Eadfbenb
- benthic impact	mGy/d	Tadfben	1.65E-04	4.19E-05	1.19E-03	1.70E-04	2.96E-04	1.9E-03	'=Iadf+Eadfben

Table H.1-1

Aquatic Dose Calculations

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Absorbed Doses - Aquatic Plants									
Internal Dose Factor	mGy/d per Bq	Idcfap	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadapb	9.55E-05	1.82E-04	7.63E-05	3.98E-05	5.92E-04	9.9E-04	'=apcb*Idcfap
Internal dose impacted	mGy/d	Iadap	1.80E-04	5.27E-04	2.14E-04	1.07E-04	1.90E-03	2.9E-03	'=apc*Idcfap
Ext. dose factor aq plan	mGy/d per Bq	Edcfap	1.29E-02	2.25E-04	3.67E-02	6.03E-03	1.10E-07		
Ext. dose to leaf bkgd	mGy/d	Eadpwb	1.59E-07	1.35E-09	1.47E-07	6.63E-08	5.50E-13	3.7E-07	'=wcb*Edcfap/1000000
Ext. dose to leaf impact	mGy/d	Eadpw	3.00E-07	3.91E-09	4.12E-07	1.78E-07	1.76E-12	8.9E-07	'=wc*Edcfap/1000000
Ext. dose to root bkgd	mGy/d	Eadpsb	4.28E-04	9.00E-06	1.47E-03	6.03E-04	1.10E-08	2.5E-03	'=sedwcb*Edcfap
Ext. dose to root impact	mGy/d	Eadps	4.92E-04	1.10E-05	2.05E-03	7.47E-04	1.30E-08	3.3E-03	'=sedwc*Edcfap
Total dose - leaf bkgd	mGy/d	Tadaplb	9.57E-05	1.82E-04	7.65E-05	3.99E-05	5.92E-04	9.9E-04	'=Iadapb+Eadpwb
- leaf impacted	mGy/d	Tadapl	1.81E-04	5.27E-04	2.14E-04	1.07E-04	1.90E-03	2.9E-03	'=Iadap+Eadpw
Total dose - root bkgd	mGy/d	Tadaprb	5.24E-04	1.91E-04	1.54E-03	6.43E-04	5.92E-04	3.5E-03	'=Iadapb+Eadpsb
- root impacted	mGy/d	Tadapr	6.73E-04	5.38E-04	2.26E-03	8.53E-04	1.90E-03	6.2E-03	'=Iadap+Eadps
Absorbed Doses - Benthic Invertebrates									
Internal Dose Factor	mGy/d per Bq	Idcfbi	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadbib	1.25E-03	2.35E-05	6.17E-04	1.46E-05	5.62E-04	2.5E-03	'=bicb*Idcfbi
Internal dose impacted	mGy/d	Iadbi	2.35E-03	6.81E-05	1.73E-03	3.91E-05	1.80E-03	6.0E-03	'=bic*Idcfbi
Ext. dose factor ben inv	mGy/d per Bq	Edcfbi	1.29E-02	2.25E-04	3.67E-02	6.03E-03	1.10E-07		
Ext. dose bkgd sedimer	mGy/d	Eadbenb	4.28E-04	9.00E-06	1.47E-03	6.03E-04	1.10E-08	2.5E-03	'=sedwcb*Edcfbi
Ext. dose impacted sedi	mGy/d	Eadben	4.92E-04	1.10E-05	2.05E-03	7.47E-04	1.30E-08	3.3E-03	'=sedwc*Edcfbi
Total dose - bkgd	mGy/d	Tadbenb	1.67E-03	3.25E-05	2.08E-03	6.18E-04	5.62E-04	5.0E-03	'=Iadbib+Eadbenb
Total dose - impacted	mGy/d	Tadben	2.84E-03	7.91E-05	3.78E-03	7.86E-04	1.80E-03	9.3E-03	'=Iadbi+Eadben
Equivalent Doses - Fish									
RBE for alpha	Sv/Gy	RBEf	10						
Total dose - pelagic bkg	mSv/d	Tedfpb	8.49E-06	1.42E-04	5.92E-04	5.67E-06	9.25E-04	1.7E-03	'=Iadfb*RBEf+Eadfb
- pelagic impact	mSv/d	Tedfp	1.60E-05	4.12E-04	1.66E-03	1.52E-05	2.96E-03	5.1E-03	'=Iadf*RBEf+Eadf
Total dose - benthic bkg	mSv/d	Tedfbenb	1.51E-04	1.43E-04	1.33E-03	1.31E-04	9.25E-04	2.7E-03	'=Iadfb*RBEf+Eadfbenb
- benthic impact	mSv/d	Tedfben	1.79E-04	4.13E-04	2.68E-03	1.70E-04	2.96E-03	6.4E-03	'=Iadf*RBEf+Eadfben
Equivalent Doses - Aquatic Plants									
RBE for alpha	Sv/Gy	RBEap	10						
Total dose - leaf bkgd	mSv/d	Tedaplb	9.56E-04	1.82E-03	7.63E-04	3.99E-05	5.92E-03	9.5E-03	'=Iadapb*RBEap+Eadpwb
- leaf impacted	mSv/d	Tedapl	1.80E-03	5.27E-03	2.14E-03	1.07E-04	1.90E-02	2.8E-02	'=Iadap*RBEap+Eadpw
Total dose - root bkgd	mSv/d	Tedaprb	1.38E-03	1.83E-03	2.23E-03	6.43E-04	5.92E-03	1.2E-02	'=Iadapb*RBEap+Eadpsb
- root impacted	mSv/d	Tedapr	2.30E-03	5.28E-03	4.19E-03	8.53E-04	1.90E-02	3.2E-02	'=Iadap*RBEap+Eadps

Table H.1-1

Aquatic Dose Calculations

Equivalent Doses - Benthic Invertebrates

RBE for alpha	Sv/Gy	RBEbi	10							
Total dose - bkgd	mSv/d	Tedbenb	1.29E-02	2.44E-04	7.64E-03	6.18E-04	5.62E-03	2.7E-02		'=Iadbib*RBEbi+Eadbenb
Total dose - impacted	mSv/d	Tedben	2.40E-02	6.92E-04	1.93E-02	7.86E-04	1.80E-02	6.3E-02		'=Iadbi*RBEbi+Eadben

0.6 Screening Criterion in mGy/d	3 6	Total Absorbed Dose mGy/d	Total Equivalent Dose mSv/d	Index (Absorbed Equivalent Dose)	Index (Absorbed Equivalent Dose)
Pelagic Fish - Background		1.7E-04	1.7E-03	2.9E-04	2.8E-03
Pelagic Fish - Impacted		5.2E-04	5.1E-03	8.7E-04	8.4E-03
Benthic Fish - Background		1.2E-03	2.7E-03	2.0E-03	4.5E-03
Benthic Fish - Impacted		1.9E-03	6.4E-03	3.1E-03	1.1E-02
Aquatic Plant Leaves - Background		9.9E-04	9.5E-03	3.3E-04	3.2E-03
Aquatic Plant Leaves - Impacted		2.9E-03	2.8E-02	9.8E-04	9.4E-03
Aquatic Plant Roots - Background		3.5E-03	1.2E-02	1.2E-03	4.0E-03
Aquatic Plant Roots - Impacted		6.2E-03	3.2E-02	2.1E-03	1.1E-02
Benthic Invertebrates - Background		5.0E-03	2.7E-02	8.3E-04	4.5E-03
Benthic Invertebrates - Impacted		9.3E-03	6.3E-02	1.5E-03	1.0E-02

U-238+	Internal	U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235
	External	U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235 (beta + gamma only)
Ra-226+	Internal	Ra-226 + 0.3* (Rn-222 + ...Po-214)
	External	Ra-226 + 1.0* (Rn-222 + ...Po-214) (beta + gamma only)
Th-232+	Internal	Th-232 + ...Po-212/Tl-208 (Th-232 + Th-228 are inputs)
	External	Th-232 + Po-212/Tl-208
Ra-228+	Internal	Ra-228 + ...Po-212/Tl-208

Table H.1-1
Aquatic Dose Calculations

JSL-8 **Determination of Aquatic Dose - Average, RBE 40**

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Water									
Background	Bq/m3	wcb	12.30	6.00	4.00	11.00	5.00		
Impacted water body	Bq/m3	wc	11.05	13.9	9.1	25.7	12.0		<<<< input concentrations in water
Sediment									
Background	Bq/g(wet)	sedwcb	3.32E-02	4.00E-02	4.00E-02	1.00E-01	1.00E-01		
Impacted water body	Bq/g(wet)	sedwc	3.53E-02	4.41E-02	4.94E-02	1.14E-01	1.10E-01		<<<< input concentrations in sediment
Fish									
Water-to-fish biocon fa	m3/gwet	bcff	4.80E-07	3.60E-05	9.30E-05	8.50E-05	2.50E-04		<<<< input transfer factor
Fish in bkgd water	Bq/g wet	fc	5.90E-06	2.16E-04	3.72E-04	9.35E-04	1.25E-03		
Fish in impacted water	Bq/g wet	fc	5.30E-06	5.00E-04	8.42E-04	2.18E-03	3.00E-03		
Aquatic Plants									
Water-to-plants biocon	m3/gwet	bcfb	5.47E-05	4.6E-04	1.2E-04	6.0E-04	1.6E-03		<<<< input transfer factor
Plants in bkgd water	Bq/g wet	apcb	6.73E-04	2.76E-03	4.80E-04	6.60E-03	8.00E-03		
Plants in impacted water	Bq/g wet	apc	6.04E-04	6.39E-03	1.09E-03	1.54E-02	1.92E-02		
Benthic Invertebrates									
Water-to-benthos biocon	m3/gwet	bcfbi	7.13E-04	5.95E-05	9.70E-04	2.20E-04	1.52E-03		<<<< input transfer factor
Benthos in bkgd water	Bq/g wet	bicb	8.77E-03	3.57E-04	3.88E-03	2.42E-03	7.60E-03		
Benthos in impacted water	Bq/g wet	bic	7.88E-03	8.27E-04	8.78E-03	5.65E-03	1.83E-02		
Absorbed Doses - Fish									
Internal Dose Factor	mGy/d per Bq	Idc	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadfb	8.38E-07	1.42E-05	5.91E-05	5.64E-06	9.25E-05	1.7E-04	'=fcb*Idc
Internal dose impacted	mGy/d	Iadf	7.53E-07	3.29E-05	1.34E-04	1.32E-05	2.22E-04	4.0E-04	'=fc*Idc
Ext. dose factor	mGy/d per Bq	Edc	8.57E-03	2.93E-05	3.68E-02	2.50E-03	1.40E-07		
Ext. dose bkgd pelagic	mGy/d	Eadfb	1.05E-07	1.76E-10	1.47E-07	2.75E-08	7.00E-13	2.8E-07	'=wcb*Edc/1000000
Ext. dose impacted pelagic	mGy/d	Eadf	9.47E-08	4.07E-10	3.33E-07	6.42E-08	1.68E-12	4.9E-07	'=wc*Edc/1000000
Ext. dose bkgd benthic	mGy/d	Eadfbenb	1.42E-04	5.86E-07	7.36E-04	1.25E-04	7.00E-09	1.0E-03	'=Edc*(wcb/1000000+sedwcb)/2
Ext. dose impacted benthic	mGy/d	Eadfben	1.51E-04	6.46E-07	9.09E-04	1.42E-04	7.70E-09	1.2E-03	'=Edc*(wc/1000000+sedwc)/2
Total dose - pelagic bkgd	mGy/d	Tadfb	9.44E-07	1.42E-05	5.93E-05	5.67E-06	9.25E-05	1.7E-04	'=Iadfb+Eadfb
- pelagic impact	mGy/d	Tadf	8.48E-07	3.29E-05	1.34E-04	1.32E-05	2.22E-04	4.0E-04	'=Iadf+Eadf
Total dose - benthic bkgd	mGy/d	Tadfbenb	1.43E-04	1.48E-05	7.95E-04	1.31E-04	9.25E-05	1.2E-03	'=Iadfb+Eadfbenb
- benthic impact	mGy/d	Tadfben	1.52E-04	3.36E-05	1.04E-03	1.56E-04	2.22E-04	1.6E-03	'=Iadf+Eadfben

Table H.1-1

Aquatic Dose Calculations

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Absorbed Doses - Aquatic Plants									
Internal Dose Factor	mGy/d per Bq	Idcfap	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadapb	9.55E-05	1.82E-04	7.63E-05	3.98E-05	5.92E-04	9.9E-04	'=apcb*Idcfap
Internal dose impacted	mGy/d	Iadap	8.58E-05	4.21E-04	1.73E-04	9.29E-05	1.42E-03	2.2E-03	'=apc*Idcfap
Ext. dose factor aq plan	mGy/d per Bq	Edcfap	1.29E-02	2.25E-04	3.67E-02	6.03E-03	1.10E-07		
Ext. dose to leaf bkgd	mGy/d	Eadpwb	1.59E-07	1.35E-09	1.47E-07	6.63E-08	5.50E-13	3.7E-07	'=wcb*Edcfap/1000000
Ext. dose to leaf impact	mGy/d	Eadpw	1.43E-07	3.13E-09	3.32E-07	1.55E-07	1.32E-12	6.3E-07	'=wc*Edcfap/1000000
Ext. dose to root bkgd	mGy/d	Eadpsb	4.28E-04	9.00E-06	1.47E-03	6.03E-04	1.10E-08	2.5E-03	'=sedwcb*Edcfap
Ext. dose to root impact	mGy/d	Eadps	4.55E-04	9.92E-06	1.81E-03	6.87E-04	1.21E-08	3.0E-03	'=sedwc*Edcfap
Total dose - leaf bkgd	mGy/d	Tadaplb	9.57E-05	1.82E-04	7.65E-05	3.99E-05	5.92E-04	9.9E-04	'=Iadapb+Eadpwb
- leaf impacted	mGy/d	Tadapl	8.60E-05	4.21E-04	1.73E-04	9.31E-05	1.42E-03	2.2E-03	'=Iadap+Eadpw
Total dose - root bkgd	mGy/d	Tadaprb	5.24E-04	1.91E-04	1.54E-03	6.43E-04	5.92E-04	3.5E-03	'=Iadapb+Eadpsb
- root impacted	mGy/d	Tadapr	5.41E-04	4.31E-04	1.99E-03	7.80E-04	1.42E-03	5.2E-03	'=Iadap+Eadps
Absorbed Doses - Benthic Invertebrates									
Internal Dose Factor	mGy/d per Bq	Idcfbi	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadbib	1.25E-03	2.35E-05	6.17E-04	1.46E-05	5.62E-04	2.5E-03	'=bicb*Idcfbi
Internal dose impacted	mGy/d	Iadbi	1.12E-03	5.44E-05	1.40E-03	3.41E-05	1.35E-03	4.0E-03	'=bic*Idcfbi
Ext. dose factor ben inv	mGy/d per Bq	Edcfbi	1.29E-02	2.25E-04	3.67E-02	6.03E-03	1.10E-07		
Ext. dose bkgd sedimer	mGy/d	Eadbenb	4.28E-04	9.00E-06	1.47E-03	6.03E-04	1.10E-08	2.5E-03	'=sedwcb*Edcfbi
Ext. dose impacted sedi	mGy/d	Eadben	4.55E-04	9.92E-06	1.81E-03	6.87E-04	1.21E-08	3.0E-03	'=sedwc*Edcfbi
Total dose - bkgd	mGy/d	Tadbenb	1.67E-03	3.25E-05	2.08E-03	6.18E-04	5.62E-04	5.0E-03	'=Iadbib+Eadbenb
Total dose - impacted	mGy/d	Tadben	1.57E-03	6.43E-05	3.21E-03	7.21E-04	1.35E-03	6.9E-03	'=Iadbi+Eadben
Equivalent Doses - Fish									
RBE for alpha	Sv/Gy	RBEf	40						
Total dose - pelagic bkg	mSv/d	Tedfpb	3.36E-05	5.69E-04	2.37E-03	5.67E-06	3.70E-03	6.7E-03	'=Iadfb*RBEf+Eadfb
- pelagic impact	mSv/d	Tedfp	3.02E-05	1.32E-03	5.35E-03	5.26E-04	8.89E-03	1.6E-02	'=Iadf*RBEf+Eadf
Total dose - benthic bkg	mSv/d	Tedfbenb	1.76E-04	5.69E-04	3.10E-03	1.31E-04	3.70E-03	7.7E-03	'=Iadfb*RBEf+Eadfbenb
- benthic impact	mSv/d	Tedfben	1.81E-04	1.32E-03	6.26E-03	6.69E-04	8.89E-03	1.7E-02	'=Iadf*RBEf+Eadfben
Equivalent Doses - Aquatic Plants									
RBE for alpha	Sv/Gy	RBEap	40						
Total dose - leaf bkgd	mSv/d	Tedaplb	3.82E-03	7.26E-03	3.05E-03	3.99E-05	2.37E-02	3.8E-02	'=Iadapb*RBEap+Eadpwb
- leaf impacted	mSv/d	Tedapl	3.43E-03	1.68E-02	6.91E-03	3.72E-03	5.69E-02	8.8E-02	'=Iadap*RBEap+Eadpw
Total dose - root bkgd	mSv/d	Tedaprb	4.25E-03	7.27E-03	4.52E-03	6.43E-04	2.37E-02	4.0E-02	'=Iadapb*RBEap+Eadpsb
- root impacted	mSv/d	Tedapr	3.89E-03	1.68E-02	8.72E-03	4.40E-03	5.69E-02	9.1E-02	'=Iadap*RBEap+Eadps

Table H.1-1

Aquatic Dose Calculations

Equivalent Doses - Benthic Invertebrates

RBE for alpha	Sv/Gy	RBEbi	40							
Total dose - bkgd	mSv/d	Tedbenb	1.29E-02	2.44E-04	7.64E-03	6.18E-04	5.62E-03	2.7E-02		'=Iadbib*RBEbi+Eadbenb
Total dose - impacted	mSv/d	Tedben	4.52E-02	9.92E-06	1.81E-03	6.87E-04	1.21E-08	4.8E-02		'=Iadbi*RBEbi+Eadben

0.6 Screening Criterion in mGy/d	3 6	Total Absorbed Dose mGy/d	Total Equivalent Dose mSv/d	Index (Absorbed Equivalent Dose)	Index (Absorbed Equivalent Dose)
Pelagic Fish - Background		1.7E-04	6.7E-03	2.9E-04	1.1E-02
Pelagic Fish - Impacted		4.0E-04	1.6E-02	6.7E-04	2.7E-02
Benthic Fish - Background		1.2E-03	7.7E-03	2.0E-03	1.3E-02
Benthic Fish - Impacted		1.6E-03	1.7E-02	2.7E-03	2.9E-02
Aquatic Plant Leaves - Background		9.9E-04	3.8E-02	3.3E-04	1.3E-02
Aquatic Plant Leaves - Impacted		2.2E-03	8.8E-02	7.3E-04	2.9E-02
Aquatic Plant Roots - Background		3.5E-03	4.0E-02	1.2E-03	1.3E-02
Aquatic Plant Roots - Impacted		5.2E-03	9.1E-02	1.7E-03	3.0E-02
Benthic Invertebrates - Background		5.0E-03	2.7E-02	8.3E-04	4.5E-03
Benthic Invertebrates - Impacted		6.9E-03	4.8E-02	1.2E-03	8.0E-03

U-238+	Internal	U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235
	External	U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235 (beta + gamma only)
Ra-226+	Internal	Ra-226 + 0.3* (Rn-222 + ...Po-214)
	External	Ra-226 + 1.0* (Rn-222 + ...Po-214) (beta + gamma only)
Th-232+	Internal	Th-232 + ...Po-212/Tl-208 (Th-232 + Th-228 are inputs)
	External	Th-232 + Po-212/Tl-208
Ra-228+	Internal	Ra-228 + ...Po-212/Tl-208

Table H.1-1
Aquatic Dose Calculations

JSL-8

Determination of Aquatic Dose - 95th Percentile, RBE 40

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Water									
Background	Bq/m3	wcb	12.30	6.00	4.00	11.00	5.00		
Impacted water body	Bq/m3	wc	23.22	17.4	11.2	29.5	16.0		<<<< input concentrations in water
Sediment									
Background	Bq/g(wet)	sedwcb	3.32E-02	4.00E-02	4.00E-02	1.00E-01	1.00E-01		
Impacted water body	Bq/g(wet)	sedwc	3.82E-02	4.88E-02	5.58E-02	1.24E-01	1.18E-01		<<<< input concentrations in sediment
Fish									
Water-to-fish biocon fa	m3/gwet	bcff	4.80E-07	3.60E-05	9.30E-05	8.50E-05	2.50E-04		<<<< input transfer factor
Fish in bkgd water	Bq/g wet	fc	5.90E-06	2.16E-04	3.72E-04	9.35E-04	1.25E-03		
Fish in impacted water	Bq/g wet	fc	1.11E-05	6.26E-04	1.04E-03	2.51E-03	4.00E-03		
Aquatic Plants									
Water-to-plants biocon m3/gwet		bcfb	5.47E-05	4.6E-04	1.2E-04	6.0E-04	1.6E-03		<<<< input transfer factor
Plants in bkgd water	Bq/g wet	apcb	6.73E-04	2.76E-03	4.80E-04	6.60E-03	8.00E-03		
Plants in impacted water	Bq/g wet	apc	1.27E-03	8.00E-03	1.35E-03	1.77E-02	2.56E-02		
Benthic Invertebrates									
Water-to-benthos biocon m3/gwet		bcfbi	7.13E-04	5.95E-05	9.70E-04	2.20E-04	1.52E-03		<<<< input transfer factor
Benthos in bkgd water	Bq/g wet	bicb	8.77E-03	3.57E-04	3.88E-03	2.42E-03	7.60E-03		
Benthos in impacted water	Bq/g wet	bic	1.66E-02	1.04E-03	1.09E-02	6.49E-03	2.43E-02		
Absorbed Doses - Fish									
Internal Dose Factor	mGy/d per Bq	Idc	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadfb	8.38E-07	1.42E-05	5.91E-05	5.64E-06	9.25E-05	1.7E-04	'=fcb*Idc
Internal dose impacted	mGy/d	Iadf	1.58E-06	4.12E-05	1.66E-04	1.51E-05	2.96E-04	5.2E-04	'=fc*Idc
Ext. dose factor	mGy/d per Bq	Edc	8.57E-03	2.93E-05	3.68E-02	2.50E-03	1.40E-07		
Ext. dose bkgd pelagic	mGy/d	Eadfb	1.05E-07	1.76E-10	1.47E-07	2.75E-08	7.00E-13	2.8E-07	'=wcb*Edc/1000000
Ext. dose impacted pelagic	mGy/d	Eadf	1.99E-07	5.10E-10	4.13E-07	7.37E-08	2.24E-12	6.9E-07	'=wc*Edc/1000000
Ext. dose bkgd benthic	mGy/d	Eadfbenb	1.42E-04	5.86E-07	7.36E-04	1.25E-04	7.00E-09	1.0E-03	'=Edc*((wcb/1000000+sedwcb)/2
Ext. dose impacted benthic	mGy/d	Eadfben	1.64E-04	7.16E-07	1.03E-03	1.55E-04	8.26E-09	1.3E-03	'=Edc*((wc/1000000+sedwc)/2
Total dose - pelagic bkgd	mGy/d	Tadfbp	9.44E-07	1.42E-05	5.93E-05	5.67E-06	9.25E-05	1.7E-04	'=Iadfb+Eadfb
- pelagic impact	mGy/d	Tadfp	1.78E-06	4.12E-05	1.66E-04	1.52E-05	2.96E-04	5.2E-04	'=Iadf+Eadf
Total dose - benthic bkgd	mGy/d	Tadfbenb	1.43E-04	1.48E-05	7.95E-04	1.31E-04	9.25E-05	1.2E-03	'=Iadfb+Eadfbenb
- benthic impact	mGy/d	Tadfben	1.65E-04	4.19E-05	1.19E-03	1.70E-04	2.96E-04	1.9E-03	'=Iadf+Eadfben

Table H.1-1

Aquatic Dose Calculations

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Absorbed Doses - Aquatic Plants									
Internal Dose Factor	mGy/d per Bq	Idcfap	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadapb	9.55E-05	1.82E-04	7.63E-05	3.98E-05	5.92E-04	9.9E-04	'=apcb*Idcfap
Internal dose impacted	mGy/d	Iadap	1.80E-04	5.27E-04	2.14E-04	1.07E-04	1.90E-03	2.9E-03	'=apc*Idcfap
Ext. dose factor aq plan	mGy/d per Bq	Edcfap	1.29E-02	2.25E-04	3.67E-02	6.03E-03	1.10E-07		
Ext. dose to leaf bkgd	mGy/d	Eadpwb	1.59E-07	1.35E-09	1.47E-07	6.63E-08	5.50E-13	3.7E-07	'=wcb*Edcfap/1000000
Ext. dose to leaf impact	mGy/d	Eadpw	3.00E-07	3.91E-09	4.12E-07	1.78E-07	1.76E-12	8.9E-07	'=wc*Edcfap/1000000
Ext. dose to root bkgd	mGy/d	Eadpsb	4.28E-04	9.00E-06	1.47E-03	6.03E-04	1.10E-08	2.5E-03	'=sedwcb*Edcfap
Ext. dose to root impact	mGy/d	Eadps	4.92E-04	1.10E-05	2.05E-03	7.47E-04	1.30E-08	3.3E-03	'=sedwc*Edcfap
Total dose - leaf bkgd	mGy/d	Tadaplb	9.57E-05	1.82E-04	7.65E-05	3.99E-05	5.92E-04	9.9E-04	'=Iadapb+Eadpwb
- leaf impacted	mGy/d	Tadapl	1.81E-04	5.27E-04	2.14E-04	1.07E-04	1.90E-03	2.9E-03	'=Iadap+Eadpw
Total dose - root bkgd	mGy/d	Tadaprb	5.24E-04	1.91E-04	1.54E-03	6.43E-04	5.92E-04	3.5E-03	'=Iadapb+Eadpsb
- root impacted	mGy/d	Tadapr	6.73E-04	5.38E-04	2.26E-03	8.53E-04	1.90E-03	6.2E-03	'=Iadap+Eadps
Absorbed Doses - Benthic Invertebrates									
Internal Dose Factor	mGy/d per Bq	Idcfbi	1.42E-01	6.58E-02	1.59E-01	6.03E-03	7.40E-02		
Internal dose bkgd	mGy/d	Iadbib	1.25E-03	2.35E-05	6.17E-04	1.46E-05	5.62E-04	2.5E-03	'=bicb*Idcfbi
Internal dose impacted	mGy/d	Iadbi	2.35E-03	6.81E-05	1.73E-03	3.91E-05	1.80E-03	6.0E-03	'=bic*Idcfbi
Ext. dose factor ben inv	mGy/d per Bq	Edcfbi	1.29E-02	2.25E-04	3.67E-02	6.03E-03	1.10E-07		
Ext. dose bkgd sedimer	mGy/d	Eadbenb	4.28E-04	9.00E-06	1.47E-03	6.03E-04	1.10E-08	2.5E-03	'=sedwcb*Edcfbi
Ext. dose impacted sedi	mGy/d	Eadben	4.92E-04	1.10E-05	2.05E-03	7.47E-04	1.30E-08	3.3E-03	'=sedwc*Edcfbi
Total dose - bkgd	mGy/d	Tadbenb	1.67E-03	3.25E-05	2.08E-03	6.18E-04	5.62E-04	5.0E-03	'=Iadbib+Eadbenb
Total dose - impacted	mGy/d	Tadben	2.84E-03	7.91E-05	3.78E-03	7.86E-04	1.80E-03	9.3E-03	'=Iadbi+Eadben
Equivalent Doses - Fish									
RBE for alpha	Sv/Gy	RBEf	40						
Total dose - pelagic bkg	mSv/d	Tedfpb	3.36E-05	5.69E-04	2.37E-03	5.67E-06	3.70E-03	6.7E-03	'=Iadfb*RBEf+Eadfb
- pelagic impact	mSv/d	Tedfp	6.35E-05	1.65E-03	6.63E-03	1.52E-05	1.19E-02	2.0E-02	'=Iadf*RBEf+Eadf
Total dose - benthic bkg	mSv/d	Tedfbenb	1.76E-04	5.69E-04	3.10E-03	1.31E-04	3.70E-03	7.7E-03	'=Iadfb*RBEf+Eadfbenb
- benthic impact	mSv/d	Tedfben	2.27E-04	1.65E-03	7.66E-03	1.70E-04	1.19E-02	2.2E-02	'=Iadf*RBEf+Eadfben
Equivalent Doses - Aquatic Plants									
RBE for alpha	Sv/Gy	RBEap	40						
Total dose - leaf bkgd	mSv/d	Tedaplb	3.82E-03	7.26E-03	3.05E-03	3.99E-05	2.37E-02	3.8E-02	'=Iadapb*RBEap+Eadpwb
- leaf impacted	mSv/d	Tedapl	7.22E-03	2.11E-02	8.56E-03	1.07E-04	7.59E-02	1.1E-01	'=Iadap*RBEap+Eadpw
Total dose - root bkgd	mSv/d	Tedaprb	4.25E-03	7.27E-03	4.52E-03	6.43E-04	2.37E-02	4.0E-02	'=Iadapb*RBEap+Eadpsb
- root impacted	mSv/d	Tedapr	7.71E-03	2.11E-02	1.06E-02	8.53E-04	7.59E-02	1.2E-01	'=Iadap*RBEap+Eadps

Table H.1-1

Aquatic Dose Calculations

Equivalent Doses - Benthic Invertebrates

RBE for alpha	Sv/Gy	RBEbi	40							
Total dose - bkgd	mSv/d	Tedbenb	5.02E-02	9.49E-04	2.61E-02	6.18E-04	2.25E-02	1.0E-01		'=Iadbib*RBEbi+Eadbenb
Total dose - impacted	mSv/d	Tedben	9.45E-02	2.74E-03	7.12E-02	7.86E-04	7.21E-02	2.4E-01		'=Iadbi*RBEbi+Eadben

0.6 Screening Criterion in mGy/d	3 6	Total Absorbed Dose mGy/d	Total Equivalent Dose mSv/d	Index (Absorbed Equivalent Dose)	Index (Absorbed Equivalent Dose)
Pelagic Fish - Background		1.7E-04	6.7E-03	2.9E-04	1.1E-02
Pelagic Fish - Impacted		5.2E-04	2.0E-02	8.7E-04	3.4E-02
Benthic Fish - Background		1.2E-03	7.7E-03	2.0E-03	1.3E-02
Benthic Fish - Impacted		1.9E-03	2.2E-02	3.1E-03	3.6E-02
Aquatic Plant Leaves - Background		9.9E-04	3.8E-02	3.3E-04	1.3E-02
Aquatic Plant Leaves - Impacted		2.9E-03	1.1E-01	9.8E-04	3.8E-02
Aquatic Plant Roots - Background		3.5E-03	4.0E-02	1.2E-03	1.3E-02
Aquatic Plant Roots - Impacted		6.2E-03	1.2E-01	2.1E-03	3.9E-02
Benthic Invertebrates - Background		5.0E-03	1.0E-01	8.3E-04	1.7E-02
Benthic Invertebrates - Impacted		9.3E-03	2.4E-01	1.5E-03	4.0E-02

U-238+	Internal	U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235
	External	U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235 (beta + gamma only)
Ra-226+	Internal	Ra-226 + 0.3* (Rn-222 + ...Po-214)
	External	Ra-226 + 1.0* (Rn-222 + ...Po-214) (beta + gamma only)
Th-232+	Internal	Th-232 + ...Po-212/Tl-208 (Th-232 + Th-228 are inputs)
	External	Th-232 + Po-212/Tl-208
Ra-228+	Internal	Ra-228 + ...Po-212/Tl-208

Table H.2-2

Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

2010

DOSES TO SELECTED VECs - Average Total Dose

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Absorbed Doses - Bear - LSA									
Concentration	Bq/g	Crad	1.26E-05	3.35E-05	2.28E-05	5.30E-05	1.79E-03		
Internal Dose Factor	mGy/d per Bq/g	ldcf	1.4E-01	6.6E-02	1.6E-01	6.0E-03	7.4E-02		
Internal dose rate	mGy/d	ldrat	1.8E-06	2.2E-06	3.6E-06	3.2E-07	1.3E-04	1.4E-04	=Crad*ldcf
External Gamma rate	uGy/h	Xgrat	0.04						
Fraction of time on site	-	fts	1.00						
External dose rate	mGy/d	Xdrat	9.6E-04						=Xgrat*24*fts/1000
Internal plus external	mGy/d	tdrat	1.1E-03						=SUM(ldrat)+Xdrat
Absorbed Doses - Caribou - LSA									
Concentration	Bq/g	Crad2	2.99E-05	4.43E-05	8.68E-05	9.05E-04	2.39E-02		
Internal dose rate	mGy/d	ldrat2	4.3E-06	2.9E-06	1.4E-05	5.5E-06	1.8E-03	1.8E-03	=Crad2*ldcf
Fraction of time on site	-	fts2	1.00						
External dose rate	mGy/d	Xdrat2	9.6E-04						=Xgrat*24*fts2/1000
Internal plus external	mGy/d	tdrat2	2.8E-03						=SUM(ldrat2)+Xdrat2
Absorbed Doses - Caribou - RSA									
Concentration	Bq/g	Crad3	2.99E-05	4.43E-05	8.68E-05	9.05E-04	2.39E-02		
Internal dose rate	mGy/d	ldrat3	4.3E-06	2.9E-06	1.4E-05	5.5E-06	1.8E-03	1.8E-03	=Crad3*ldcf
Fraction of time on site	-	fts3	1.00						
External dose rate	mGy/d	Xdrat3	9.6E-04						=Xgrat*24*fts3/1000
Internal plus external	mGy/d	tdrat3	2.8E-03						=SUM(ldrat3)+Xdrat3
Absorbed Doses - Falcon - LSA									
Concentration	Bq/g	Crad4	3.79E-06	1.20E-04	3.99E-04	1.34E-01	1.46E-02		
Internal dose rate	mGy/d	ldrat4	5.4E-07	7.9E-06	6.3E-05	8.1E-04	1.1E-03	2.0E-03	=Crad4*ldcf
Fraction of time on site	-	fts4	1.00						
External dose rate	mGy/d	Xdrat4	9.6E-04						=Xgrat*24*fts4/1000
Internal plus external	mGy/d	tdrat4	2.9E-03						=SUM(ldrat4)+Xdrat4
Absorbed Doses - Falcon - RSA									
Concentration	Bq/g	Crad5	3.78E-06	1.20E-04	3.98E-04	1.34E-01	1.46E-02		
Internal dose rate	mGy/d	ldrat5	5.4E-07	7.9E-06	6.3E-05	8.1E-04	1.1E-03	2.0E-03	=Crad5*ldcf
Fraction of time on site	-	fts5	1.00						
External dose rate	mGy/d	Xdrat5	9.6E-04						=Xgrat*24*fts5/1000
Internal plus external	mGy/d	tdrat5	2.9E-03						=SUM(ldrat5)+Xdrat5
Absorbed Doses - Fox - LSA									
Concentration	Bq/g	Crad6	8.13E-06	2.47E-05	5.34E-05	1.28E-04	1.08E-03		
Internal dose rate	mGy/d	ldrat6	1.2E-06	1.6E-06	8.5E-06	7.7E-07	8.0E-05	9.2E-05	=Crad6*ldcf
Fraction of time on site	-	fts6	1.00						
External dose rate	mGy/d	Xdrat6	9.6E-04						=Xgrat*24*fts6/1000
Internal plus external	mGy/d	tdrat6	1.1E-03						=SUM(ldrat6)+Xdrat6
Absorbed Doses - Lemming - Rock Lake Watershed									
Concentration	Bq/g	Crad7	3.22E-05	1.14E-03	2.26E-03	4.72E-02	6.00E-03		
Internal dose rate	mGy/d	ldrat7	4.6E-06	7.5E-05	3.6E-04	2.8E-04	4.4E-04	1.2E-03	=Crad7*ldcf
Fraction of time on site	-	fts7	1.00						
External dose rate	mGy/d	Xdrat7	9.6E-04						=Xgrat*24*fts7/1000
Internal plus external	mGy/d	tdrat7	2.1E-03						=SUM(ldrat7)+Xdrat7
Absorbed Doses - Lemming - JSL @ Kiggavik Discharge									
Concentration	Bq/g	Crad8	3.22E-05	1.14E-03	2.26E-03	4.72E-02	6.00E-03		
Internal dose rate	mGy/d	ldrat8	4.6E-06	7.5E-05	3.6E-04	2.8E-04	4.4E-04	1.2E-03	=Crad8*ldcf
Fraction of time on site	-	fts8	1.00						
External dose rate	mGy/d	Xdrat8	9.6E-04						=Xgrat*24*fts8/1000
Internal plus external	mGy/d	tdrat8	2.1E-03						=SUM(ldrat8)+Xdrat8
Absorbed Doses - Lemming - Kiggavik Camp									
Concentration	Bq/g	Crad9	3.22E-05	1.14E-03	2.26E-03	4.72E-02	6.00E-03		
Internal dose rate	mGy/d	ldrat9	4.6E-06	7.5E-05	3.6E-04	2.8E-04	4.4E-04	1.2E-03	=Crad9*ldcf
Fraction of time on site	-	fts9	1.00						
External dose rate	mGy/d	Xdrat9	9.6E-04						=Xgrat*24*fts9/1000
Internal plus external	mGy/d	tdrat9	2.1E-03						=SUM(ldrat9)+Xdrat9
Absorbed Doses - Lemming - JSL @ Sissons Discharge									
Concentration	Bq/g	Crad10	3.22E-05	1.14E-03	2.26E-03	4.72E-02	6.00E-03		
Internal dose rate	mGy/d	ldrat10	4.6E-06	7.5E-05	3.6E-04	2.8E-04	4.4E-04	1.2E-03	=Crad10*ldcf
Fraction of time on site	-	fts10	1.00						
External dose rate	mGy/d	Xdrat10	9.6E-04						=Xgrat*24*fts10/1000
Internal plus external	mGy/d	tdrat10	2.1E-03						=SUM(ldrat10)+Xdrat10
Absorbed Doses - Lapland Longspur - Rock Lake Watershed									
Concentration	Bq/g	Crad11	1.15E-05	7.43E-04	1.58E-03	3.56E-02	1.28E-02		
Internal dose rate	mGy/d	ldrat11	1.6E-06	4.9E-05	2.5E-04	2.1E-04	9.5E-04	1.5E-03	=Crad11*ldcf
Fraction of time on site	-	fts11	1.00						
External dose rate	mGy/d	Xdrat11	9.6E-04						=Xgrat*24*fts11/1000
Internal plus external	mGy/d	tdrat11	2.4E-03						=SUM(ldrat11)+Xdrat11

Table H.2-2

Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

Absorbed Doses - Lapland Longspur - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad12	1.24E-05	7.45E-04	1.62E-03	3.59E-02	1.32E-02			
Internal dose rate	mGy/d	ldrat12	1.8E-06	4.9E-05	2.6E-04	2.2E-04	9.8E-04	1.5E-03	=Crad12*ldcf	
Fraction of time on site	-	fts12	1.00							
External dose rate	mGy/d	Xdrat12	9.6E-04						=Xgrat*24*fts12/1000	
Internal plus external	mGy/d	tdrat12	2.5E-03						=SUM(ldrat12)+Xdrat12	
Absorbed Doses - Lapland Longspur - Kiggavik Camp										
Concentration	Bq/g	Crad13	3.49E-06	7.42E-04	1.55E-03	3.54E-02	1.26E-02			
Internal dose rate	mGy/d	ldrat13	5.0E-07	4.9E-05	2.5E-04	2.1E-04	9.4E-04	1.4E-03	=Crad13*ldcf	
Fraction of time on site	-	fts13	1.00							
External dose rate	mGy/d	Xdrat13	9.6E-04						=Xgrat*24*fts13/1000	
Internal plus external	mGy/d	tdrat13	2.4E-03						=SUM(ldrat13)+Xdrat13	
Absorbed Doses - Lapland Longspur - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad14	1.17E-05	7.43E-04	1.58E-03	3.56E-02	1.29E-02			
Internal dose rate	mGy/d	ldrat14	1.7E-06	4.9E-05	2.5E-04	2.1E-04	9.5E-04	1.5E-03	=Crad14*ldcf	
Fraction of time on site	-	fts14	1.00							
External dose rate	mGy/d	Xdrat14	9.6E-04						=Xgrat*24*fts14/1000	
Internal plus external	mGy/d	tdrat14	2.4E-03						=SUM(ldrat14)+Xdrat14	
Absorbed Doses - Long-Tailed Duck - Rock Lake										
Concentration	Bq/g	Crad15	1.95E-05	2.00E-04	2.29E-03	1.99E-02	1.55E-02			
Internal dose rate	mGy/d	ldrat15	2.8E-06	1.3E-05	3.6E-04	1.2E-04	1.1E-03	1.6E-03	=Crad15*ldcf	
Fraction of time on site	-	fts15	1.00							
External dose rate	mGy/d	Xdrat15	9.6E-04						=Xgrat*24*fts15/1000	
Internal plus external	mGy/d	tdrat15	2.6E-03						=SUM(ldrat15)+Xdrat15	
Absorbed Doses - Long-Tailed Duck - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad16	1.76E-05	1.94E-04	2.21E-03	1.92E-02	1.49E-02			
Internal dose rate	mGy/d	ldrat16	2.5E-06	1.3E-05	3.5E-04	1.2E-04	1.1E-03	1.6E-03	=Crad16*ldcf	
Fraction of time on site	-	fts16	1.00							
External dose rate	mGy/d	Xdrat16	9.6E-04						=Xgrat*24*fts16/1000	
Internal plus external	mGy/d	tdrat16	2.5E-03						=SUM(ldrat16)+Xdrat16	
Absorbed Doses - Long-Tailed Duck - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad17	1.79E-05	1.95E-04	2.22E-03	1.93E-02	1.50E-02			
Internal dose rate	mGy/d	ldrat17	2.5E-06	1.3E-05	3.5E-04	1.2E-04	1.1E-03	1.6E-03	=Crad17*ldcf	
Fraction of time on site	-	fts17	1.00							
External dose rate	mGy/d	Xdrat17	9.6E-04						=Xgrat*24*fts17/1000	
Internal plus external	mGy/d	tdrat17	2.6E-03						=SUM(ldrat17)+Xdrat17	
Absorbed Doses - Merganser - Rock Lake										
Concentration	Bq/g	Crad18	2.29E-06	8.25E-05	1.24E-04	6.28E-03	2.11E-03			
Internal dose rate	mGy/d	ldrat18	3.3E-07	5.4E-06	2.0E-05	3.8E-05	1.6E-04	2.2E-04	=Crad18*ldcf	
Fraction of time on site	-	fts18	1.00							
External dose rate	mGy/d	Xdrat18	9.6E-04						=Xgrat*24*fts18/1000	
Internal plus external	mGy/d	tdrat18	1.2E-03						=SUM(ldrat18)+Xdrat18	
Absorbed Doses - Merganser - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad19	2.29E-06	7.94E-05	1.17E-04	6.08E-03	2.00E-03			
Internal dose rate	mGy/d	ldrat19	3.2E-07	5.2E-06	1.9E-05	3.7E-05	1.5E-04	2.1E-04	=Crad19*ldcf	
Fraction of time on site	-	fts19	1.00							
External dose rate	mGy/d	Xdrat19	9.6E-04						=Xgrat*24*fts19/1000	
Internal plus external	mGy/d	tdrat19	1.2E-03						=SUM(ldrat19)+Xdrat19	
Absorbed Doses - Merganser - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad20	2.29E-06	7.98E-05	1.18E-04	6.10E-03	2.02E-03			
Internal dose rate	mGy/d	ldrat20	3.2E-07	5.3E-06	1.9E-05	3.7E-05	1.5E-04	2.1E-04	=Crad20*ldcf	
Fraction of time on site	-	fts20	1.00							
External dose rate	mGy/d	Xdrat20	9.6E-04						=Xgrat*24*fts20/1000	
Internal plus external	mGy/d	tdrat20	1.2E-03						=SUM(ldrat20)+Xdrat20	
Absorbed Doses - Muskox - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad21	3.12E-05	5.03E-05	7.12E-05	2.22E-04	6.91E-03			
Internal dose rate	mGy/d	ldrat21	4.4E-06	3.3E-06	1.1E-05	1.3E-06	5.1E-04	5.3E-04	=Crad21*ldcf	
Fraction of time on site	-	fts21	1.00							
External dose rate	mGy/d	Xdrat21	9.6E-04						=Xgrat*24*fts21/1000	
Internal plus external	mGy/d	tdrat21	1.5E-03						=SUM(ldrat21)+Xdrat21	
Absorbed Doses - Muskox - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad22	1.17E-05	7.43E-04	1.58E-03	3.56E-02	1.29E-02			
Internal dose rate	mGy/d	ldrat22	1.7E-06	4.9E-05	2.5E-04	2.1E-04	9.5E-04	1.5E-03	=Crad22*ldcf	
Fraction of time on site	-	fts22	1.00							
External dose rate	mGy/d	Xdrat22	9.6E-04						=Xgrat*24*fts22/1000	
Internal plus external	mGy/d	tdrat22	2.4E-03						=SUM(ldrat22)+Xdrat22	
Absorbed Doses - Northern Pintail - Rock Lake										
Concentration	Bq/g	Crad23	7.17E-06	1.15E-03	6.59E-04	5.23E-02	1.76E-02			
Internal dose rate	mGy/d	ldrat23	1.0E-06	7.5E-05	1.0E-04	3.2E-04	1.3E-03	1.8E-03	=Crad23*ldcf	
Fraction of time on site	-	fts23	1.00							
External dose rate	mGy/d	Xdrat23	9.6E-04						=Xgrat*24*fts23/1000	
Internal plus external	mGy/d	tdrat23	2.8E-03						=SUM(ldrat23)+Xdrat23	

Table H.2-2

Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

Absorbed Doses - Northern Pintail - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad24	6.58E-06	1.10E-03	6.35E-04	5.03E-02	1.68E-02			
Internal dose rate	mGy/d	Idrat24	9.3E-07	7.2E-05	1.0E-04	3.0E-04	1.2E-03	1.7E-03	=Crad24*Idcf	
Fraction of time on site	-	fts24	1.00							
External dose rate	mGy/d	Xdrat24	9.6E-04						=Xgrat*24*fts24/1000	
Internal plus external	mGy/d	tdrat24	2.7E-03						=SUM(Idrat24)+Xdrat24	
Absorbed Doses - Northern Pintail - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad25	6.68E-06	1.11E-03	6.38E-04	5.06E-02	1.70E-02			
Internal dose rate	mGy/d	Idrat25	9.5E-07	7.3E-05	1.0E-04	3.1E-04	1.3E-03	1.7E-03	=Crad25*Idcf	
Fraction of time on site	-	fts25	1.00							
External dose rate	mGy/d	Xdrat25	9.6E-04						=Xgrat*24*fts25/1000	
Internal plus external	mGy/d	tdrat25	2.7E-03						=SUM(Idrat25)+Xdrat25	
Absorbed Doses - Ptarmigan - Rock Lake Watershed										
Concentration	Bq/g	Crad26	1.15E-05	2.25E-04	6.65E-04	1.38E-01	4.73E-02			
Internal dose rate	mGy/d	Idrat26	1.6E-06	1.5E-05	1.1E-04	8.3E-04	3.5E-03	4.5E-03	=Crad26*Idcf	
Fraction of time on site	-	fts26	1.00							
External dose rate	mGy/d	Xdrat26	9.6E-04						=Xgrat*24*fts26/1000	
Internal plus external	mGy/d	tdrat26	5.4E-03						=SUM(Idrat26)+Xdrat26	
Absorbed Doses - Ptarmigan - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad27	1.18E-05	2.26E-04	6.77E-04	1.38E-01	4.75E-02			
Internal dose rate	mGy/d	Idrat27	1.7E-06	1.5E-05	1.1E-04	8.3E-04	3.5E-03	4.5E-03	=Crad27*Idcf	
Fraction of time on site	-	fts27	1.00							
External dose rate	mGy/d	Xdrat27	9.6E-04						=Xgrat*24*fts27/1000	
Internal plus external	mGy/d	tdrat27	5.4E-03						=SUM(Idrat27)+Xdrat27	
Absorbed Doses - Ptarmigan - Kiggavik Camp										
Concentration	Bq/g	Crad28	8.86E-06	2.25E-04	6.54E-04	1.37E-01	4.73E-02			
Internal dose rate	mGy/d	Idrat28	1.3E-06	1.5E-05	1.0E-04	8.3E-04	3.5E-03	4.4E-03	=Crad28*Idcf	
Fraction of time on site	-	fts28	1.00							
External dose rate	mGy/d	Xdrat28	9.6E-04						=Xgrat*24*fts28/1000	
Internal plus external	mGy/d	tdrat28	5.4E-03						=SUM(Idrat28)+Xdrat28	
Absorbed Doses - Ptarmigan - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad29	1.15E-05	2.25E-04	6.64E-04	1.38E-01	4.74E-02			
Internal dose rate	mGy/d	Idrat29	1.6E-06	1.5E-05	1.1E-04	8.3E-04	3.5E-03	4.5E-03	=Crad29*Idcf	
Fraction of time on site	-	fts29	1.00							
External dose rate	mGy/d	Xdrat29	9.6E-04						=Xgrat*24*fts29/1000	
Internal plus external	mGy/d	tdrat29	5.4E-03						=SUM(Idrat29)+Xdrat29	
Absorbed Doses - Sandpiper - Rock Lake										
Concentration	Bq/g	Crad30	4.84E-05	7.53E-04	3.86E-03	5.67E-02	3.46E-02			
Internal dose rate	mGy/d	Idrat30	6.9E-06	5.0E-05	6.1E-04	3.4E-04	2.6E-03	3.6E-03	=Crad30*Idcf	
Fraction of time on site	-	fts30	1.00							
External dose rate	mGy/d	Xdrat30	9.6E-04						=Xgrat*24*fts30/1000	
Internal plus external	mGy/d	tdrat30	4.5E-03						=SUM(Idrat30)+Xdrat30	
Absorbed Doses - Sandpiper - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad31	4.49E-05	7.43E-04	3.72E-03	5.54E-02	3.32E-02			
Internal dose rate	mGy/d	Idrat31	6.4E-06	4.9E-05	5.9E-04	3.3E-04	2.5E-03	3.4E-03	=Crad31*Idcf	
Fraction of time on site	-	fts31	1.00							
External dose rate	mGy/d	Xdrat31	9.6E-04						=Xgrat*24*fts31/1000	
Internal plus external	mGy/d	tdrat31	4.4E-03						=SUM(Idrat31)+Xdrat31	
Absorbed Doses - Sandpiper - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad32	4.55E-05	7.43E-04	3.73E-03	5.55E-02	3.34E-02			
Internal dose rate	mGy/d	Idrat32	6.5E-06	4.9E-05	5.9E-04	3.3E-04	2.5E-03	3.5E-03	=Crad32*Idcf	
Fraction of time on site	-	fts32	1.00							
External dose rate	mGy/d	Xdrat32	9.6E-04						=Xgrat*24*fts32/1000	
Internal plus external	mGy/d	tdrat32	4.4E-03						=SUM(Idrat32)+Xdrat32	
Absorbed Doses - Shrew - Rock Lake Watershed										
Concentration	Bq/g	Crad33	3.26E-05	1.90E-04	1.27E-03	1.12E-02	2.07E-03			
Internal dose rate	mGy/d	Idrat33	4.6E-06	1.3E-05	2.0E-04	6.8E-05	1.5E-04	4.4E-04	=Crad33*Idcf	
Fraction of time on site	-	fts33	1.00							
External dose rate	mGy/d	Xdrat33	9.6E-04						=Xgrat*24*fts33/1000	
Internal plus external	mGy/d	tdrat33	1.4E-03						=SUM(Idrat33)+Xdrat33	
Absorbed Doses - Shrew - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad34	3.58E-05	2.00E-04	1.37E-03	1.13E-02	2.12E-03			
Internal dose rate	mGy/d	Idrat34	5.1E-06	1.3E-05	2.2E-04	6.8E-05	1.6E-04	4.6E-04	=Crad34*Idcf	
Fraction of time on site	-	fts34	1.00							
External dose rate	mGy/d	Xdrat34	9.6E-04						=Xgrat*24*fts34/1000	
Internal plus external	mGy/d	tdrat34	1.4E-03						=SUM(Idrat34)+Xdrat34	
Absorbed Doses - Shrew - Kiggavik Camp										
Concentration	Bq/g	Crad35	2.99E-06	1.84E-04	1.18E-03	1.11E-02	2.05E-03			
Internal dose rate	mGy/d	Idrat35	4.2E-07	1.2E-05	1.9E-04	6.7E-05	1.5E-04	4.2E-04	=Crad35*Idcf	
Fraction of time on site	-	fts35	1.00							
External dose rate	mGy/d	Xdrat35	9.6E-04						=Xgrat*24*fts35/1000	
Internal plus external	mGy/d	tdrat35	1.4E-03						=SUM(Idrat35)+Xdrat35	
Absorbed Doses - Shrew - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad36	3.31E-05	1.91E-04	1.26E-03	1.12E-02	2.08E-03			
Internal dose rate	mGy/d	Idrat36	4.7E-06	1.3E-05	2.0E-04	6.8E-05	1.5E-04	4.4E-04	=Crad36*Idcf	
Fraction of time on site	-	fts36	1.00							

Table H.2-2
Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

External dose rate	mGy/d	Xdrat36	2.7E-04							=Xgrat*24*fts36/3600
Internal plus external	mGy/d	tdrat36	7.1E-04							=SUM(ldrat36)+Xdrat36
Absorbed Doses - Squirrel - Rock Lake Watershed										
Concentration	Bq/g	Crad37	2.69E-05	9.87E-04	1.48E-03	1.96E-02	2.33E-03			
Internal dose rate	mGy/d	ldrat37	3.8E-06	6.5E-05	2.4E-04	1.2E-04	1.7E-04	6.0E-04		=Crad37*ldcf
Fraction of time on site	-	fts37	1.00							
External dose rate	mGy/d	Xdrat37	9.6E-04							=Xgrat*24*fts37/1000
Internal plus external	mGy/d	tdrat37	1.6E-03							=SUM(ldrat37)+Xdrat37
Absorbed Doses - Squirrel - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad38	2.69E-05	9.87E-04	1.48E-03	1.96E-02	2.33E-03			
Internal dose rate	mGy/d	ldrat38	3.8E-06	6.5E-05	2.4E-04	1.2E-04	1.7E-04	6.0E-04		=Crad38*ldcf
Fraction of time on site	-	fts38	1.00							
External dose rate	mGy/d	Xdrat38	9.6E-04							=Xgrat*24*fts38/1000
Internal plus external	mGy/d	tdrat38	1.6E-03							=SUM(ldrat38)+Xdrat38
Absorbed Doses - Squirrel - Kiggavik Camp										
Concentration	Bq/g	Crad39	2.69E-05	9.87E-04	1.48E-03	1.96E-02	2.33E-03			
Internal dose rate	mGy/d	ldrat39	3.8E-06	6.5E-05	2.4E-04	1.2E-04	1.7E-04	6.0E-04		=Crad39*ldcf
Fraction of time on site	-	fts39	1.00							
External dose rate	mGy/d	Xdrat39	9.6E-04							=Xgrat*24*fts39/1000
Internal plus external	mGy/d	tdrat39	1.6E-03							=SUM(ldrat39)+Xdrat39

Table H.2-2
Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

Absorbed Doses - Squirrel - JSL @ Sissons Discharge									
Concentration	Bq/g	Crad40	2.69E-05	9.87E-04	1.48E-03	1.96E-02	2.33E-03		
Internal dose rate	mGy/d	ldrat40	3.8E-06	6.5E-05	2.4E-04	1.2E-04	1.7E-04	6.0E-04	=Crad40*ldcf
Fraction of time on site	-	fts40	1.00						
External dose rate	mGy/d	Xdrat40	9.6E-04						=Xgrat*24*fts40/1000
Internal plus external	mGy/d	tdrat40	1.6E-03						=SUM(ldrat40)+Xdrat40
Absorbed Doses - Wolf - LSA									
Concentration	Bq/g	Crad41	1.16E-05	9.61E-06	6.02E-06	3.68E-06	1.90E-03		
Internal dose rate	mGy/d	ldrat41	1.6E-06	6.3E-07	9.6E-07	2.2E-08	1.4E-04	1.4E-04	=Crad41*ldcf
Fraction of time on site	-	fts41	1.00						
External dose rate	mGy/d	Xdrat41	9.6E-04						=Xgrat*24*fts41/1000
Internal plus external	mGy/d	tdrat41	1.1E-03						=SUM(ldrat41)+Xdrat41
Absorbed Doses - Wolf - RSA									
Concentration	Bq/g	Crad42	1.16E-05	9.60E-06	6.02E-06	3.68E-06	1.90E-03		
Internal dose rate	mGy/d	ldrat42	1.6E-06	6.3E-07	9.6E-07	2.2E-08	1.4E-04	1.4E-04	=Crad42*ldcf
Fraction of time on site	-	fts42	1.00						
External dose rate	mGy/d	Xdrat42	9.6E-04						=Xgrat*24*fts42/1000
Internal plus external	mGy/d	tdrat42	1.1E-03						=SUM(ldrat42)+Xdrat42
Absorbed Doses - Wolverine - LSA									
Concentration	Bq/g	Crad43	1.56E-05	3.36E-05	5.34E-05	1.05E-04	4.76E-04		
Internal dose rate	mGy/d	ldrat43	2.2E-06	2.2E-06	8.5E-06	6.3E-07	3.5E-05	4.9E-05	=Crad43*ldcf
Fraction of time on site	-	fts43	1.00						
External dose rate	mGy/d	Xdrat43	9.6E-04						=Xgrat*24*fts43/1000
Internal plus external	mGy/d	tdrat43	1.0E-03						=SUM(ldrat43)+Xdrat43
Absorbed Doses - Wolverine - RSA									
Concentration	Bq/g	Crad44	1.56E-05	3.37E-05	5.34E-05	1.05E-04	4.76E-04		
Internal dose rate	mGy/d	ldrat44	2.2E-06	2.2E-06	8.5E-06	6.3E-07	3.5E-05	4.9E-05	=Crad44*ldcf
Fraction of time on site	-	fts44	1.00						
External dose rate	mGy/d	Xdrat44	9.6E-04						=Xgrat*24*fts44/1000
Internal plus external	mGy/d	tdrat44	1.0E-03						=SUM(ldrat44)+Xdrat44
Equivalent Doses - Bear - LSA									
RBE for alpha	Sv/Gy	RBE	10						
High LET dose rate	mSv/d	Hletdr	1.8E-05	2.2E-05	3.6E-05	3.2E-07	1.3E-03	1.4E-03	=ldrat*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr	9.6E-04						=Xdrat
Total dose rate	mSv/d	tdr	2.4E-03						=SUM(Hletdr)+Lletdr
Equivalent Doses - Caribou - LSA									
High LET dose rate	mSv/d	Hletdr2	4.3E-05	2.9E-05	1.4E-04	5.5E-06	1.8E-02	1.8E-02	=ldrat2*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr2	9.6E-04						=Xdrat2
Total dose rate	mSv/d	tdr2	1.9E-02						=SUM(Hletdr2)+Lletdr2
Equivalent Doses - Caribou - RSA									
High LET dose rate	mSv/d	Hletdr3	4.3E-05	2.9E-05	1.4E-04	5.5E-06	1.8E-02	1.8E-02	=ldrat3*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr3	9.6E-04						=Xdrat3
Total dose rate	mSv/d	tdr3	1.9E-02						=SUM(Hletdr3)+Lletdr3
Equivalent Doses - Falcon - LSA									
High LET dose rate	mSv/d	Hletdr4	5.4E-06	7.9E-05	6.3E-04	8.1E-04	1.1E-02	1.2E-02	=ldrat4*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr4	9.6E-04						=Xdrat4
Total dose rate	mSv/d	tdr4	1.3E-02						=SUM(Hletdr4)+Lletdr4
Equivalent Doses - Falcon - RSA									
High LET dose rate	mSv/d	Hletdr5	5.4E-06	7.9E-05	6.3E-04	8.1E-04	1.1E-02	1.2E-02	=ldrat5*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr5	9.6E-04						=Xdrat5
Total dose rate	mSv/d	tdr5	1.3E-02						=SUM(Hletdr5)+Lletdr5
Equivalent Doses - Fox - LSA									
High LET dose rate	mSv/d	Hletdr6	1.2E-05	1.6E-05	8.5E-05	7.7E-07	8.0E-04	9.1E-04	=ldrat6*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr6	9.6E-04						=Xdrat6
Total dose rate	mSv/d	tdr6	1.9E-03						=SUM(Hletdr6)+Lletdr6
Equivalent Doses - Lemming - Rock Lake Watershed									
High LET dose rate	mSv/d	Hletdr7	4.6E-05	7.5E-04	3.6E-03	2.8E-04	4.4E-03	9.1E-03	=ldrat7*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr7	9.6E-04						=Xdrat7
Total dose rate	mSv/d	tdr7	1.0E-02						=SUM(Hletdr7)+Lletdr7
Equivalent Doses - Lemming - JSL @ Kiggavik Discharge									
High LET dose rate	mSv/d	Hletdr8	4.6E-05	7.5E-04	3.6E-03	2.8E-04	4.4E-03	9.1E-03	=ldrat8*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr8	9.6E-04						=Xdrat8
Total dose rate	mSv/d	tdr8	1.0E-02						=SUM(Hletdr8)+Lletdr8
Equivalent Doses - Lemming - Kiggavik Camp									
High LET dose rate	mSv/d	Hletdr9	4.6E-05	7.5E-04	3.6E-03	2.8E-04	4.4E-03	9.1E-03	=ldrat9*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr9	9.6E-04						=Xdrat9
Total dose rate	mSv/d	tdr9	1.0E-02						=SUM(Hletdr9)+Lletdr9
Equivalent Doses - Lemming - JSL @ Sissons Discharge									
High LET dose rate	mSv/d	Hletdr10	4.6E-05	7.5E-04	3.6E-03	2.8E-04	4.4E-03	9.1E-03	=ldrat10*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr10	9.6E-04						=Xdrat10
Total dose rate	mSv/d	tdr10	1.0E-02						=SUM(Hletdr10)+Lletdr10

Table H.2-2

Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

Equivalent Doses - Lapland Longspur - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr11	1.6E-05	4.9E-04	2.5E-03	2.1E-04	9.5E-03	1.3E-02	=ldrat11*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr11	9.6E-04						=Xdrat11	
Total dose rate	mSv/d	tdr11	1.4E-02						=SUM(Hletdr11)+Lletdr11	
Equivalent Doses - Lapland Longspur - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr12	1.8E-05	4.9E-04	2.6E-03	2.2E-04	9.8E-03	1.3E-02	=ldrat12*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr12	9.6E-04						=Xdrat12	
Total dose rate	mSv/d	tdr12	1.4E-02						=SUM(Hletdr12)+Lletdr12	
Equivalent Doses - Lapland Longspur - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr13	5.0E-06	4.9E-04	2.5E-03	2.1E-04	9.4E-03	1.3E-02	=ldrat13*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr13	9.6E-04						=Xdrat13	
Total dose rate	mSv/d	tdr13	1.3E-02						=SUM(Hletdr13)+Lletdr13	
Equivalent Doses - Lapland Longspur - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr14	1.7E-05	4.9E-04	2.5E-03	2.1E-04	9.5E-03	1.3E-02	=ldrat14*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr14	9.6E-04						=Xdrat14	
Total dose rate	mSv/d	tdr14	1.4E-02						=SUM(Hletdr14)+Lletdr14	
Equivalent Doses - Long-Tailed Duck - Rock Lake										
High LET dose rate	mSv/d	Hletdr15	2.8E-05	1.3E-04	3.6E-03	1.2E-04	1.1E-02	1.5E-02	=ldrat15*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr15	9.6E-04						=Xdrat15	
Total dose rate	mSv/d	tdr15	1.6E-02						=SUM(Hletdr15)+Lletdr15	
Equivalent Doses - Long-Tailed Duck - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr16	2.5E-05	1.3E-04	3.5E-03	1.2E-04	1.1E-02	1.5E-02	=ldrat16*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr16	9.6E-04						=Xdrat16	
Total dose rate	mSv/d	tdr16	1.6E-02						=SUM(Hletdr16)+Lletdr16	
Equivalent Doses - Long-Tailed Duck - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr17	2.5E-05	1.3E-04	3.5E-03	1.2E-04	1.1E-02	1.5E-02	=ldrat17*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr17	9.6E-04						=Xdrat17	
Total dose rate	mSv/d	tdr17	1.6E-02						=SUM(Hletdr17)+Lletdr17	
Equivalent Doses - Merganser - Rock Lake										
High LET dose rate	mSv/d	Hletdr18	3.3E-06	5.4E-05	2.0E-04	3.8E-05	1.6E-03	1.9E-03	=ldrat18*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr18	9.6E-04						=Xdrat18	
Total dose rate	mSv/d	tdr18	2.8E-03						=SUM(Hletdr18)+Lletdr18	
Equivalent Doses - Merganser - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr19	3.2E-06	5.2E-05	1.9E-04	3.7E-05	1.5E-03	1.8E-03	=ldrat19*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr19	9.6E-04						=Xdrat19	
Total dose rate	mSv/d	tdr19	2.7E-03						=SUM(Hletdr19)+Lletdr19	
Equivalent Doses - Merganser - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr20	3.2E-06	5.3E-05	1.9E-04	3.7E-05	1.5E-03	1.8E-03	=ldrat20*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr20	9.6E-04						=Xdrat20	
Total dose rate	mSv/d	tdr20	2.7E-03						=SUM(Hletdr20)+Lletdr20	
Equivalent Doses - Muskox - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr21	4.4E-05	3.3E-05	1.1E-04	1.3E-06	5.1E-03	5.3E-03	=ldrat21*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr21	9.6E-04						=Xdrat21	
Total dose rate	mSv/d	tdr21	6.3E-03						=SUM(Hletdr21)+Lletdr21	
Equivalent Doses - Muskox - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr22	1.7E-05	4.9E-04	2.5E-03	2.1E-04	9.5E-03	1.3E-02	=ldrat22*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr22	9.6E-04						=Xdrat22	
Total dose rate	mSv/d	tdr22	1.4E-02						=SUM(Hletdr22)+Lletdr22	
Equivalent Doses - Northern Pintail - Rock Lake										
High LET dose rate	mSv/d	Hletdr23	1.0E-05	7.5E-04	1.0E-03	3.2E-04	1.3E-02	1.5E-02	=ldrat23*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr23	9.6E-04						=Xdrat23	
Total dose rate	mSv/d	tdr23	1.6E-02						=SUM(Hletdr23)+Lletdr23	
Equivalent Doses - Northern Pintail - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr24	9.3E-06	7.2E-04	1.0E-03	3.0E-04	1.2E-02	1.5E-02	=ldrat24*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr24	9.6E-04						=Xdrat24	
Total dose rate	mSv/d	tdr24	1.5E-02						=SUM(Hletdr24)+Lletdr24	
Equivalent Doses - Northern Pintail - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr25	9.5E-06	7.3E-04	1.0E-03	3.1E-04	1.3E-02	1.5E-02	=ldrat25*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr25	9.6E-04						=Xdrat25	
Total dose rate	mSv/d	tdr25	1.6E-02						=SUM(Hletdr25)+Lletdr25	
Equivalent Doses - Ptarmigan - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr26	1.6E-05	1.5E-04	1.1E-03	8.3E-04	3.5E-02	3.7E-02	=ldrat26*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr26	9.6E-04						=Xdrat26	
Total dose rate	mSv/d	tdr26	3.8E-02						=SUM(Hletdr26)+Lletdr26	
Equivalent Doses - Ptarmigan - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr27	1.7E-05	1.5E-04	1.1E-03	8.3E-04	3.5E-02	3.7E-02	=ldrat27*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr27	9.6E-04						=Xdrat27	
Total dose rate	mSv/d	tdr27	3.8E-02						=SUM(Hletdr27)+Lletdr27	

Table H.2-2

Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

Equivalent Doses - Ptarmigan - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr28	1.3E-05	1.5E-04	1.0E-03	8.3E-04	3.5E-02	3.7E-02	=Idrat28*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr28	9.6E-04						=Xdrat28	
Total dose rate	mSv/d	tdr28	3.8E-02						=SUM(Hletdr28)+Lletdr28	
Equivalent Doses - Ptarmigan - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr29	1.6E-05	1.5E-04	1.1E-03	8.3E-04	3.5E-02	3.7E-02	=Idrat29*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr29	9.6E-04						=Xdrat29	
Total dose rate	mSv/d	tdr29	3.8E-02						=SUM(Hletdr29)+Lletdr29	
Equivalent Doses - Sandpiper - Rock Lake										
High LET dose rate	mSv/d	Hletdr30	6.9E-05	5.0E-04	6.1E-03	3.4E-04	2.6E-02	3.3E-02	=Idrat30*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr30	9.6E-04						=Xdrat30	
Total dose rate	mSv/d	tdr30	3.4E-02						=SUM(Hletdr30)+Lletdr30	
Equivalent Doses - Sandpiper - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr31	6.4E-05	4.9E-04	5.9E-03	3.3E-04	2.5E-02	3.1E-02	=Idrat31*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr31	9.6E-04						=Xdrat31	
Total dose rate	mSv/d	tdr31	3.2E-02						=SUM(Hletdr31)+Lletdr31	
Equivalent Doses - Sandpiper - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr32	6.5E-05	4.9E-04	5.9E-03	3.3E-04	2.5E-02	3.2E-02	=Idrat32*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr32	9.6E-04						=Xdrat32	
Total dose rate	mSv/d	tdr32	3.3E-02						=SUM(Hletdr32)+Lletdr32	
Equivalent Doses - Shrew - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr33	4.6E-05	1.3E-04	2.0E-03	6.8E-05	1.5E-03	3.8E-03	=Idrat33*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr33	9.6E-04						=Xdrat33	
Total dose rate	mSv/d	tdr33	4.7E-03						=SUM(Hletdr33)+Lletdr33	
Equivalent Doses - Shrew - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr34	5.1E-05	1.3E-04	2.2E-03	6.8E-05	1.6E-03	4.0E-03	=Idrat34*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr34	9.6E-04						=Xdrat34	
Total dose rate	mSv/d	tdr34	5.0E-03						=SUM(Hletdr34)+Lletdr34	
Equivalent Doses - Shrew - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr35	4.2E-06	1.2E-04	1.9E-03	6.7E-05	1.5E-03	3.6E-03	=Idrat35*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr35	9.6E-04						=Xdrat35	
Total dose rate	mSv/d	tdr35	4.5E-03						=SUM(Hletdr35)+Lletdr35	
Equivalent Doses - Shrew - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr36	4.7E-05	1.3E-04	2.0E-03	6.8E-05	1.5E-03	3.8E-03	=Idrat36*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr36	2.7E-04						=Xdrat36	
Total dose rate	mSv/d	tdr36	4.1E-03						=SUM(Hletdr36)+Lletdr36	
Equivalent Doses - Squirrel - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr37	3.8E-05	6.5E-04	2.4E-03	1.2E-04	1.7E-03	4.9E-03	=Idrat37*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr37	9.6E-04						=Xdrat37	
Total dose rate	mSv/d	tdr37	5.8E-03						=SUM(Hletdr37)+Lletdr37	
Equivalent Doses - Squirrel - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr38	3.8E-05	6.5E-04	2.4E-03	1.2E-04	1.7E-03	4.9E-03	=Idrat38*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr38	9.6E-04						=Xdrat38	
Total dose rate	mSv/d	tdr38	5.8E-03						=SUM(Hletdr38)+Lletdr38	
Equivalent Doses - Squirrel - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr39	3.8E-05	6.5E-04	2.4E-03	1.2E-04	1.7E-03	4.9E-03	=Idrat39*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr39	9.6E-04						=Xdrat39	
Total dose rate	mSv/d	tdr39	5.8E-03						=SUM(Hletdr39)+Lletdr39	
Equivalent Doses - Squirrel - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr40	3.8E-05	6.5E-04	2.4E-03	1.2E-04	1.7E-03	4.9E-03	=Idrat40*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr40	9.6E-04						=Xdrat40	
Total dose rate	mSv/d	tdr40	5.8E-03						=SUM(Hletdr40)+Lletdr40	
Equivalent Doses - Wolf - LSA										
High LET dose rate	mSv/d	Hletdr41	1.6E-05	6.3E-06	9.6E-06	2.2E-08	1.4E-03	1.4E-03	=Idrat41*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr41	9.6E-04						=Xdrat41	
Total dose rate	mSv/d	tdr41	2.4E-03						=SUM(Hletdr41)+Lletdr41	
Equivalent Doses - Wolf - RSA										
High LET dose rate	mSv/d	Hletdr42	1.6E-05	6.3E-06	9.6E-06	2.2E-08	1.4E-03	1.4E-03	=Idrat42*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr42	9.6E-04						=Xdrat42	
Total dose rate	mSv/d	tdr42	2.4E-03						=SUM(Hletdr42)+Lletdr42	
Equivalent Doses - Wolverine - LSA										
High LET dose rate	mSv/d	Hletdr43	2.2E-05	2.2E-05	8.5E-05	6.3E-07	3.5E-04	4.8E-04	=Idrat43*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr43	9.6E-04						=Xdrat43	
Total dose rate	mSv/d	tdr43	1.4E-03						=SUM(Hletdr43)+Lletdr43	
Equivalent Doses - Wolverine - RSA										
High LET dose rate	mSv/d	Hletdr44	2.2E-05	2.2E-05	8.5E-05	6.3E-07	3.5E-04	4.8E-04	=Idrat44*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr44	9.6E-04						=Xdrat44	
Total dose rate	mSv/d	tdr44	1.4E-03						=SUM(Hletdr44)+Lletdr44	

Table H.2-2
Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

SUMMARY

3 Screening Criterion in mGy/d	Total Absorbed Dose mGy/d	Total Equivalent Dose mSv/d	Index (Absorbed Dose)	Index (Equivalent Dose)
Bear - LSA	1.1E-03	2.4E-03	3.7E-04	7.9E-04
Caribou - LSA	2.8E-03	1.9E-02	9.2E-04	6.3E-03
Caribou - RSA	2.8E-03	1.9E-02	9.2E-04	6.3E-03
Falcon - LSA	2.9E-03	1.3E-02	9.7E-04	4.4E-03
Falcon - RSA	2.9E-03	1.3E-02	9.7E-04	4.4E-03
Fox - LSA	1.1E-03	1.9E-03	3.5E-04	6.2E-04
Lemming - Rock Lake Watershed	2.1E-03	1.0E-02	7.1E-04	3.4E-03
Lemming - JSL @ Kiggavik Discharge	2.1E-03	1.0E-02	7.1E-04	3.4E-03
Lemming - Kiggavik Camp	2.1E-03	1.0E-02	7.1E-04	3.4E-03
Lemming - JSL @ Sissons Discharge	2.1E-03	1.0E-02	7.1E-04	3.4E-03
Lapland Longspur - Rock Lake Watershed	2.4E-03	1.4E-02	8.1E-04	4.6E-03
Lapland Longspur - JSL @ Kiggavik Discharge	2.5E-03	1.4E-02	8.2E-04	4.7E-03
Lapland Longspur - Kiggavik Camp	2.4E-03	1.3E-02	8.0E-04	4.5E-03
Lapland Longspur - JSL @ Sissons Discharge	2.4E-03	1.4E-02	8.1E-04	4.6E-03
Long-Tailed Duck - Rock Lake	2.6E-03	1.6E-02	8.7E-04	5.5E-03
Long-Tailed Duck - JSL @ Kiggavik Discharge	2.5E-03	1.6E-02	8.5E-04	5.2E-03
Long-Tailed Duck - JSL @ Sissons Discharge	2.6E-03	1.6E-02	8.5E-04	5.3E-03
Merganser - Rock Lake	1.2E-03	2.8E-03	3.9E-04	9.4E-04
Merganser - JSL @ Kiggavik Discharge	1.2E-03	2.7E-03	3.9E-04	9.1E-04
Merganser - JSL @ Sissons Discharge	1.2E-03	2.7E-03	3.9E-04	9.1E-04
Muskox - JSL @ Kiggavik Discharge	1.5E-03	6.3E-03	5.0E-04	2.1E-03
Muskox - JSL @ Sissons Discharge	2.4E-03	1.4E-02	8.1E-04	4.6E-03
Northern Pintail - Rock Lake	2.8E-03	1.6E-02	9.2E-04	5.4E-03
Northern Pintail - JSL @ Kiggavik Discharge	2.7E-03	1.5E-02	8.9E-04	5.2E-03
Northern Pintail - JSL @ Sissons Discharge	2.7E-03	1.6E-02	9.0E-04	5.2E-03
Ptarmigan - Rock Lake Watershed	5.4E-03	3.8E-02	1.8E-03	1.3E-02
Ptarmigan - JSL @ Kiggavik Discharge	5.4E-03	3.8E-02	1.8E-03	1.3E-02
Ptarmigan - Kiggavik Camp	5.4E-03	3.8E-02	1.8E-03	1.3E-02
Ptarmigan - JSL @ Sissons Discharge	5.4E-03	3.8E-02	1.8E-03	1.3E-02
Sandpiper - Rock Lake	4.5E-03	3.4E-02	1.5E-03	1.1E-02
Sandpiper - JSL @ Kiggavik Discharge	4.4E-03	3.2E-02	1.5E-03	1.1E-02
Sandpiper - JSL @ Sissons Discharge	4.4E-03	3.3E-02	1.5E-03	1.1E-02
Shrew - Rock Lake Watershed	1.4E-03	4.7E-03	4.7E-04	1.6E-03
Shrew - JSL @ Kiggavik Discharge	1.4E-03	5.0E-03	4.7E-04	1.7E-03
Shrew - Kiggavik Camp	1.4E-03	4.5E-03	4.6E-04	1.5E-03
Shrew - JSL @ Sissons Discharge	7.1E-04	4.1E-03	2.4E-04	1.4E-03
Squirrel - Rock Lake Watershed	1.6E-03	5.8E-03	5.2E-04	1.9E-03
Squirrel - JSL @ Kiggavik Discharge	1.6E-03	5.8E-03	5.2E-04	1.9E-03
Squirrel - Kiggavik Camp	1.6E-03	5.8E-03	5.2E-04	1.9E-03
Squirrel - JSL @ Sissons Discharge	1.6E-03	5.8E-03	5.2E-04	1.9E-03
Wolf - LSA	1.1E-03	2.4E-03	3.7E-04	8.0E-04
Wolf - RSA	1.1E-03	2.4E-03	3.7E-04	8.0E-04
Wolverine - LSA	1.0E-03	1.4E-03	3.4E-04	4.8E-04
Wolverine - RSA	1.0E-03	1.4E-03	3.4E-04	4.8E-04

U-238+ Internal U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235
Ra-226+ Internal Ra-226 + 0.3* (Rn-222 + ...Po-214)
Pb-210+ Internal Pb-210 + Bi-210

Table H.2-2

Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

2010

DOSES TO SELECTED VECs - 95th Percentile Total Dose

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals		
Absorbed Doses - Bear - LSA										
Concentration	Bq/g	Crad	3.85E-05	1.50E-04	6.99E-05	1.74E-04	6.41E-03			
Internal Dose Factor	mGy/d per Bq/g	ldcf	1.4E-01	6.6E-02	1.6E-01	6.0E-03	7.4E-02			
Internal dose rate	mGy/d	ldrat	5.5E-06	9.9E-06	1.1E-05	1.0E-06	4.7E-04	5.0E-04	=Crad*ldcf	
External Gamma rate	uGy/h	Xgrat	0.04							
Fraction of time on site	-	fts	1.00							
External dose rate	mGy/d	Xdrat	9.6E-04						=Xgrat*24*fts/1000	
Internal plus external	mGy/d	tdrat	1.5E-03						=SUM(ldrat)+Xdrat	
Absorbed Doses - Caribou - LSA										
Concentration	Bq/g	Crad2	8.62E-05	1.33E-04	2.95E-04	2.53E-03	7.65E-02			
Internal dose rate	mGy/d	ldrat2	1.2E-05	8.7E-06	4.7E-05	1.5E-05	5.7E-03	5.7E-03	=Crad2*ldcf	
Fraction of time on site	-	fts2	1.00							
External dose rate	mGy/d	Xdrat2	9.6E-04						=Xgrat*24*fts2/1000	
Internal plus external	mGy/d	tdrat2	6.7E-03						=SUM(ldrat2)+Xdrat2	
Absorbed Doses - Caribou - RSA										
Concentration	Bq/g	Crad3	8.62E-05	1.33E-04	2.95E-04	2.53E-03	7.65E-02			
Internal dose rate	mGy/d	ldrat3	1.2E-05	8.7E-06	4.7E-05	1.5E-05	5.7E-03	5.7E-03	=Crad3*ldcf	
Fraction of time on site	-	fts3	1.00							
External dose rate	mGy/d	Xdrat3	9.6E-04						=Xgrat*24*fts3/1000	
Internal plus external	mGy/d	tdrat3	6.7E-03						=SUM(ldrat3)+Xdrat3	
Absorbed Doses - Falcon - LSA										
Concentration	Bq/g	Crad4	1.14E-05	3.57E-04	1.38E-03	4.40E-01	5.01E-02			
Internal dose rate	mGy/d	ldrat4	1.6E-06	2.3E-05	2.2E-04	2.7E-03	3.7E-03	6.6E-03	=Crad4*ldcf	
Fraction of time on site	-	fts4	1.00							
External dose rate	mGy/d	Xdrat4	9.6E-04						=Xgrat*24*fts4/1000	
Internal plus external	mGy/d	tdrat4	7.6E-03						=SUM(ldrat4)+Xdrat4	
Absorbed Doses - Falcon - RSA										
Concentration	Bq/g	Crad5	1.14E-05	3.56E-04	1.38E-03	4.40E-01	5.00E-02			
Internal dose rate	mGy/d	ldrat5	1.6E-06	2.3E-05	2.2E-04	2.7E-03	3.7E-03	6.6E-03	=Crad5*ldcf	
Fraction of time on site	-	fts5	1.00							
External dose rate	mGy/d	Xdrat5	9.6E-04						=Xgrat*24*fts5/1000	
Internal plus external	mGy/d	tdrat5	7.6E-03						=SUM(ldrat5)+Xdrat5	
Absorbed Doses - Fox - LSA										
Concentration	Bq/g	Crad6	2.00E-05	7.94E-05	1.30E-04	5.15E-04	3.65E-03			
Internal dose rate	mGy/d	ldrat6	2.8E-06	5.2E-06	2.1E-05	3.1E-06	2.7E-04	3.0E-04	=Crad6*ldcf	
Fraction of time on site	-	fts6	1.00							
External dose rate	mGy/d	Xdrat6	9.6E-04						=Xgrat*24*fts6/1000	
Internal plus external	mGy/d	tdrat6	1.3E-03						=SUM(ldrat6)+Xdrat6	
Absorbed Doses - Lemming - Rock Lake Watershed										
Concentration	Bq/g	Crad7	1.49E-04	3.56E-03	6.36E-03	1.69E-01	2.09E-02			
Internal dose rate	mGy/d	ldrat7	2.1E-05	2.3E-04	1.0E-03	1.0E-03	1.5E-03	3.8E-03	=Crad7*ldcf	
Fraction of time on site	-	fts7	1.00							
External dose rate	mGy/d	Xdrat7	9.6E-04						=Xgrat*24*fts7/1000	
Internal plus external	mGy/d	tdrat7	4.8E-03						=SUM(ldrat7)+Xdrat7	
Absorbed Doses - Lemming - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad8	1.49E-04	3.56E-03	6.36E-03	1.69E-01	2.09E-02			
Internal dose rate	mGy/d	ldrat8	2.1E-05	2.3E-04	1.0E-03	1.0E-03	1.5E-03	3.8E-03	=Crad8*ldcf	
Fraction of time on site	-	fts8	1.00							
External dose rate	mGy/d	Xdrat8	9.6E-04						=Xgrat*24*fts8/1000	
Internal plus external	mGy/d	tdrat8	4.8E-03						=SUM(ldrat8)+Xdrat8	
Absorbed Doses - Lemming - Kiggavik Camp										
Concentration	Bq/g	Crad9	1.49E-04	3.56E-03	6.36E-03	1.69E-01	2.09E-02			
Internal dose rate	mGy/d	ldrat9	2.1E-05	2.3E-04	1.0E-03	1.0E-03	1.5E-03	3.8E-03	=Crad9*ldcf	
Fraction of time on site	-	fts9	1.00							
External dose rate	mGy/d	Xdrat9	9.6E-04						=Xgrat*24*fts9/1000	
Internal plus external	mGy/d	tdrat9	4.8E-03						=SUM(ldrat9)+Xdrat9	
Absorbed Doses - Lemming - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad10	1.49E-04	3.56E-03	6.36E-03	1.69E-01	2.09E-02			
Internal dose rate	mGy/d	ldrat10	2.1E-05	2.3E-04	1.0E-03	1.0E-03	1.5E-03	3.8E-03	=Crad10*ldcf	
Fraction of time on site	-	fts10	1.00							
External dose rate	mGy/d	Xdrat10	9.6E-04						=Xgrat*24*fts10/1000	
Internal plus external	mGy/d	tdrat10	4.8E-03						=SUM(ldrat10)+Xdrat10	
Absorbed Doses - Lapland Longspur - Rock Lake Watershed										
Concentration	Bq/g	Crad11	4.06E-05	3.37E-03	5.23E-03	1.35E-01	3.62E-02			
Internal dose rate	mGy/d	ldrat11	5.8E-06	2.2E-04	8.3E-04	8.1E-04	2.7E-03	4.6E-03	=Crad11*ldcf	
Fraction of time on site	-	fts11	1.00							
External dose rate	mGy/d	Xdrat11	9.6E-04						=Xgrat*24*fts11/1000	
Internal plus external	mGy/d	tdrat11	5.5E-03						=SUM(ldrat11)+Xdrat11	

Table H.2-2

Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

Absorbed Doses - Lapland Longspur - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad12	4.32E-05	3.38E-03	5.39E-03	1.36E-01	3.72E-02			
Internal dose rate	mGy/d	ldrat12	6.1E-06	2.2E-04	8.6E-04	8.2E-04	2.8E-03	4.7E-03	=Crad12*ldcf	
Fraction of time on site	-	fts12	1.00							
External dose rate	mGy/d	Xdrat12	9.6E-04						=Xgrat*24*fts12/1000	
Internal plus external	mGy/d	tdrat12	5.6E-03						=SUM(ldrat12)+Xdrat12	
Absorbed Doses - Lapland Longspur - Kiggavik Camp										
Concentration	Bq/g	Crad13	1.27E-05	3.37E-03	5.10E-03	1.34E-01	3.57E-02			
Internal dose rate	mGy/d	ldrat13	1.8E-06	2.2E-04	8.1E-04	8.1E-04	2.6E-03	4.5E-03	=Crad13*ldcf	
Fraction of time on site	-	fts13	1.00							
External dose rate	mGy/d	Xdrat13	9.6E-04						=Xgrat*24*fts13/1000	
Internal plus external	mGy/d	tdrat13	5.4E-03						=SUM(ldrat13)+Xdrat13	
Absorbed Doses - Lapland Longspur - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad14	4.06E-05	3.37E-03	5.22E-03	1.35E-01	3.64E-02			
Internal dose rate	mGy/d	ldrat14	5.8E-06	2.2E-04	8.3E-04	8.1E-04	2.7E-03	4.6E-03	=Crad14*ldcf	
Fraction of time on site	-	fts14	1.00							
External dose rate	mGy/d	Xdrat14	9.6E-04						=Xgrat*24*fts14/1000	
Internal plus external	mGy/d	tdrat14	5.5E-03						=SUM(ldrat14)+Xdrat14	
Absorbed Doses - Long-Tailed Duck - Rock Lake										
Concentration	Bq/g	Crad15	5.55E-05	6.02E-04	9.25E-03	6.39E-02	5.78E-02			
Internal dose rate	mGy/d	ldrat15	7.9E-06	4.0E-05	1.5E-03	3.9E-04	4.3E-03	6.2E-03	=Crad15*ldcf	
Fraction of time on site	-	fts15	1.00							
External dose rate	mGy/d	Xdrat15	9.6E-04						=Xgrat*24*fts15/1000	
Internal plus external	mGy/d	tdrat15	7.1E-03						=SUM(ldrat15)+Xdrat15	
Absorbed Doses - Long-Tailed Duck - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad16	4.99E-05	5.82E-04	8.89E-03	6.14E-02	5.54E-02			
Internal dose rate	mGy/d	ldrat16	7.1E-06	3.8E-05	1.4E-03	3.7E-04	4.1E-03	5.9E-03	=Crad16*ldcf	
Fraction of time on site	-	fts16	1.00							
External dose rate	mGy/d	Xdrat16	9.6E-04						=Xgrat*24*fts16/1000	
Internal plus external	mGy/d	tdrat16	6.9E-03						=SUM(ldrat16)+Xdrat16	
Absorbed Doses - Long-Tailed Duck - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad17	5.11E-05	5.85E-04	8.94E-03	6.18E-02	5.58E-02			
Internal dose rate	mGy/d	ldrat17	7.2E-06	3.9E-05	1.4E-03	3.7E-04	4.1E-03	6.0E-03	=Crad17*ldcf	
Fraction of time on site	-	fts17	1.00							
External dose rate	mGy/d	Xdrat17	9.6E-04						=Xgrat*24*fts17/1000	
Internal plus external	mGy/d	tdrat17	6.9E-03						=SUM(ldrat17)+Xdrat17	
Absorbed Doses - Merganser - Rock Lake										
Concentration	Bq/g	Crad18	7.67E-06	3.15E-04	3.98E-04	1.98E-02	7.05E-03			
Internal dose rate	mGy/d	ldrat18	1.1E-06	2.1E-05	6.3E-05	1.2E-04	5.2E-04	7.3E-04	=Crad18*ldcf	
Fraction of time on site	-	fts18	1.00							
External dose rate	mGy/d	Xdrat18	9.6E-04						=Xgrat*24*fts18/1000	
Internal plus external	mGy/d	tdrat18	1.7E-03						=SUM(ldrat18)+Xdrat18	
Absorbed Doses - Merganser - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad19	7.65E-06	3.07E-04	3.70E-04	1.97E-02	6.67E-03			
Internal dose rate	mGy/d	ldrat19	1.1E-06	2.0E-05	5.9E-05	1.2E-04	4.9E-04	6.9E-04	=Crad19*ldcf	
Fraction of time on site	-	fts19	1.00							
External dose rate	mGy/d	Xdrat19	9.6E-04						=Xgrat*24*fts19/1000	
Internal plus external	mGy/d	tdrat19	1.7E-03						=SUM(ldrat19)+Xdrat19	
Absorbed Doses - Merganser - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad20	7.64E-06	3.09E-04	3.73E-04	1.97E-02	6.68E-03			
Internal dose rate	mGy/d	ldrat20	1.1E-06	2.0E-05	5.9E-05	1.2E-04	4.9E-04	6.9E-04	=Crad20*ldcf	
Fraction of time on site	-	fts20	1.00							
External dose rate	mGy/d	Xdrat20	9.6E-04						=Xgrat*24*fts20/1000	
Internal plus external	mGy/d	tdrat20	1.7E-03						=SUM(ldrat20)+Xdrat20	
Absorbed Doses - Muskox - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad21	1.18E-04	1.86E-04	2.87E-04	6.76E-04	2.04E-02			
Internal dose rate	mGy/d	ldrat21	1.7E-05	1.2E-05	4.6E-05	4.1E-06	1.5E-03	1.6E-03	=Crad21*ldcf	
Fraction of time on site	-	fts21	1.00							
External dose rate	mGy/d	Xdrat21	9.6E-04						=Xgrat*24*fts21/1000	
Internal plus external	mGy/d	tdrat21	2.6E-03						=SUM(ldrat21)+Xdrat21	
Absorbed Doses - Muskox - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad22	4.06E-05	3.37E-03	5.22E-03	1.35E-01	3.64E-02			
Internal dose rate	mGy/d	ldrat22	5.8E-06	2.2E-04	8.3E-04	8.1E-04	2.7E-03	4.6E-03	=Crad22*ldcf	
Fraction of time on site	-	fts22	1.00							
External dose rate	mGy/d	Xdrat22	9.6E-04						=Xgrat*24*fts22/1000	
Internal plus external	mGy/d	tdrat22	5.5E-03						=SUM(ldrat22)+Xdrat22	
Absorbed Doses - Northern Pintail - Rock Lake										
Concentration	Bq/g	Crad23	2.33E-05	4.59E-03	2.26E-03	1.68E-01	6.11E-02			
Internal dose rate	mGy/d	ldrat23	3.3E-06	3.0E-04	3.6E-04	1.0E-03	4.5E-03	6.2E-03	=Crad23*ldcf	
Fraction of time on site	-	fts23	1.00							
External dose rate	mGy/d	Xdrat23	9.6E-04						=Xgrat*24*fts23/1000	
Internal plus external	mGy/d	tdrat23	7.2E-03						=SUM(ldrat23)+Xdrat23	

Table H.2-2

Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

Absorbed Doses - Northern Pintail - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad24	2.11E-05	4.42E-03	2.17E-03	1.62E-01	5.85E-02			
Internal dose rate	mGy/d	Idrat24	3.0E-06	2.9E-04	3.5E-04	9.8E-04	4.3E-03	5.9E-03	=Crad24*Idcf	
Fraction of time on site	-	fts24	1.00							
External dose rate	mGy/d	Xdrat24	9.6E-04						=Xgrat*24*fts24/1000	
Internal plus external	mGy/d	tdrat24	6.9E-03						=SUM(Idrat24)+Xdrat24	
Absorbed Doses - Northern Pintail - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad25	2.14E-05	4.45E-03	2.18E-03	1.63E-01	5.90E-02			
Internal dose rate	mGy/d	Idrat25	3.0E-06	2.9E-04	3.5E-04	9.8E-04	4.4E-03	6.0E-03	=Crad25*Idcf	
Fraction of time on site	-	fts25	1.00							
External dose rate	mGy/d	Xdrat25	9.6E-04						=Xgrat*24*fts25/1000	
Internal plus external	mGy/d	tdrat25	6.9E-03						=SUM(Idrat25)+Xdrat25	
Absorbed Doses - Ptarmigan - Rock Lake Watershed										
Concentration	Bq/g	Crad26	4.26E-05	9.01E-04	2.17E-03	3.88E-01	1.42E-01			
Internal dose rate	mGy/d	Idrat26	6.0E-06	5.9E-05	3.5E-04	2.3E-03	1.1E-02	1.3E-02	=Crad26*Idcf	
Fraction of time on site	-	fts26	1.00							
External dose rate	mGy/d	Xdrat26	9.6E-04						=Xgrat*24*fts26/1000	
Internal plus external	mGy/d	tdrat26	1.4E-02						=SUM(Idrat26)+Xdrat26	
Absorbed Doses - Ptarmigan - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad27	4.32E-05	9.03E-04	2.21E-03	3.88E-01	1.42E-01			
Internal dose rate	mGy/d	Idrat27	6.1E-06	5.9E-05	3.5E-04	2.3E-03	1.1E-02	1.3E-02	=Crad27*Idcf	
Fraction of time on site	-	fts27	1.00							
External dose rate	mGy/d	Xdrat27	9.6E-04						=Xgrat*24*fts27/1000	
Internal plus external	mGy/d	tdrat27	1.4E-02						=SUM(Idrat27)+Xdrat27	
Absorbed Doses - Ptarmigan - Kiggavik Camp										
Concentration	Bq/g	Crad28	3.38E-05	9.00E-04	2.10E-03	3.88E-01	1.42E-01			
Internal dose rate	mGy/d	Idrat28	4.8E-06	5.9E-05	3.3E-04	2.3E-03	1.1E-02	1.3E-02	=Crad28*Idcf	
Fraction of time on site	-	fts28	1.00							
External dose rate	mGy/d	Xdrat28	9.6E-04						=Xgrat*24*fts28/1000	
Internal plus external	mGy/d	tdrat28	1.4E-02						=SUM(Idrat28)+Xdrat28	
Absorbed Doses - Ptarmigan - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad29	4.27E-05	9.01E-04	2.16E-03	3.88E-01	1.42E-01			
Internal dose rate	mGy/d	Idrat29	6.1E-06	5.9E-05	3.4E-04	2.3E-03	1.1E-02	1.3E-02	=Crad29*Idcf	
Fraction of time on site	-	fts29	1.00							
External dose rate	mGy/d	Xdrat29	9.6E-04						=Xgrat*24*fts29/1000	
Internal plus external	mGy/d	tdrat29	1.4E-02						=SUM(Idrat29)+Xdrat29	
Absorbed Doses - Sandpiper - Rock Lake										
Concentration	Bq/g	Crad30	1.96E-04	2.12E-03	1.52E-02	1.82E-01	1.19E-01			
Internal dose rate	mGy/d	Idrat30	2.8E-05	1.4E-04	2.4E-03	1.1E-03	8.8E-03	1.3E-02	=Crad30*Idcf	
Fraction of time on site	-	fts30	1.00							
External dose rate	mGy/d	Xdrat30	9.6E-04						=Xgrat*24*fts30/1000	
Internal plus external	mGy/d	tdrat30	1.3E-02						=SUM(Idrat30)+Xdrat30	
Absorbed Doses - Sandpiper - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad31	1.81E-04	2.10E-03	1.47E-02	1.78E-01	1.14E-01			
Internal dose rate	mGy/d	Idrat31	2.6E-05	1.4E-04	2.3E-03	1.1E-03	8.5E-03	1.2E-02	=Crad31*Idcf	
Fraction of time on site	-	fts31	1.00							
External dose rate	mGy/d	Xdrat31	9.6E-04						=Xgrat*24*fts31/1000	
Internal plus external	mGy/d	tdrat31	1.3E-02						=SUM(Idrat31)+Xdrat31	
Absorbed Doses - Sandpiper - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad32	1.84E-04	2.10E-03	1.48E-02	1.78E-01	1.15E-01			
Internal dose rate	mGy/d	Idrat32	2.6E-05	1.4E-04	2.4E-03	1.1E-03	8.5E-03	1.2E-02	=Crad32*Idcf	
Fraction of time on site	-	fts32	1.00							
External dose rate	mGy/d	Xdrat32	9.6E-04						=Xgrat*24*fts32/1000	
Internal plus external	mGy/d	tdrat32	1.3E-02						=SUM(Idrat32)+Xdrat32	
Absorbed Doses - Shrew - Rock Lake Watershed										
Concentration	Bq/g	Crad33	1.03E-04	6.30E-04	4.01E-03	3.64E-02	5.70E-03			
Internal dose rate	mGy/d	Idrat33	1.5E-05	4.1E-05	6.4E-04	2.2E-04	4.2E-04	1.3E-03	=Crad33*Idcf	
Fraction of time on site	-	fts33	1.00							
External dose rate	mGy/d	Xdrat33	9.6E-04						=Xgrat*24*fts33/1000	
Internal plus external	mGy/d	tdrat33	2.3E-03						=SUM(Idrat33)+Xdrat33	
Absorbed Doses - Shrew - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad34	1.13E-04	6.72E-04	4.37E-03	3.68E-02	5.88E-03			
Internal dose rate	mGy/d	Idrat34	1.6E-05	4.4E-05	6.9E-04	2.2E-04	4.4E-04	1.4E-03	=Crad34*Idcf	
Fraction of time on site	-	fts34	1.00							
External dose rate	mGy/d	Xdrat34	9.6E-04						=Xgrat*24*fts34/1000	
Internal plus external	mGy/d	tdrat34	2.4E-03						=SUM(Idrat34)+Xdrat34	
Absorbed Doses - Shrew - Kiggavik Camp										
Concentration	Bq/g	Crad35	9.18E-06	5.99E-04	3.72E-03	3.61E-02	5.69E-03			
Internal dose rate	mGy/d	Idrat35	1.3E-06	3.9E-05	5.9E-04	2.2E-04	4.2E-04	1.3E-03	=Crad35*Idcf	
Fraction of time on site	-	fts35	1.00							
External dose rate	mGy/d	Xdrat35	9.6E-04						=Xgrat*24*fts35/1000	
Internal plus external	mGy/d	tdrat35	2.2E-03						=SUM(Idrat35)+Xdrat35	
Absorbed Doses - Shrew - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad36	1.04E-04	6.31E-04	4.01E-03	3.64E-02	5.72E-03			
Internal dose rate	mGy/d	Idrat36	1.5E-05	4.2E-05	6.4E-04	2.2E-04	4.2E-04	1.3E-03	=Crad36*Idcf	
Fraction of time on site	-	fts36	1.00							

Table H.2-2
Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

External dose rate	mGy/d	Xdrat36	2.7E-04							=Xgrat*24*fts36/3600
Internal plus external	mGy/d	tdrat36	1.6E-03							=SUM(ldrat36)+Xdrat36
Absorbed Doses - Squirrel - Rock Lake Watershed										
Concentration	Bq/g	Crad37	8.95E-05	3.42E-03	6.40E-03	8.30E-02	1.01E-02			
Internal dose rate	mGy/d	ldrat37	1.3E-05	2.2E-04	1.0E-03	5.0E-04	7.5E-04	2.5E-03		=Crad37*ldcf
Fraction of time on site	-	fts37	1.00							
External dose rate	mGy/d	Xdrat37	9.6E-04							=Xgrat*24*fts37/1000
Internal plus external	mGy/d	tdrat37	3.5E-03							=SUM(ldrat37)+Xdrat37
Absorbed Doses - Squirrel - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad38	8.95E-05	3.42E-03	6.40E-03	8.30E-02	1.01E-02			
Internal dose rate	mGy/d	ldrat38	1.3E-05	2.2E-04	1.0E-03	5.0E-04	7.5E-04	2.5E-03		=Crad38*ldcf
Fraction of time on site	-	fts38	1.00							
External dose rate	mGy/d	Xdrat38	9.6E-04							=Xgrat*24*fts38/1000
Internal plus external	mGy/d	tdrat38	3.5E-03							=SUM(ldrat38)+Xdrat38
Absorbed Doses - Squirrel - Kiggavik Camp										
Concentration	Bq/g	Crad39	8.94E-05	3.42E-03	6.40E-03	8.30E-02	1.01E-02			
Internal dose rate	mGy/d	ldrat39	1.3E-05	2.2E-04	1.0E-03	5.0E-04	7.5E-04	2.5E-03		=Crad39*ldcf
Fraction of time on site	-	fts39	1.00							
External dose rate	mGy/d	Xdrat39	9.6E-04							=Xgrat*24*fts39/1000
Internal plus external	mGy/d	tdrat39	3.5E-03							=SUM(ldrat39)+Xdrat39

Table H.2-2
Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

Absorbed Doses - Squirrel - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad40	8.95E-05	3.42E-03	6.40E-03	8.30E-02	1.01E-02			
Internal dose rate	mGy/d	Idrat40	1.3E-05	2.2E-04	1.0E-03	5.0E-04	7.5E-04	2.5E-03	=Crad40*Idcf	
Fraction of time on site	-	fts40	1.00							
External dose rate	mGy/d	Xdrat40	9.6E-04						=Xgrat*24*fts40/1000	
Internal plus external	mGy/d	tdrat40	3.5E-03						=SUM(Idrat40)+Xdrat40	
Absorbed Doses - Wolf - LSA										
Concentration	Bq/g	Crad41	4.14E-05	2.94E-05	2.20E-05	1.44E-05	7.66E-03			
Internal dose rate	mGy/d	Idrat41	5.9E-06	1.9E-06	3.5E-06	8.7E-08	5.7E-04	5.8E-04	=Crad41*Idcf	
Fraction of time on site	-	fts41	1.00							
External dose rate	mGy/d	Xdrat41	9.6E-04						=Xgrat*24*fts41/1000	
Internal plus external	mGy/d	tdrat41	1.5E-03						=SUM(Idrat41)+Xdrat41	
Absorbed Doses - Wolf - RSA										
Concentration	Bq/g	Crad42	4.15E-05	2.93E-05	2.20E-05	1.44E-05	7.66E-03			
Internal dose rate	mGy/d	Idrat42	5.9E-06	1.9E-06	3.5E-06	8.7E-08	5.7E-04	5.8E-04	=Crad42*Idcf	
Fraction of time on site	-	fts42	1.00							
External dose rate	mGy/d	Xdrat42	9.6E-04						=Xgrat*24*fts42/1000	
Internal plus external	mGy/d	tdrat42	1.5E-03						=SUM(Idrat42)+Xdrat42	
Absorbed Doses - Wolverine - LSA										
Concentration	Bq/g	Crad43	5.79E-05	1.16E-04	2.13E-04	4.70E-04	1.79E-03			
Internal dose rate	mGy/d	Idrat43	8.2E-06	7.6E-06	3.4E-05	2.8E-06	1.3E-04	1.9E-04	=Crad43*Idcf	
Fraction of time on site	-	fts43	1.00							
External dose rate	mGy/d	Xdrat43	9.6E-04						=Xgrat*24*fts43/1000	
Internal plus external	mGy/d	tdrat43	1.1E-03						=SUM(Idrat43)+Xdrat43	
Absorbed Doses - Wolverine - RSA										
Concentration	Bq/g	Crad44	5.81E-05	1.16E-04	2.13E-04	4.70E-04	1.79E-03			
Internal dose rate	mGy/d	Idrat44	8.2E-06	7.6E-06	3.4E-05	2.8E-06	1.3E-04	1.9E-04	=Crad44*Idcf	
Fraction of time on site	-	fts44	1.00							
External dose rate	mGy/d	Xdrat44	9.6E-04						=Xgrat*24*fts44/1000	
Internal plus external	mGy/d	tdrat44	1.1E-03						=SUM(Idrat44)+Xdrat44	
Equivalent Doses - Bear - LSA										
RBE for alpha	Sv/Gy	RBE	10							
High LET dose rate	mSv/d	Hletdr	5.5E-05	9.9E-05	1.1E-04	1.0E-06	4.7E-03	5.0E-03	=Idrat*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr	9.6E-04						=Xdrat	
Total dose rate	mSv/d	tdr	6.0E-03						=SUM(Hletdr)+Lletdr	
Equivalent Doses - Caribou - LSA										
High LET dose rate	mSv/d	Hletdr2	1.2E-04	8.7E-05	4.7E-04	1.5E-05	5.7E-02	5.7E-02	=Idrat2*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr2	9.6E-04						=Xdrat2	
Total dose rate	mSv/d	tdr2	5.8E-02						=SUM(Hletdr2)+Lletdr2	
Equivalent Doses - Caribou - RSA										
High LET dose rate	mSv/d	Hletdr3	1.2E-04	8.7E-05	4.7E-04	1.5E-05	5.7E-02	5.7E-02	=Idrat3*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr3	9.6E-04						=Xdrat3	
Total dose rate	mSv/d	tdr3	5.8E-02						=SUM(Hletdr3)+Lletdr3	
Equivalent Doses - Falcon - LSA										
High LET dose rate	mSv/d	Hletdr4	1.6E-05	2.3E-04	2.2E-03	2.7E-03	3.7E-02	4.2E-02	=Idrat4*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr4	9.6E-04						=Xdrat4	
Total dose rate	mSv/d	tdr4	4.3E-02						=SUM(Hletdr4)+Lletdr4	
Equivalent Doses - Falcon - RSA										
High LET dose rate	mSv/d	Hletdr5	1.6E-05	2.3E-04	2.2E-03	2.7E-03	3.7E-02	4.2E-02	=Idrat5*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr5	9.6E-04						=Xdrat5	
Total dose rate	mSv/d	tdr5	4.3E-02						=SUM(Hletdr5)+Lletdr5	
Equivalent Doses - Fox - LSA										
High LET dose rate	mSv/d	Hletdr6	2.8E-05	5.2E-05	2.1E-04	3.1E-06	2.7E-03	3.0E-03	=Idrat6*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr6	9.6E-04						=Xdrat6	
Total dose rate	mSv/d	tdr6	3.9E-03						=SUM(Hletdr6)+Lletdr6	
Equivalent Doses - Lemming - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr7	2.1E-04	2.3E-03	1.0E-02	1.0E-03	1.5E-02	2.9E-02	=Idrat7*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr7	9.6E-04						=Xdrat7	
Total dose rate	mSv/d	tdr7	3.0E-02						=SUM(Hletdr7)+Lletdr7	
Equivalent Doses - Lemming - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr8	2.1E-04	2.3E-03	1.0E-02	1.0E-03	1.5E-02	2.9E-02	=Idrat8*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr8	9.6E-04						=Xdrat8	
Total dose rate	mSv/d	tdr8	3.0E-02						=SUM(Hletdr8)+Lletdr8	
Equivalent Doses - Lemming - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr9	2.1E-04	2.3E-03	1.0E-02	1.0E-03	1.5E-02	2.9E-02	=Idrat9*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr9	9.6E-04						=Xdrat9	
Total dose rate	mSv/d	tdr9	3.0E-02						=SUM(Hletdr9)+Lletdr9	
Equivalent Doses - Lemming - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr10	2.1E-04	2.3E-03	1.0E-02	1.0E-03	1.5E-02	2.9E-02	=Idrat10*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr10	9.6E-04						=Xdrat10	
Total dose rate	mSv/d	tdr10	3.0E-02						=SUM(Hletdr10)+Lletdr10	

Table H.2-2

Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

Equivalent Doses - Lapland Longspur - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr11	5.8E-05	2.2E-03	8.3E-03	8.1E-04	2.7E-02	3.8E-02	=Idrat11*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr11	9.6E-04						=Xdrat11	
Total dose rate	mSv/d	tdr11	3.9E-02						=SUM(Hletdr11)+Lletdr11	
Equivalent Doses - Lapland Longspur - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr12	6.1E-05	2.2E-03	8.6E-03	8.2E-04	2.8E-02	3.9E-02	=Idrat12*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr12	9.6E-04						=Xdrat12	
Total dose rate	mSv/d	tdr12	4.0E-02						=SUM(Hletdr12)+Lletdr12	
Equivalent Doses - Lapland Longspur - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr13	1.8E-05	2.2E-03	8.1E-03	8.1E-04	2.6E-02	3.8E-02	=Idrat13*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr13	9.6E-04						=Xdrat13	
Total dose rate	mSv/d	tdr13	3.8E-02						=SUM(Hletdr13)+Lletdr13	
Equivalent Doses - Lapland Longspur - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr14	5.8E-05	2.2E-03	8.3E-03	8.1E-04	2.7E-02	3.8E-02	=Idrat14*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr14	9.6E-04						=Xdrat14	
Total dose rate	mSv/d	tdr14	3.9E-02						=SUM(Hletdr14)+Lletdr14	
Equivalent Doses - Long-Tailed Duck - Rock Lake										
High LET dose rate	mSv/d	Hletdr15	7.9E-05	4.0E-04	1.5E-02	3.9E-04	4.3E-02	5.8E-02	=Idrat15*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr15	9.6E-04						=Xdrat15	
Total dose rate	mSv/d	tdr15	5.9E-02						=SUM(Hletdr15)+Lletdr15	
Equivalent Doses - Long-Tailed Duck - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr16	7.1E-05	3.8E-04	1.4E-02	3.7E-04	4.1E-02	5.6E-02	=Idrat16*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr16	9.6E-04						=Xdrat16	
Total dose rate	mSv/d	tdr16	5.7E-02						=SUM(Hletdr16)+Lletdr16	
Equivalent Doses - Long-Tailed Duck - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr17	7.2E-05	3.9E-04	1.4E-02	3.7E-04	4.1E-02	5.6E-02	=Idrat17*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr17	9.6E-04						=Xdrat17	
Total dose rate	mSv/d	tdr17	5.7E-02						=SUM(Hletdr17)+Lletdr17	
Equivalent Doses - Merganser - Rock Lake										
High LET dose rate	mSv/d	Hletdr18	1.1E-05	2.1E-04	6.3E-04	1.2E-04	5.2E-03	6.2E-03	=Idrat18*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr18	9.6E-04						=Xdrat18	
Total dose rate	mSv/d	tdr18	7.1E-03						=SUM(Hletdr18)+Lletdr18	
Equivalent Doses - Merganser - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr19	1.1E-05	2.0E-04	5.9E-04	1.2E-04	4.9E-03	5.9E-03	=Idrat19*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr19	9.6E-04						=Xdrat19	
Total dose rate	mSv/d	tdr19	6.8E-03						=SUM(Hletdr19)+Lletdr19	
Equivalent Doses - Merganser - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr20	1.1E-05	2.0E-04	5.9E-04	1.2E-04	4.9E-03	5.9E-03	=Idrat20*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr20	9.6E-04						=Xdrat20	
Total dose rate	mSv/d	tdr20	6.8E-03						=SUM(Hletdr20)+Lletdr20	
Equivalent Doses - Muskox - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr21	1.7E-04	1.2E-04	4.6E-04	4.1E-06	1.5E-02	1.6E-02	=Idrat21*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr21	9.6E-04						=Xdrat21	
Total dose rate	mSv/d	tdr21	1.7E-02						=SUM(Hletdr21)+Lletdr21	
Equivalent Doses - Muskox - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr22	5.8E-05	2.2E-03	8.3E-03	8.1E-04	2.7E-02	3.8E-02	=Idrat22*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr22	9.6E-04						=Xdrat22	
Total dose rate	mSv/d	tdr22	3.9E-02						=SUM(Hletdr22)+Lletdr22	
Equivalent Doses - Northern Pintail - Rock Lake										
High LET dose rate	mSv/d	Hletdr23	3.3E-05	3.0E-03	3.6E-03	1.0E-03	4.5E-02	5.3E-02	=Idrat23*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr23	9.6E-04						=Xdrat23	
Total dose rate	mSv/d	tdr23	5.4E-02						=SUM(Hletdr23)+Lletdr23	
Equivalent Doses - Northern Pintail - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr24	3.0E-05	2.9E-03	3.5E-03	9.8E-04	4.3E-02	5.1E-02	=Idrat24*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr24	9.6E-04						=Xdrat24	
Total dose rate	mSv/d	tdr24	5.2E-02						=SUM(Hletdr24)+Lletdr24	
Equivalent Doses - Northern Pintail - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr25	3.0E-05	2.9E-03	3.5E-03	9.8E-04	4.4E-02	5.1E-02	=Idrat25*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr25	9.6E-04						=Xdrat25	
Total dose rate	mSv/d	tdr25	5.2E-02						=SUM(Hletdr25)+Lletdr25	
Equivalent Doses - Ptarmigan - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr26	6.0E-05	5.9E-04	3.5E-03	2.3E-03	1.1E-01	1.1E-01	=Idrat26*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr26	9.6E-04						=Xdrat26	
Total dose rate	mSv/d	tdr26	1.1E-01						=SUM(Hletdr26)+Lletdr26	
Equivalent Doses - Ptarmigan - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr27	6.1E-05	5.9E-04	3.5E-03	2.3E-03	1.1E-01	1.1E-01	=Idrat27*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr27	9.6E-04						=Xdrat27	
Total dose rate	mSv/d	tdr27	1.1E-01						=SUM(Hletdr27)+Lletdr27	

Table H.2-2

Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

Equivalent Doses - Ptarmigan - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr28	4.8E-05	5.9E-04	3.3E-03	2.3E-03	1.1E-01	1.1E-01	=Idrat28*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr28	9.6E-04						=Xdrat28	
Total dose rate	mSv/d	tdr28	1.1E-01						=SUM(Hletdr28)+Lletdr28	
Equivalent Doses - Ptarmigan - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr29	6.1E-05	5.9E-04	3.4E-03	2.3E-03	1.1E-01	1.1E-01	=Idrat29*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr29	9.6E-04						=Xdrat29	
Total dose rate	mSv/d	tdr29	1.1E-01						=SUM(Hletdr29)+Lletdr29	
Equivalent Doses - Sandpiper - Rock Lake										
High LET dose rate	mSv/d	Hletdr30	2.8E-04	1.4E-03	2.4E-02	1.1E-03	8.8E-02	1.2E-01	=Idrat30*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr30	9.6E-04						=Xdrat30	
Total dose rate	mSv/d	tdr30	1.2E-01						=SUM(Hletdr30)+Lletdr30	
Equivalent Doses - Sandpiper - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr31	2.6E-04	1.4E-03	2.3E-02	1.1E-03	8.5E-02	1.1E-01	=Idrat31*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr31	9.6E-04						=Xdrat31	
Total dose rate	mSv/d	tdr31	1.1E-01						=SUM(Hletdr31)+Lletdr31	
Equivalent Doses - Sandpiper - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr32	2.6E-04	1.4E-03	2.4E-02	1.1E-03	8.5E-02	1.1E-01	=Idrat32*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr32	9.6E-04						=Xdrat32	
Total dose rate	mSv/d	tdr32	1.1E-01						=SUM(Hletdr32)+Lletdr32	
Equivalent Doses - Shrew - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr33	1.5E-04	4.1E-04	6.4E-03	2.2E-04	4.2E-03	1.1E-02	=Idrat33*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr33	9.6E-04						=Xdrat33	
Total dose rate	mSv/d	tdr33	1.2E-02						=SUM(Hletdr33)+Lletdr33	
Equivalent Doses - Shrew - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr34	1.6E-04	4.4E-04	6.9E-03	2.2E-04	4.4E-03	1.2E-02	=Idrat34*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr34	9.6E-04						=Xdrat34	
Total dose rate	mSv/d	tdr34	1.3E-02						=SUM(Hletdr34)+Lletdr34	
Equivalent Doses - Shrew - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr35	1.3E-05	3.9E-04	5.9E-03	2.2E-04	4.2E-03	1.1E-02	=Idrat35*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr35	9.6E-04						=Xdrat35	
Total dose rate	mSv/d	tdr35	1.2E-02						=SUM(Hletdr35)+Lletdr35	
Equivalent Doses - Shrew - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr36	1.5E-04	4.2E-04	6.4E-03	2.2E-04	4.2E-03	1.1E-02	=Idrat36*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr36	2.7E-04						=Xdrat36	
Total dose rate	mSv/d	tdr36	1.2E-02						=SUM(Hletdr36)+Lletdr36	
Equivalent Doses - Squirrel - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr37	1.3E-04	2.2E-03	1.0E-02	5.0E-04	7.5E-03	2.1E-02	=Idrat37*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr37	9.6E-04						=Xdrat37	
Total dose rate	mSv/d	tdr37	2.1E-02						=SUM(Hletdr37)+Lletdr37	
Equivalent Doses - Squirrel - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr38	1.3E-04	2.2E-03	1.0E-02	5.0E-04	7.5E-03	2.1E-02	=Idrat38*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr38	9.6E-04						=Xdrat38	
Total dose rate	mSv/d	tdr38	2.1E-02						=SUM(Hletdr38)+Lletdr38	
Equivalent Doses - Squirrel - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr39	1.3E-04	2.2E-03	1.0E-02	5.0E-04	7.5E-03	2.1E-02	=Idrat39*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr39	9.6E-04						=Xdrat39	
Total dose rate	mSv/d	tdr39	2.1E-02						=SUM(Hletdr39)+Lletdr39	
Equivalent Doses - Squirrel - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr40	1.3E-04	2.2E-03	1.0E-02	5.0E-04	7.5E-03	2.1E-02	=Idrat40*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr40	9.6E-04						=Xdrat40	
Total dose rate	mSv/d	tdr40	2.1E-02						=SUM(Hletdr40)+Lletdr40	
Equivalent Doses - Wolf - LSA										
High LET dose rate	mSv/d	Hletdr41	5.9E-05	1.9E-05	3.5E-05	8.7E-08	5.7E-03	5.8E-03	=Idrat41*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr41	9.6E-04						=Xdrat41	
Total dose rate	mSv/d	tdr41	6.7E-03						=SUM(Hletdr41)+Lletdr41	
Equivalent Doses - Wolf - RSA										
High LET dose rate	mSv/d	Hletdr42	5.9E-05	1.9E-05	3.5E-05	8.7E-08	5.7E-03	5.8E-03	=Idrat42*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr42	9.6E-04						=Xdrat42	
Total dose rate	mSv/d	tdr42	6.7E-03						=SUM(Hletdr42)+Lletdr42	
Equivalent Doses - Wolverine - LSA										
High LET dose rate	mSv/d	Hletdr43	8.2E-05	7.6E-05	3.4E-04	2.8E-06	1.3E-03	1.8E-03	=Idrat43*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr43	9.6E-04						=Xdrat43	
Total dose rate	mSv/d	tdr43	2.8E-03						=SUM(Hletdr43)+Lletdr43	
Equivalent Doses - Wolverine - RSA										
High LET dose rate	mSv/d	Hletdr44	8.2E-05	7.6E-05	3.4E-04	2.8E-06	1.3E-03	1.8E-03	=Idrat44*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr44	9.6E-04						=Xdrat44	
Total dose rate	mSv/d	tdr44	2.8E-03						=SUM(Hletdr44)+Lletdr44	

Table H.2-2
Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

SUMMARY

3 Screening Criterion in mGy/d	Total Absorbed Dose mGy/d	Total Equivalent Dose mSv/d	Index (Absorbed Dose)	Index (Equivalent Dose)
Bear - LSA	1.5E-03	6.0E-03	4.9E-04	2.0E-03
Caribou - LSA	6.7E-03	5.8E-02	2.2E-03	1.9E-02
Caribou - RSA	6.7E-03	5.8E-02	2.2E-03	1.9E-02
Falcon - LSA	7.6E-03	4.3E-02	2.5E-03	1.4E-02
Falcon - RSA	7.6E-03	4.3E-02	2.5E-03	1.4E-02
Fox - LSA	1.3E-03	3.9E-03	4.2E-04	1.3E-03
Lemming - Rock Lake Watershed	4.8E-03	3.0E-02	1.6E-03	1.0E-02
Lemming - JSL @ Kiggavik Discharge	4.8E-03	3.0E-02	1.6E-03	1.0E-02
Lemming - Kiggavik Camp	4.8E-03	3.0E-02	1.6E-03	1.0E-02
Lemming - JSL @ Sissons Discharge	4.8E-03	3.0E-02	1.6E-03	1.0E-02
Lapland Longspur - Rock Lake Watershed	5.5E-03	3.9E-02	1.8E-03	1.3E-02
Lapland Longspur - JSL @ Kiggavik Discharge	5.6E-03	4.0E-02	1.9E-03	1.3E-02
Lapland Longspur - Kiggavik Camp	5.4E-03	3.8E-02	1.8E-03	1.3E-02
Lapland Longspur - JSL @ Sissons Discharge	5.5E-03	3.9E-02	1.8E-03	1.3E-02
Long-Tailed Duck - Rock Lake	7.1E-03	5.9E-02	2.4E-03	2.0E-02
Long-Tailed Duck - JSL @ Kiggavik Discharge	6.9E-03	5.7E-02	2.3E-03	1.9E-02
Long-Tailed Duck - JSL @ Sissons Discharge	6.9E-03	5.7E-02	2.3E-03	1.9E-02
Merganser - Rock Lake	1.7E-03	7.1E-03	5.6E-04	2.4E-03
Merganser - JSL @ Kiggavik Discharge	1.7E-03	6.8E-03	5.5E-04	2.3E-03
Merganser - JSL @ Sissons Discharge	1.7E-03	6.8E-03	5.5E-04	2.3E-03
Muskox - JSL @ Kiggavik Discharge	2.6E-03	1.7E-02	8.5E-04	5.6E-03
Muskox - JSL @ Sissons Discharge	5.5E-03	3.9E-02	1.8E-03	1.3E-02
Northern Pintail - Rock Lake	7.2E-03	5.4E-02	2.4E-03	1.8E-02
Northern Pintail - JSL @ Kiggavik Discharge	6.9E-03	5.2E-02	2.3E-03	1.7E-02
Northern Pintail - JSL @ Sissons Discharge	6.9E-03	5.2E-02	2.3E-03	1.7E-02
Ptarmigan - Rock Lake Watershed	1.4E-02	1.1E-01	4.7E-03	3.8E-02
Ptarmigan - JSL @ Kiggavik Discharge	1.4E-02	1.1E-01	4.8E-03	3.8E-02
Ptarmigan - Kiggavik Camp	1.4E-02	1.1E-01	4.7E-03	3.8E-02
Ptarmigan - JSL @ Sissons Discharge	1.4E-02	1.1E-01	4.7E-03	3.8E-02
Sandpiper - Rock Lake	1.3E-02	1.2E-01	4.5E-03	3.9E-02
Sandpiper - JSL @ Kiggavik Discharge	1.3E-02	1.1E-01	4.3E-03	3.7E-02
Sandpiper - JSL @ Sissons Discharge	1.3E-02	1.1E-01	4.4E-03	3.7E-02
Shrew - Rock Lake Watershed	2.3E-03	1.2E-02	7.6E-04	4.1E-03
Shrew - JSL @ Kiggavik Discharge	2.4E-03	1.3E-02	7.9E-04	4.4E-03
Shrew - Kiggavik Camp	2.2E-03	1.2E-02	7.4E-04	3.9E-03
Shrew - JSL @ Sissons Discharge	1.6E-03	1.2E-02	5.3E-04	3.9E-03
Squirrel - Rock Lake Watershed	3.5E-03	2.1E-02	1.2E-03	7.2E-03
Squirrel - JSL @ Kiggavik Discharge	3.5E-03	2.1E-02	1.2E-03	7.2E-03
Squirrel - Kiggavik Camp	3.5E-03	2.1E-02	1.2E-03	7.2E-03
Squirrel - JSL @ Sissons Discharge	3.5E-03	2.1E-02	1.2E-03	7.2E-03
Wolf - LSA	1.5E-03	6.7E-03	5.1E-04	2.2E-03
Wolf - RSA	1.5E-03	6.7E-03	5.1E-04	2.2E-03
Wolverine - LSA	1.1E-03	2.8E-03	3.8E-04	9.3E-04
Wolverine - RSA	1.1E-03	2.8E-03	3.8E-04	9.3E-04

U-238+ Internal U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235
Ra-226+ Internal Ra-226 + 0.3* (Rn-222 + ...Po-214)
Pb-210+ Internal Pb-210 + Bi-210

Table H.2-2

Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

2023

DOSES TO SELECTED VECs - Average Total Dose

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Absorbed Doses - Bear - LSA									
Concentration	Bq/g	Crad	1.72E-05	3.49E-05	2.39E-05	5.32E-05	1.80E-03		
Internal Dose Factor	mGy/d per Bq/g	ldcf	1.4E-01	6.6E-02	1.6E-01	6.0E-03	7.4E-02		
Internal dose rate	mGy/d	ldrat	2.4E-06	2.3E-06	3.8E-06	3.2E-07	1.3E-04	1.4E-04	=Crad*ldcf
External Gamma rate	uGy/h	Xgrat	0.04						
Fraction of time on site	-	fts	1.00						
External dose rate	mGy/d	Xdrat	9.6E-04						=Xgrat*24*fts/1000
Internal plus external	mGy/d	tdrat	1.1E-03						=SUM(ldrat)+Xdrat
Absorbed Doses - Caribou - LSA									
Concentration	Bq/g	Crad2	7.26E-05	4.61E-05	9.33E-05	9.07E-04	2.41E-02		
Internal dose rate	mGy/d	ldrat2	1.0E-05	3.0E-06	1.5E-05	5.5E-06	1.8E-03	1.8E-03	=Crad2*ldcf
Fraction of time on site	-	fts2	1.00						
External dose rate	mGy/d	Xdrat2	9.6E-04						=Xgrat*24*fts2/1000
Internal plus external	mGy/d	tdrat2	2.8E-03						=SUM(ldrat2)+Xdrat2
Absorbed Doses - Caribou - RSA									
Concentration	Bq/g	Crad3	4.76E-05	4.51E-05	8.95E-05	9.06E-04	2.40E-02		
Internal dose rate	mGy/d	ldrat3	6.8E-06	3.0E-06	1.4E-05	5.5E-06	1.8E-03	1.8E-03	=Crad3*ldcf
Fraction of time on site	-	fts3	1.00						
External dose rate	mGy/d	Xdrat3	9.6E-04						=Xgrat*24*fts3/1000
Internal plus external	mGy/d	tdrat3	2.8E-03						=SUM(ldrat3)+Xdrat3
Absorbed Doses - Falcon - LSA									
Concentration	Bq/g	Crad4	4.03E-06	1.21E-04	4.04E-04	1.34E-01	1.47E-02		
Internal dose rate	mGy/d	ldrat4	5.7E-07	8.0E-06	6.4E-05	8.1E-04	1.1E-03	2.0E-03	=Crad4*ldcf
Fraction of time on site	-	fts4	1.00						
External dose rate	mGy/d	Xdrat4	9.6E-04						=Xgrat*24*fts4/1000
Internal plus external	mGy/d	tdrat4	2.9E-03						=SUM(ldrat4)+Xdrat4
Absorbed Doses - Falcon - RSA									
Concentration	Bq/g	Crad5	3.90E-06	1.20E-04	3.99E-04	1.34E-01	1.47E-02		
Internal dose rate	mGy/d	ldrat5	5.5E-07	7.9E-06	6.3E-05	8.1E-04	1.1E-03	2.0E-03	=Crad5*ldcf
Fraction of time on site	-	fts5	1.00						
External dose rate	mGy/d	Xdrat5	9.6E-04						=Xgrat*24*fts5/1000
Internal plus external	mGy/d	tdrat5	2.9E-03						=SUM(ldrat5)+Xdrat5
Absorbed Doses - Fox - LSA									
Concentration	Bq/g	Crad6	1.81E-05	2.80E-05	6.26E-05	1.31E-04	1.16E-03		
Internal dose rate	mGy/d	ldrat6	2.6E-06	1.8E-06	9.9E-06	7.9E-07	8.5E-05	1.0E-04	=Crad6*ldcf
Fraction of time on site	-	fts6	1.00						
External dose rate	mGy/d	Xdrat6	9.6E-04						=Xgrat*24*fts6/1000
Internal plus external	mGy/d	tdrat6	1.1E-03						=SUM(ldrat6)+Xdrat6
Absorbed Doses - Lemming - Rock Lake Watershed									
Concentration	Bq/g	Crad7	1.41E-04	1.26E-03	2.61E-03	4.81E-02	6.66E-03		
Internal dose rate	mGy/d	ldrat7	2.0E-05	8.3E-05	4.2E-04	2.9E-04	4.9E-04	1.3E-03	=Crad7*ldcf
Fraction of time on site	-	fts7	1.00						
External dose rate	mGy/d	Xdrat7	9.6E-04						=Xgrat*24*fts7/1000
Internal plus external	mGy/d	tdrat7	2.3E-03						=SUM(ldrat7)+Xdrat7
Absorbed Doses - Lemming - JSL @ Kiggavik Discharge									
Concentration	Bq/g	Crad8	1.22E-04	1.24E-03	2.55E-03	4.80E-02	6.55E-03		
Internal dose rate	mGy/d	ldrat8	1.7E-05	8.2E-05	4.1E-04	2.9E-04	4.8E-04	1.3E-03	=Crad8*ldcf
Fraction of time on site	-	fts8	1.00						
External dose rate	mGy/d	Xdrat8	9.6E-04						=Xgrat*24*fts8/1000
Internal plus external	mGy/d	tdrat8	2.2E-03						=SUM(ldrat8)+Xdrat8
Absorbed Doses - Lemming - Kiggavik Camp									
Concentration	Bq/g	Crad9	2.05E-03	3.47E-03	8.82E-03	6.52E-02	1.82E-02		
Internal dose rate	mGy/d	ldrat9	2.9E-04	2.3E-04	1.4E-03	3.9E-04	1.3E-03	3.7E-03	=Crad9*ldcf
Fraction of time on site	-	fts9	1.00						
External dose rate	mGy/d	Xdrat9	9.6E-04						=Xgrat*24*fts9/1000
Internal plus external	mGy/d	tdrat9	4.6E-03						=SUM(ldrat9)+Xdrat9
Absorbed Doses - Lemming - JSL @ Sissons Discharge									
Concentration	Bq/g	Crad10	2.45E-04	1.38E-03	2.95E-03	4.91E-02	7.29E-03		
Internal dose rate	mGy/d	ldrat10	3.5E-05	9.1E-05	4.7E-04	3.0E-04	5.4E-04	1.4E-03	=Crad10*ldcf
Fraction of time on site	-	fts10	1.00						
External dose rate	mGy/d	Xdrat10	9.6E-04						=Xgrat*24*fts10/1000
Internal plus external	mGy/d	tdrat10	2.4E-03						=SUM(ldrat10)+Xdrat10
Absorbed Doses - Lapland Longspur - Rock Lake Watershed									
Concentration	Bq/g	Crad11	1.42E-05	7.56E-04	1.61E-03	3.59E-02	1.29E-02		
Internal dose rate	mGy/d	ldrat11	2.0E-06	5.0E-05	2.6E-04	2.2E-04	9.6E-04	1.5E-03	=Crad11*ldcf
Fraction of time on site	-	fts11	1.00						
External dose rate	mGy/d	Xdrat11	9.6E-04						=Xgrat*24*fts11/1000
Internal plus external	mGy/d	tdrat11	2.4E-03						=SUM(ldrat11)+Xdrat11

Table H.2-2

Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

Absorbed Doses - Lapland Longspur - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad12	1.97E-05	7.55E-04	1.65E-03	3.61E-02	1.34E-02			
Internal dose rate	mGy/d	ldrat12	2.8E-06	5.0E-05	2.6E-04	2.2E-04	9.9E-04	1.5E-03	=Crad12*ldcf	
Fraction of time on site	-	fts12	1.00							
External dose rate	mGy/d	Xdrat12	9.6E-04						=Xgrat*24*fts12/1000	
Internal plus external	mGy/d	tdrat12	2.5E-03						=SUM(ldrat12)+Xdrat12	
Absorbed Doses - Lapland Longspur - Kiggavik Camp										
Concentration	Bq/g	Crad13	4.69E-05	9.46E-04	2.03E-03	3.97E-02	1.41E-02			
Internal dose rate	mGy/d	ldrat13	6.7E-06	6.2E-05	3.2E-04	2.4E-04	1.0E-03	1.7E-03	=Crad13*ldcf	
Fraction of time on site	-	fts13	1.00							
External dose rate	mGy/d	Xdrat13	9.6E-04						=Xgrat*24*fts13/1000	
Internal plus external	mGy/d	tdrat13	2.6E-03						=SUM(ldrat13)+Xdrat13	
Absorbed Doses - Lapland Longspur - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad14	3.23E-05	7.65E-04	1.64E-03	3.62E-02	1.32E-02			
Internal dose rate	mGy/d	ldrat14	4.6E-06	5.0E-05	2.6E-04	2.2E-04	9.8E-04	1.5E-03	=Crad14*ldcf	
Fraction of time on site	-	fts14	1.00							
External dose rate	mGy/d	Xdrat14	9.6E-04						=Xgrat*24*fts14/1000	
Internal plus external	mGy/d	tdrat14	2.5E-03						=SUM(ldrat14)+Xdrat14	
Absorbed Doses - Long-Tailed Duck - Rock Lake										
Concentration	Bq/g	Crad15	1.95E-05	2.01E-04	2.30E-03	1.99E-02	1.55E-02			
Internal dose rate	mGy/d	ldrat15	2.8E-06	1.3E-05	3.6E-04	1.2E-04	1.1E-03	1.6E-03	=Crad15*ldcf	
Fraction of time on site	-	fts15	1.00							
External dose rate	mGy/d	Xdrat15	9.6E-04						=Xgrat*24*fts15/1000	
Internal plus external	mGy/d	tdrat15	2.6E-03						=SUM(ldrat15)+Xdrat15	
Absorbed Doses - Long-Tailed Duck - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad16	3.14E-05	1.96E-04	2.21E-03	1.93E-02	1.52E-02			
Internal dose rate	mGy/d	ldrat16	4.5E-06	1.3E-05	3.5E-04	1.2E-04	1.1E-03	1.6E-03	=Crad16*ldcf	
Fraction of time on site	-	fts16	1.00							
External dose rate	mGy/d	Xdrat16	9.6E-04						=Xgrat*24*fts16/1000	
Internal plus external	mGy/d	tdrat16	2.6E-03						=SUM(ldrat16)+Xdrat16	
Absorbed Doses - Long-Tailed Duck - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad17	4.73E-05	1.97E-04	2.24E-03	1.95E-02	1.52E-02			
Internal dose rate	mGy/d	ldrat17	6.7E-06	1.3E-05	3.6E-04	1.2E-04	1.1E-03	1.6E-03	=Crad17*ldcf	
Fraction of time on site	-	fts17	1.00							
External dose rate	mGy/d	Xdrat17	9.6E-04						=Xgrat*24*fts17/1000	
Internal plus external	mGy/d	tdrat17	2.6E-03						=SUM(ldrat17)+Xdrat17	
Absorbed Doses - Merganser - Rock Lake										
Concentration	Bq/g	Crad18	2.29E-06	8.27E-05	1.25E-04	6.29E-03	2.11E-03			
Internal dose rate	mGy/d	ldrat18	3.3E-07	5.4E-06	2.0E-05	3.8E-05	1.6E-04	2.2E-04	=Crad18*ldcf	
Fraction of time on site	-	fts18	1.00							
External dose rate	mGy/d	Xdrat18	9.6E-04						=Xgrat*24*fts18/1000	
Internal plus external	mGy/d	tdrat18	1.2E-03						=SUM(ldrat18)+Xdrat18	
Absorbed Doses - Merganser - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad19	2.31E-06	8.03E-05	1.18E-04	6.13E-03	2.04E-03			
Internal dose rate	mGy/d	ldrat19	3.3E-07	5.3E-06	1.9E-05	3.7E-05	1.5E-04	2.1E-04	=Crad19*ldcf	
Fraction of time on site	-	fts19	1.00							
External dose rate	mGy/d	Xdrat19	9.6E-04						=Xgrat*24*fts19/1000	
Internal plus external	mGy/d	tdrat19	1.2E-03						=SUM(ldrat19)+Xdrat19	
Absorbed Doses - Merganser - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad20	2.33E-06	8.08E-05	1.20E-04	6.18E-03	2.06E-03			
Internal dose rate	mGy/d	ldrat20	3.3E-07	5.3E-06	1.9E-05	3.7E-05	1.5E-04	2.1E-04	=Crad20*ldcf	
Fraction of time on site	-	fts20	1.00							
External dose rate	mGy/d	Xdrat20	9.6E-04						=Xgrat*24*fts20/1000	
Internal plus external	mGy/d	tdrat20	1.2E-03						=SUM(ldrat20)+Xdrat20	
Absorbed Doses - Muskox - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad21	3.13E-05	5.03E-05	7.12E-05	2.22E-04	6.91E-03			
Internal dose rate	mGy/d	ldrat21	4.4E-06	3.3E-06	1.1E-05	1.3E-06	5.1E-04	5.3E-04	=Crad21*ldcf	
Fraction of time on site	-	fts21	1.00							
External dose rate	mGy/d	Xdrat21	9.6E-04						=Xgrat*24*fts21/1000	
Internal plus external	mGy/d	tdrat21	1.5E-03						=SUM(ldrat21)+Xdrat21	
Absorbed Doses - Muskox - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad22	3.23E-05	7.65E-04	1.64E-03	3.62E-02	1.32E-02			
Internal dose rate	mGy/d	ldrat22	4.6E-06	5.0E-05	2.6E-04	2.2E-04	9.8E-04	1.5E-03	=Crad22*ldcf	
Fraction of time on site	-	fts22	1.00							
External dose rate	mGy/d	Xdrat22	9.6E-04						=Xgrat*24*fts22/1000	
Internal plus external	mGy/d	tdrat22	2.5E-03						=SUM(ldrat22)+Xdrat22	
Absorbed Doses - Northern Pintail - Rock Lake										
Concentration	Bq/g	Crad23	7.17E-06	1.15E-03	6.60E-04	5.23E-02	1.76E-02			
Internal dose rate	mGy/d	ldrat23	1.0E-06	7.5E-05	1.0E-04	3.2E-04	1.3E-03	1.8E-03	=Crad23*ldcf	
Fraction of time on site	-	fts23	1.00							
External dose rate	mGy/d	Xdrat23	9.6E-04						=Xgrat*24*fts23/1000	
Internal plus external	mGy/d	tdrat23	2.8E-03						=SUM(ldrat23)+Xdrat23	

Table H.2-2

Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

Absorbed Doses - Northern Pintail - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad24	1.07E-05	1.11E-03	6.38E-04	5.08E-02	1.71E-02			
Internal dose rate	mGy/d	Idrat24	1.5E-06	7.3E-05	1.0E-04	3.1E-04	1.3E-03	1.7E-03	=Crad24*Idcf	
Fraction of time on site	-	fts24	1.00							
External dose rate	mGy/d	Xdrat24	9.6E-04						=Xgrat*24*fts24/1000	
Internal plus external	mGy/d	tdrat24	2.7E-03						=SUM(Idrat24)+Xdrat24	
Absorbed Doses - Northern Pintail - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad25	1.56E-05	1.12E-03	6.43E-04	5.13E-02	1.72E-02			
Internal dose rate	mGy/d	Idrat25	2.2E-06	7.4E-05	1.0E-04	3.1E-04	1.3E-03	1.8E-03	=Crad25*Idcf	
Fraction of time on site	-	fts25	1.00							
External dose rate	mGy/d	Xdrat25	9.6E-04						=Xgrat*24*fts25/1000	
Internal plus external	mGy/d	tdrat25	2.7E-03						=SUM(Idrat25)+Xdrat25	
Absorbed Doses - Ptarmigan - Rock Lake Watershed										
Concentration	Bq/g	Crad26	1.21E-05	2.28E-04	6.70E-04	1.38E-01	4.74E-02			
Internal dose rate	mGy/d	Idrat26	1.7E-06	1.5E-05	1.1E-04	8.3E-04	3.5E-03	4.5E-03	=Crad26*Idcf	
Fraction of time on site	-	fts26	1.00							
External dose rate	mGy/d	Xdrat26	9.6E-04						=Xgrat*24*fts26/1000	
Internal plus external	mGy/d	tdrat26	5.4E-03						=SUM(Idrat26)+Xdrat26	
Absorbed Doses - Ptarmigan - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad27	1.40E-05	2.28E-04	6.81E-04	1.38E-01	4.76E-02			
Internal dose rate	mGy/d	Idrat27	2.0E-06	1.5E-05	1.1E-04	8.3E-04	3.5E-03	4.5E-03	=Crad27*Idcf	
Fraction of time on site	-	fts27	1.00							
External dose rate	mGy/d	Xdrat27	9.6E-04						=Xgrat*24*fts27/1000	
Internal plus external	mGy/d	tdrat27	5.4E-03						=SUM(Idrat27)+Xdrat27	
Absorbed Doses - Ptarmigan - Kiggavik Camp										
Concentration	Bq/g	Crad28	1.84E-05	2.62E-04	7.35E-04	1.39E-01	4.77E-02			
Internal dose rate	mGy/d	Idrat28	2.6E-06	1.7E-05	1.2E-04	8.4E-04	3.5E-03	4.5E-03	=Crad28*Idcf	
Fraction of time on site	-	fts28	1.00							
External dose rate	mGy/d	Xdrat28	9.6E-04						=Xgrat*24*fts28/1000	
Internal plus external	mGy/d	tdrat28	5.5E-03						=SUM(Idrat28)+Xdrat28	
Absorbed Doses - Ptarmigan - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad29	1.79E-05	2.30E-04	6.75E-04	1.38E-01	4.75E-02			
Internal dose rate	mGy/d	Idrat29	2.5E-06	1.5E-05	1.1E-04	8.3E-04	3.5E-03	4.5E-03	=Crad29*Idcf	
Fraction of time on site	-	fts29	1.00							
External dose rate	mGy/d	Xdrat29	9.6E-04						=Xgrat*24*fts29/1000	
Internal plus external	mGy/d	tdrat29	5.4E-03						=SUM(Idrat29)+Xdrat29	
Absorbed Doses - Sandpiper - Rock Lake										
Concentration	Bq/g	Crad30	4.85E-05	7.57E-04	3.86E-03	5.69E-02	3.46E-02			
Internal dose rate	mGy/d	Idrat30	6.9E-06	5.0E-05	6.1E-04	3.4E-04	2.6E-03	3.6E-03	=Crad30*Idcf	
Fraction of time on site	-	fts30	1.00							
External dose rate	mGy/d	Xdrat30	9.6E-04						=Xgrat*24*fts30/1000	
Internal plus external	mGy/d	tdrat30	4.5E-03						=SUM(Idrat30)+Xdrat30	
Absorbed Doses - Sandpiper - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad31	7.06E-05	7.48E-04	3.74E-03	5.58E-02	3.42E-02			
Internal dose rate	mGy/d	Idrat31	1.0E-05	4.9E-05	5.9E-04	3.4E-04	2.5E-03	3.5E-03	=Crad31*Idcf	
Fraction of time on site	-	fts31	1.00							
External dose rate	mGy/d	Xdrat31	9.6E-04						=Xgrat*24*fts31/1000	
Internal plus external	mGy/d	tdrat31	4.5E-03						=SUM(Idrat31)+Xdrat31	
Absorbed Doses - Sandpiper - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad32	1.07E-04	7.48E-04	3.77E-03	5.60E-02	3.41E-02			
Internal dose rate	mGy/d	Idrat32	1.5E-05	4.9E-05	6.0E-04	3.4E-04	2.5E-03	3.5E-03	=Crad32*Idcf	
Fraction of time on site	-	fts32	1.00							
External dose rate	mGy/d	Xdrat32	9.6E-04						=Xgrat*24*fts32/1000	
Internal plus external	mGy/d	tdrat32	4.5E-03						=SUM(Idrat32)+Xdrat32	
Absorbed Doses - Shrew - Rock Lake Watershed										
Concentration	Bq/g	Crad33	1.01E-04	2.60E-04	1.45E-03	1.17E-02	2.43E-03			
Internal dose rate	mGy/d	Idrat33	1.4E-05	1.7E-05	2.3E-04	7.0E-05	1.8E-04	5.1E-04	=Crad33*Idcf	
Fraction of time on site	-	fts33	1.00							
External dose rate	mGy/d	Xdrat33	9.6E-04						=Xgrat*24*fts33/1000	
Internal plus external	mGy/d	tdrat33	1.5E-03						=SUM(Idrat33)+Xdrat33	
Absorbed Doses - Shrew - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad34	1.12E-04	2.60E-04	1.52E-03	1.17E-02	2.43E-03			
Internal dose rate	mGy/d	Idrat34	1.6E-05	1.7E-05	2.4E-04	7.0E-05	1.8E-04	5.3E-04	=Crad34*Idcf	
Fraction of time on site	-	fts34	1.00							
External dose rate	mGy/d	Xdrat34	9.6E-04						=Xgrat*24*fts34/1000	
Internal plus external	mGy/d	tdrat34	1.5E-03						=SUM(Idrat34)+Xdrat34	
Absorbed Doses - Shrew - Kiggavik Camp										
Concentration	Bq/g	Crad35	1.27E-03	1.48E-03	4.44E-03	2.01E-02	8.75E-03			
Internal dose rate	mGy/d	Idrat35	1.8E-04	9.7E-05	7.1E-04	1.2E-04	6.5E-04	1.8E-03	=Crad35*Idcf	
Fraction of time on site	-	fts35	1.00							
External dose rate	mGy/d	Xdrat35	9.6E-04						=Xgrat*24*fts35/1000	
Internal plus external	mGy/d	tdrat35	2.7E-03						=SUM(Idrat35)+Xdrat35	
Absorbed Doses - Shrew - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad36	2.24E-04	3.32E-04	1.63E-03	1.22E-02	2.80E-03			
Internal dose rate	mGy/d	Idrat36	3.2E-05	2.2E-05	2.6E-04	7.3E-05	2.1E-04	5.9E-04	=Crad36*Idcf	
Fraction of time on site	-	fts36	1.00							

Table H.2-2

Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

External dose rate	mGy/d	Xdrat36	2.7E-04							=Xgrat*24*fts36/3600
Internal plus external	mGy/d	tdrat36	8.6E-04							=SUM(ldrat36)+Xdrat36
Absorbed Doses - Squirrel - Rock Lake Watershed										
Concentration	Bq/g	Crad37	2.87E-05	9.96E-04	1.50E-03	1.97E-02	2.34E-03			
Internal dose rate	mGy/d	ldrat37	4.1E-06	6.6E-05	2.4E-04	1.2E-04	1.7E-04	6.0E-04		=Crad37*ldcf
Fraction of time on site	-	fts37	1.00							
External dose rate	mGy/d	Xdrat37	9.6E-04							=Xgrat*24*fts37/1000
Internal plus external	mGy/d	tdrat37	1.6E-03							=SUM(ldrat37)+Xdrat37
Absorbed Doses - Squirrel - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad38	2.83E-05	9.94E-04	1.49E-03	1.97E-02	2.34E-03			
Internal dose rate	mGy/d	ldrat38	4.0E-06	6.5E-05	2.4E-04	1.2E-04	1.7E-04	6.0E-04		=Crad38*ldcf
Fraction of time on site	-	fts38	1.00							
External dose rate	mGy/d	Xdrat38	9.6E-04							=Xgrat*24*fts38/1000
Internal plus external	mGy/d	tdrat38	1.6E-03							=SUM(ldrat38)+Xdrat38
Absorbed Doses - Squirrel - Kiggavik Camp										
Concentration	Bq/g	Crad39	5.59E-05	1.14E-03	1.73E-03	1.99E-02	2.37E-03			
Internal dose rate	mGy/d	ldrat39	7.9E-06	7.5E-05	2.7E-04	1.2E-04	1.8E-04	6.5E-04		=Crad39*ldcf
Fraction of time on site	-	fts39	1.00							
External dose rate	mGy/d	Xdrat39	9.6E-04							=Xgrat*24*fts39/1000
Internal plus external	mGy/d	tdrat39	1.6E-03							=SUM(ldrat39)+Xdrat39

Table H.2-2
Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

Absorbed Doses - Squirrel - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad40	2.99E-05	1.00E-03	1.51E-03	1.97E-02	2.34E-03			
Internal dose rate	mGy/d	Idrat40	4.2E-06	6.6E-05	2.4E-04	1.2E-04	1.7E-04	6.0E-04	=Crad40*Idcf	
Fraction of time on site	-	fts40	1.00							
External dose rate	mGy/d	Xdrat40	9.6E-04						=Xgrat*24*fts40/1000	
Internal plus external	mGy/d	tdrat40	1.6E-03						=SUM(Idrat40)+Xdrat40	
Absorbed Doses - Wolf - LSA										
Concentration	Bq/g	Crad41	1.29E-05	9.62E-06	6.08E-06	3.68E-06	1.91E-03			
Internal dose rate	mGy/d	Idrat41	1.8E-06	6.3E-07	9.7E-07	2.2E-08	1.4E-04	1.4E-04	=Crad41*Idcf	
Fraction of time on site	-	fts41	1.00							
External dose rate	mGy/d	Xdrat41	9.6E-04						=Xgrat*24*fts41/1000	
Internal plus external	mGy/d	tdrat41	1.1E-03						=SUM(Idrat41)+Xdrat41	
Absorbed Doses - Wolf - RSA										
Concentration	Bq/g	Crad42	1.28E-05	9.62E-06	6.07E-06	3.68E-06	1.91E-03			
Internal dose rate	mGy/d	Idrat42	1.8E-06	6.3E-07	9.6E-07	2.2E-08	1.4E-04	1.4E-04	=Crad42*Idcf	
Fraction of time on site	-	fts42	1.00							
External dose rate	mGy/d	Xdrat42	9.6E-04						=Xgrat*24*fts42/1000	
Internal plus external	mGy/d	tdrat42	1.1E-03						=SUM(Idrat42)+Xdrat42	
Absorbed Doses - Wolverine - LSA										
Concentration	Bq/g	Crad43	2.15E-05	3.52E-05	5.82E-05	1.07E-04	5.04E-04			
Internal dose rate	mGy/d	Idrat43	3.1E-06	2.3E-06	9.3E-06	6.4E-07	3.7E-05	5.3E-05	=Crad43*Idcf	
Fraction of time on site	-	fts43	1.00							
External dose rate	mGy/d	Xdrat43	9.6E-04						=Xgrat*24*fts43/1000	
Internal plus external	mGy/d	tdrat43	1.0E-03						=SUM(Idrat43)+Xdrat43	
Absorbed Doses - Wolverine - RSA										
Concentration	Bq/g	Crad44	1.82E-05	3.43E-05	5.54E-05	1.06E-04	4.89E-04			
Internal dose rate	mGy/d	Idrat44	2.6E-06	2.3E-06	8.8E-06	6.4E-07	3.6E-05	5.0E-05	=Crad44*Idcf	
Fraction of time on site	-	fts44	1.00							
External dose rate	mGy/d	Xdrat44	9.6E-04						=Xgrat*24*fts44/1000	
Internal plus external	mGy/d	tdrat44	1.0E-03						=SUM(Idrat44)+Xdrat44	
Equivalent Doses - Bear - LSA										
RBE for alpha	Sv/Gy	RBE	10							
High LET dose rate	mSv/d	Hletdr	2.4E-05	2.3E-05	3.8E-05	3.2E-07	1.3E-03	1.4E-03	=Idrat*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr	9.6E-04						=Xdrat	
Total dose rate	mSv/d	tdr	2.4E-03						=SUM(Hletdr)+Lletdr	
Equivalent Doses - Caribou - LSA										
High LET dose rate	mSv/d	Hletdr2	1.0E-04	3.0E-05	1.5E-04	5.5E-06	1.8E-02	1.8E-02	=Idrat2*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr2	9.6E-04						=Xdrat2	
Total dose rate	mSv/d	tdr2	1.9E-02						=SUM(Hletdr2)+Lletdr2	
Equivalent Doses - Caribou - RSA										
High LET dose rate	mSv/d	Hletdr3	6.8E-05	3.0E-05	1.4E-04	5.5E-06	1.8E-02	1.8E-02	=Idrat3*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr3	9.6E-04						=Xdrat3	
Total dose rate	mSv/d	tdr3	1.9E-02						=SUM(Hletdr3)+Lletdr3	
Equivalent Doses - Falcon - LSA										
High LET dose rate	mSv/d	Hletdr4	5.7E-06	8.0E-05	6.4E-04	8.1E-04	1.1E-02	1.2E-02	=Idrat4*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr4	9.6E-04						=Xdrat4	
Total dose rate	mSv/d	tdr4	1.3E-02						=SUM(Hletdr4)+Lletdr4	
Equivalent Doses - Falcon - RSA										
High LET dose rate	mSv/d	Hletdr5	5.5E-06	7.9E-05	6.3E-04	8.1E-04	1.1E-02	1.2E-02	=Idrat5*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr5	9.6E-04						=Xdrat5	
Total dose rate	mSv/d	tdr5	1.3E-02						=SUM(Hletdr5)+Lletdr5	
Equivalent Doses - Fox - LSA										
High LET dose rate	mSv/d	Hletdr6	2.6E-05	1.8E-05	9.9E-05	7.9E-07	8.5E-04	1.0E-03	=Idrat6*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr6	9.6E-04						=Xdrat6	
Total dose rate	mSv/d	tdr6	2.0E-03						=SUM(Hletdr6)+Lletdr6	
Equivalent Doses - Lemming - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr7	2.0E-04	8.3E-04	4.2E-03	2.9E-04	4.9E-03	1.0E-02	=Idrat7*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr7	9.6E-04						=Xdrat7	
Total dose rate	mSv/d	tdr7	1.1E-02						=SUM(Hletdr7)+Lletdr7	
Equivalent Doses - Lemming - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr8	1.7E-04	8.2E-04	4.1E-03	2.9E-04	4.8E-03	1.0E-02	=Idrat8*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr8	9.6E-04						=Xdrat8	
Total dose rate	mSv/d	tdr8	1.1E-02						=SUM(Hletdr8)+Lletdr8	
Equivalent Doses - Lemming - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr9	2.9E-03	2.3E-03	1.4E-02	3.9E-04	1.3E-02	3.3E-02	=Idrat9*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr9	9.6E-04						=Xdrat9	
Total dose rate	mSv/d	tdr9	3.4E-02						=SUM(Hletdr9)+Lletdr9	
Equivalent Doses - Lemming - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr10	3.5E-04	9.1E-04	4.7E-03	3.0E-04	5.4E-03	1.2E-02	=Idrat10*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr10	9.6E-04						=Xdrat10	
Total dose rate	mSv/d	tdr10	1.3E-02						=SUM(Hletdr10)+Lletdr10	

Table H.2-2

Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

Equivalent Doses - Lapland Longspur - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr11	2.0E-05	5.0E-04	2.6E-03	2.2E-04	9.6E-03	1.3E-02	=Idrat11*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr11	9.6E-04						=Xdrat11	
Total dose rate	mSv/d	tdr11	1.4E-02						=SUM(Hletdr11)+Lletdr11	
Equivalent Doses - Lapland Longspur - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr12	2.8E-05	5.0E-04	2.6E-03	2.2E-04	9.9E-03	1.3E-02	=Idrat12*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr12	9.6E-04						=Xdrat12	
Total dose rate	mSv/d	tdr12	1.4E-02						=SUM(Hletdr12)+Lletdr12	
Equivalent Doses - Lapland Longspur - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr13	6.7E-05	6.2E-04	3.2E-03	2.4E-04	1.0E-02	1.5E-02	=Idrat13*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr13	9.6E-04						=Xdrat13	
Total dose rate	mSv/d	tdr13	1.6E-02						=SUM(Hletdr13)+Lletdr13	
Equivalent Doses - Lapland Longspur - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr14	4.6E-05	5.0E-04	2.6E-03	2.2E-04	9.8E-03	1.3E-02	=Idrat14*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr14	9.6E-04						=Xdrat14	
Total dose rate	mSv/d	tdr14	1.4E-02						=SUM(Hletdr14)+Lletdr14	
Equivalent Doses - Long-Tailed Duck - Rock Lake										
High LET dose rate	mSv/d	Hletdr15	2.8E-05	1.3E-04	3.6E-03	1.2E-04	1.1E-02	1.5E-02	=Idrat15*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr15	9.6E-04						=Xdrat15	
Total dose rate	mSv/d	tdr15	1.6E-02						=SUM(Hletdr15)+Lletdr15	
Equivalent Doses - Long-Tailed Duck - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr16	4.5E-05	1.3E-04	3.5E-03	1.2E-04	1.1E-02	1.5E-02	=Idrat16*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr16	9.6E-04						=Xdrat16	
Total dose rate	mSv/d	tdr16	1.6E-02						=SUM(Hletdr16)+Lletdr16	
Equivalent Doses - Long-Tailed Duck - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr17	6.7E-05	1.3E-04	3.6E-03	1.2E-04	1.1E-02	1.5E-02	=Idrat17*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr17	9.6E-04						=Xdrat17	
Total dose rate	mSv/d	tdr17	1.6E-02						=SUM(Hletdr17)+Lletdr17	
Equivalent Doses - Merganser - Rock Lake										
High LET dose rate	mSv/d	Hletdr18	3.3E-06	5.4E-05	2.0E-04	3.8E-05	1.6E-03	1.9E-03	=Idrat18*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr18	9.6E-04						=Xdrat18	
Total dose rate	mSv/d	tdr18	2.8E-03						=SUM(Hletdr18)+Lletdr18	
Equivalent Doses - Merganser - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr19	3.3E-06	5.3E-05	1.9E-04	3.7E-05	1.5E-03	1.8E-03	=Idrat19*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr19	9.6E-04						=Xdrat19	
Total dose rate	mSv/d	tdr19	2.8E-03						=SUM(Hletdr19)+Lletdr19	
Equivalent Doses - Merganser - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr20	3.3E-06	5.3E-05	1.9E-04	3.7E-05	1.5E-03	1.8E-03	=Idrat20*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr20	9.6E-04						=Xdrat20	
Total dose rate	mSv/d	tdr20	2.8E-03						=SUM(Hletdr20)+Lletdr20	
Equivalent Doses - Muskox - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr21	4.4E-05	3.3E-05	1.1E-04	1.3E-06	5.1E-03	5.3E-03	=Idrat21*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr21	9.6E-04						=Xdrat21	
Total dose rate	mSv/d	tdr21	6.3E-03						=SUM(Hletdr21)+Lletdr21	
Equivalent Doses - Muskox - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr22	4.6E-05	5.0E-04	2.6E-03	2.2E-04	9.8E-03	1.3E-02	=Idrat22*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr22	9.6E-04						=Xdrat22	
Total dose rate	mSv/d	tdr22	1.4E-02						=SUM(Hletdr22)+Lletdr22	
Equivalent Doses - Northern Pintail - Rock Lake										
High LET dose rate	mSv/d	Hletdr23	1.0E-05	7.5E-04	1.0E-03	3.2E-04	1.3E-02	1.5E-02	=Idrat23*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr23	9.6E-04						=Xdrat23	
Total dose rate	mSv/d	tdr23	1.6E-02						=SUM(Hletdr23)+Lletdr23	
Equivalent Doses - Northern Pintail - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr24	1.5E-05	7.3E-04	1.0E-03	3.1E-04	1.3E-02	1.5E-02	=Idrat24*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr24	9.6E-04						=Xdrat24	
Total dose rate	mSv/d	tdr24	1.6E-02						=SUM(Hletdr24)+Lletdr24	
Equivalent Doses - Northern Pintail - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr25	2.2E-05	7.4E-04	1.0E-03	3.1E-04	1.3E-02	1.5E-02	=Idrat25*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr25	9.6E-04						=Xdrat25	
Total dose rate	mSv/d	tdr25	1.6E-02						=SUM(Hletdr25)+Lletdr25	
Equivalent Doses - Ptarmigan - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr26	1.7E-05	1.5E-04	1.1E-03	8.3E-04	3.5E-02	3.7E-02	=Idrat26*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr26	9.6E-04						=Xdrat26	
Total dose rate	mSv/d	tdr26	3.8E-02						=SUM(Hletdr26)+Lletdr26	
Equivalent Doses - Ptarmigan - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr27	2.0E-05	1.5E-04	1.1E-03	8.3E-04	3.5E-02	3.7E-02	=Idrat27*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr27	9.6E-04						=Xdrat27	
Total dose rate	mSv/d	tdr27	3.8E-02						=SUM(Hletdr27)+Lletdr27	

Table H.2-2

Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

Equivalent Doses - Ptarmigan - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr28	2.6E-05	1.7E-04	1.2E-03	8.4E-04	3.5E-02	3.7E-02	=Idrat28*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr28	9.6E-04						=Xdrat28	
Total dose rate	mSv/d	tdr28	3.8E-02						=SUM(Hletdr28)+Lletdr28	
Equivalent Doses - Ptarmigan - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr29	2.5E-05	1.5E-04	1.1E-03	8.3E-04	3.5E-02	3.7E-02	=Idrat29*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr29	9.6E-04						=Xdrat29	
Total dose rate	mSv/d	tdr29	3.8E-02						=SUM(Hletdr29)+Lletdr29	
Equivalent Doses - Sandpiper - Rock Lake										
High LET dose rate	mSv/d	Hletdr30	6.9E-05	5.0E-04	6.1E-03	3.4E-04	2.6E-02	3.3E-02	=Idrat30*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr30	9.6E-04						=Xdrat30	
Total dose rate	mSv/d	tdr30	3.4E-02						=SUM(Hletdr30)+Lletdr30	
Equivalent Doses - Sandpiper - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr31	1.0E-04	4.9E-04	5.9E-03	3.4E-04	2.5E-02	3.2E-02	=Idrat31*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr31	9.6E-04						=Xdrat31	
Total dose rate	mSv/d	tdr31	3.3E-02						=SUM(Hletdr31)+Lletdr31	
Equivalent Doses - Sandpiper - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr32	1.5E-04	4.9E-04	6.0E-03	3.4E-04	2.5E-02	3.2E-02	=Idrat32*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr32	9.6E-04						=Xdrat32	
Total dose rate	mSv/d	tdr32	3.3E-02						=SUM(Hletdr32)+Lletdr32	
Equivalent Doses - Shrew - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr33	1.4E-04	1.7E-04	2.3E-03	7.0E-05	1.8E-03	4.5E-03	=Idrat33*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr33	9.6E-04						=Xdrat33	
Total dose rate	mSv/d	tdr33	5.4E-03						=SUM(Hletdr33)+Lletdr33	
Equivalent Doses - Shrew - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr34	1.6E-04	1.7E-04	2.4E-03	7.0E-05	1.8E-03	4.6E-03	=Idrat34*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr34	9.6E-04						=Xdrat34	
Total dose rate	mSv/d	tdr34	5.6E-03						=SUM(Hletdr34)+Lletdr34	
Equivalent Doses - Shrew - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr35	1.8E-03	9.7E-04	7.1E-03	1.2E-04	6.5E-03	1.6E-02	=Idrat35*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr35	9.6E-04						=Xdrat35	
Total dose rate	mSv/d	tdr35	1.7E-02						=SUM(Hletdr35)+Lletdr35	
Equivalent Doses - Shrew - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr36	3.2E-04	2.2E-04	2.6E-03	7.3E-05	2.1E-03	5.3E-03	=Idrat36*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr36	2.7E-04						=Xdrat36	
Total dose rate	mSv/d	tdr36	5.5E-03						=SUM(Hletdr36)+Lletdr36	
Equivalent Doses - Squirrel - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr37	4.1E-05	6.6E-04	2.4E-03	1.2E-04	1.7E-03	4.9E-03	=Idrat37*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr37	9.6E-04						=Xdrat37	
Total dose rate	mSv/d	tdr37	5.9E-03						=SUM(Hletdr37)+Lletdr37	
Equivalent Doses - Squirrel - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr38	4.0E-05	6.5E-04	2.4E-03	1.2E-04	1.7E-03	4.9E-03	=Idrat38*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr38	9.6E-04						=Xdrat38	
Total dose rate	mSv/d	tdr38	5.9E-03						=SUM(Hletdr38)+Lletdr38	
Equivalent Doses - Squirrel - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr39	7.9E-05	7.5E-04	2.7E-03	1.2E-04	1.8E-03	5.5E-03	=Idrat39*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr39	9.6E-04						=Xdrat39	
Total dose rate	mSv/d	tdr39	6.4E-03						=SUM(Hletdr39)+Lletdr39	
Equivalent Doses - Squirrel - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr40	4.2E-05	6.6E-04	2.4E-03	1.2E-04	1.7E-03	4.9E-03	=Idrat40*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr40	9.6E-04						=Xdrat40	
Total dose rate	mSv/d	tdr40	5.9E-03						=SUM(Hletdr40)+Lletdr40	
Equivalent Doses - Wolf - LSA										
High LET dose rate	mSv/d	Hletdr41	1.8E-05	6.3E-06	9.7E-06	2.2E-08	1.4E-03	1.4E-03	=Idrat41*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr41	9.6E-04						=Xdrat41	
Total dose rate	mSv/d	tdr41	2.4E-03						=SUM(Hletdr41)+Lletdr41	
Equivalent Doses - Wolf - RSA										
High LET dose rate	mSv/d	Hletdr42	1.8E-05	6.3E-06	9.6E-06	2.2E-08	1.4E-03	1.4E-03	=Idrat42*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr42	9.6E-04						=Xdrat42	
Total dose rate	mSv/d	tdr42	2.4E-03						=SUM(Hletdr42)+Lletdr42	
Equivalent Doses - Wolverine - LSA										
High LET dose rate	mSv/d	Hletdr43	3.1E-05	2.3E-05	9.3E-05	6.4E-07	3.7E-04	5.2E-04	=Idrat43*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr43	9.6E-04						=Xdrat43	
Total dose rate	mSv/d	tdr43	1.5E-03						=SUM(Hletdr43)+Lletdr43	
Equivalent Doses - Wolverine - RSA										
High LET dose rate	mSv/d	Hletdr44	2.6E-05	2.3E-05	8.8E-05	6.4E-07	3.6E-04	5.0E-04	=Idrat44*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr44	9.6E-04						=Xdrat44	
Total dose rate	mSv/d	tdr44	1.5E-03						=SUM(Hletdr44)+Lletdr44	

Table H.2-2
Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

SUMMARY

3 Screening Criterion in mGy/d	Total Absorbed Dose mGy/d	Total Equivalent Dose mSv/d	Index (Absorbed Dose)	Index (Equivalent Dose)
Bear - LSA	1.1E-03	2.4E-03	3.7E-04	7.9E-04
Caribou - LSA	2.8E-03	1.9E-02	9.3E-04	6.4E-03
Caribou - RSA	2.8E-03	1.9E-02	9.2E-04	6.3E-03
Falcon - LSA	2.9E-03	1.3E-02	9.8E-04	4.5E-03
Falcon - RSA	2.9E-03	1.3E-02	9.8E-04	4.5E-03
Fox - LSA	1.1E-03	2.0E-03	3.5E-04	6.5E-04
Lemming - Rock Lake Watershed	2.3E-03	1.1E-02	7.5E-04	3.8E-03
Lemming - JSL @ Kiggavik Discharge	2.2E-03	1.1E-02	7.5E-04	3.7E-03
Lemming - Kiggavik Camp	4.6E-03	3.4E-02	1.5E-03	1.1E-02
Lemming - JSL @ Sissons Discharge	2.4E-03	1.3E-02	8.0E-04	4.2E-03
Lapland Longspur - Rock Lake Watershed	2.4E-03	1.4E-02	8.1E-04	4.6E-03
Lapland Longspur - JSL @ Kiggavik Discharge	2.5E-03	1.4E-02	8.3E-04	4.7E-03
Lapland Longspur - Kiggavik Camp	2.6E-03	1.6E-02	8.8E-04	5.2E-03
Lapland Longspur - JSL @ Sissons Discharge	2.5E-03	1.4E-02	8.2E-04	4.7E-03
Long-Tailed Duck - Rock Lake	2.6E-03	1.6E-02	8.7E-04	5.5E-03
Long-Tailed Duck - JSL @ Kiggavik Discharge	2.6E-03	1.6E-02	8.6E-04	5.3E-03
Long-Tailed Duck - JSL @ Sissons Discharge	2.6E-03	1.6E-02	8.6E-04	5.4E-03
Merganser - Rock Lake	1.2E-03	2.8E-03	3.9E-04	9.4E-04
Merganser - JSL @ Kiggavik Discharge	1.2E-03	2.8E-03	3.9E-04	9.2E-04
Merganser - JSL @ Sissons Discharge	1.2E-03	2.8E-03	3.9E-04	9.2E-04
Muskox - JSL @ Kiggavik Discharge	1.5E-03	6.3E-03	5.0E-04	2.1E-03
Muskox - JSL @ Sissons Discharge	2.5E-03	1.4E-02	8.2E-04	4.7E-03
Northern Pintail - Rock Lake	2.8E-03	1.6E-02	9.2E-04	5.4E-03
Northern Pintail - JSL @ Kiggavik Discharge	2.7E-03	1.6E-02	9.0E-04	5.2E-03
Northern Pintail - JSL @ Sissons Discharge	2.7E-03	1.6E-02	9.1E-04	5.3E-03
Ptarmigan - Rock Lake Watershed	5.4E-03	3.8E-02	1.8E-03	1.3E-02
Ptarmigan - JSL @ Kiggavik Discharge	5.4E-03	3.8E-02	1.8E-03	1.3E-02
Ptarmigan - Kiggavik Camp	5.5E-03	3.8E-02	1.8E-03	1.3E-02
Ptarmigan - JSL @ Sissons Discharge	5.4E-03	3.8E-02	1.8E-03	1.3E-02
Sandpiper - Rock Lake	4.5E-03	3.4E-02	1.5E-03	1.1E-02
Sandpiper - JSL @ Kiggavik Discharge	4.5E-03	3.3E-02	1.5E-03	1.1E-02
Sandpiper - JSL @ Sissons Discharge	4.5E-03	3.3E-02	1.5E-03	1.1E-02
Shrew - Rock Lake Watershed	1.5E-03	5.4E-03	4.9E-04	1.8E-03
Shrew - JSL @ Kiggavik Discharge	1.5E-03	5.6E-03	5.0E-04	1.9E-03
Shrew - Kiggavik Camp	2.7E-03	1.7E-02	9.0E-04	5.8E-03
Shrew - JSL @ Sissons Discharge	8.6E-04	5.5E-03	2.9E-04	1.8E-03
Squirrel - Rock Lake Watershed	1.6E-03	5.9E-03	5.2E-04	2.0E-03
Squirrel - JSL @ Kiggavik Discharge	1.6E-03	5.9E-03	5.2E-04	2.0E-03
Squirrel - Kiggavik Camp	1.6E-03	6.4E-03	5.4E-04	2.1E-03
Squirrel - JSL @ Sissons Discharge	1.6E-03	5.9E-03	5.2E-04	2.0E-03
Wolf - LSA	1.1E-03	2.4E-03	3.7E-04	8.0E-04
Wolf - RSA	1.1E-03	2.4E-03	3.7E-04	8.0E-04
Wolverine - LSA	1.0E-03	1.5E-03	3.4E-04	4.9E-04
Wolverine - RSA	1.0E-03	1.5E-03	3.4E-04	4.9E-04

U-238+ Internal U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235
Ra-226+ Internal Ra-226 + 0.3* (Rn-222 + ...Po-214)
Pb-210+ Internal Pb-210 + Bi-210

Table H.2-2

Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

2023

DOSES TO SELECTED VECs - 95th Percentile Total Dose

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Absorbed Doses - Bear - LSA									
Concentration	Bq/g	Crad	5.86E-05	1.53E-04	7.24E-05	1.74E-04	6.46E-03		
Internal Dose Factor	mGy/d per Bq/g	ldcf	1.4E-01	6.6E-02	1.6E-01	6.0E-03	7.4E-02	5.1E-04	=Crad*ldcf
Internal dose rate	mGy/d	ldrat	8.3E-06	1.0E-05	1.2E-05	1.0E-06	4.8E-04		
External Gamma rate	uGy/h	Xgrat	0.04						
Fraction of time on site	-	fts	1.00						
External dose rate	mGy/d	Xdrat	9.6E-04						=Xgrat*24*fts/1000
Internal plus external	mGy/d	tdrat	1.5E-03						=SUM(ldrat)+Xdrat
Absorbed Doses - Caribou - LSA									
Concentration	Bq/g	Crad2	2.17E-04	1.43E-04	3.21E-04	2.53E-03	7.70E-02		
Internal dose rate	mGy/d	ldrat2	3.1E-05	9.4E-06	5.1E-05	1.5E-05	5.7E-03	5.8E-03	=Crad2*ldcf
Fraction of time on site	-	fts2	1.00						
External dose rate	mGy/d	Xdrat2	9.6E-04						=Xgrat*24*fts2/1000
Internal plus external	mGy/d	tdrat2	6.8E-03						=SUM(ldrat2)+Xdrat2
Absorbed Doses - Caribou - RSA									
Concentration	Bq/g	Crad3	1.43E-04	1.35E-04	3.10E-04	2.53E-03	7.68E-02		
Internal dose rate	mGy/d	ldrat3	2.0E-05	8.9E-06	4.9E-05	1.5E-05	5.7E-03	5.8E-03	=Crad3*ldcf
Fraction of time on site	-	fts3	1.00						
External dose rate	mGy/d	Xdrat3	9.6E-04						=Xgrat*24*fts3/1000
Internal plus external	mGy/d	tdrat3	6.7E-03						=SUM(ldrat3)+Xdrat3
Absorbed Doses - Falcon - LSA									
Concentration	Bq/g	Crad4	1.31E-05	3.60E-04	1.40E-03	4.43E-01	5.03E-02		
Internal dose rate	mGy/d	ldrat4	1.9E-06	2.4E-05	2.2E-04	2.7E-03	3.7E-03	6.6E-03	=Crad4*ldcf
Fraction of time on site	-	fts4	1.00						
External dose rate	mGy/d	Xdrat4	9.6E-04						=Xgrat*24*fts4/1000
Internal plus external	mGy/d	tdrat4	7.6E-03						=SUM(ldrat4)+Xdrat4
Absorbed Doses - Falcon - RSA									
Concentration	Bq/g	Crad5	1.15E-05	3.57E-04	1.39E-03	4.41E-01	5.02E-02		
Internal dose rate	mGy/d	ldrat5	1.6E-06	2.3E-05	2.2E-04	2.7E-03	3.7E-03	6.6E-03	=Crad5*ldcf
Fraction of time on site	-	fts5	1.00						
External dose rate	mGy/d	Xdrat5	9.6E-04						=Xgrat*24*fts5/1000
Internal plus external	mGy/d	tdrat5	7.6E-03						=SUM(ldrat5)+Xdrat5
Absorbed Doses - Fox - LSA									
Concentration	Bq/g	Crad6	6.08E-05	1.01E-04	1.40E-04	5.33E-04	3.76E-03		
Internal dose rate	mGy/d	ldrat6	8.6E-06	6.6E-06	2.2E-05	3.2E-06	2.8E-04	3.2E-04	=Crad6*ldcf
Fraction of time on site	-	fts6	1.00						
External dose rate	mGy/d	Xdrat6	9.6E-04						=Xgrat*24*fts6/1000
Internal plus external	mGy/d	tdrat6	1.3E-03						=SUM(ldrat6)+Xdrat6
Absorbed Doses - Lemming - Rock Lake Watershed									
Concentration	Bq/g	Crad7	4.49E-04	3.99E-03	6.83E-03	1.75E-01	2.37E-02		
Internal dose rate	mGy/d	ldrat7	6.4E-05	2.6E-04	1.1E-03	1.1E-03	1.8E-03	4.2E-03	=Crad7*ldcf
Fraction of time on site	-	fts7	1.00						
External dose rate	mGy/d	Xdrat7	9.6E-04						=Xgrat*24*fts7/1000
Internal plus external	mGy/d	tdrat7	5.2E-03						=SUM(ldrat7)+Xdrat7
Absorbed Doses - Lemming - JSL @ Kiggavik Discharge									
Concentration	Bq/g	Crad8	3.96E-04	3.88E-03	6.70E-03	1.74E-01	2.32E-02		
Internal dose rate	mGy/d	ldrat8	5.6E-05	2.6E-04	1.1E-03	1.0E-03	1.7E-03	4.1E-03	=Crad8*ldcf
Fraction of time on site	-	fts8	1.00						
External dose rate	mGy/d	Xdrat8	9.6E-04						=Xgrat*24*fts8/1000
Internal plus external	mGy/d	tdrat8	5.1E-03						=SUM(ldrat8)+Xdrat8
Absorbed Doses - Lemming - Kiggavik Camp									
Concentration	Bq/g	Crad9	6.85E-03	1.54E-02	3.19E-02	2.79E-01	6.09E-02		
Internal dose rate	mGy/d	ldrat9	9.7E-04	1.0E-03	5.1E-03	1.7E-03	4.5E-03	1.3E-02	=Crad9*ldcf
Fraction of time on site	-	fts9	1.00						
External dose rate	mGy/d	Xdrat9	9.6E-04						=Xgrat*24*fts9/1000
Internal plus external	mGy/d	tdrat9	1.4E-02						=SUM(ldrat9)+Xdrat9
Absorbed Doses - Lemming - JSL @ Sissons Discharge									
Concentration	Bq/g	Crad10	7.64E-04	4.47E-03	7.73E-03	1.80E-01	2.64E-02		
Internal dose rate	mGy/d	ldrat10	1.1E-04	2.9E-04	1.2E-03	1.1E-03	2.0E-03	4.7E-03	=Crad10*ldcf
Fraction of time on site	-	fts10	1.00						
External dose rate	mGy/d	Xdrat10	9.6E-04						=Xgrat*24*fts10/1000
Internal plus external	mGy/d	tdrat10	5.6E-03						=SUM(ldrat10)+Xdrat10
Absorbed Doses - Lapland Longspur - Rock Lake Watershed									
Concentration	Bq/g	Crad11	4.55E-05	3.38E-03	5.35E-03	1.36E-01	3.64E-02		
Internal dose rate	mGy/d	ldrat11	6.5E-06	2.2E-04	8.5E-04	8.2E-04	2.7E-03	4.6E-03	=Crad11*ldcf
Fraction of time on site	-	fts11	1.00						
External dose rate	mGy/d	Xdrat11	9.6E-04						=Xgrat*24*fts11/1000
Internal plus external	mGy/d	tdrat11	5.6E-03						=SUM(ldrat11)+Xdrat11

Table H.2-2

Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

Absorbed Doses - Lapland Longspur - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad12	6.59E-05	3.38E-03	5.51E-03	1.37E-01	3.75E-02			
Internal dose rate	mGy/d	ldrat12	9.4E-06	2.2E-04	8.8E-04	8.3E-04	2.8E-03	4.7E-03	=Crad12*ldcf	
Fraction of time on site	-	fts12	1.00							
External dose rate	mGy/d	Xdrat12	9.6E-04						=Xgrat*24*fts12/1000	
Internal plus external	mGy/d	tdrat12	5.7E-03						=SUM(ldrat12)+Xdrat12	
Absorbed Doses - Lapland Longspur - Kiggavik Camp										
Concentration	Bq/g	Crad13	1.41E-04	3.79E-03	7.11E-03	1.61E-01	3.86E-02			
Internal dose rate	mGy/d	ldrat13	2.0E-05	2.5E-04	1.1E-03	9.7E-04	2.9E-03	5.2E-03	=Crad13*ldcf	
Fraction of time on site	-	fts13	1.00							
External dose rate	mGy/d	Xdrat13	9.6E-04						=Xgrat*24*fts13/1000	
Internal plus external	mGy/d	tdrat13	6.2E-03						=SUM(ldrat13)+Xdrat13	
Absorbed Doses - Lapland Longspur - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad14	1.08E-04	3.39E-03	5.61E-03	1.37E-01	3.66E-02			
Internal dose rate	mGy/d	ldrat14	1.5E-05	2.2E-04	8.9E-04	8.3E-04	2.7E-03	4.7E-03	=Crad14*ldcf	
Fraction of time on site	-	fts14	1.00							
External dose rate	mGy/d	Xdrat14	9.6E-04						=Xgrat*24*fts14/1000	
Internal plus external	mGy/d	tdrat14	5.6E-03						=SUM(ldrat14)+Xdrat14	
Absorbed Doses - Long-Tailed Duck - Rock Lake										
Concentration	Bq/g	Crad15	5.55E-05	6.03E-04	9.25E-03	6.39E-02	5.78E-02			
Internal dose rate	mGy/d	ldrat15	7.9E-06	4.0E-05	1.5E-03	3.9E-04	4.3E-03	6.2E-03	=Crad15*ldcf	
Fraction of time on site	-	fts15	1.00							
External dose rate	mGy/d	Xdrat15	9.6E-04						=Xgrat*24*fts15/1000	
Internal plus external	mGy/d	tdrat15	7.1E-03						=SUM(ldrat15)+Xdrat15	
Absorbed Doses - Long-Tailed Duck - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad16	1.05E-04	5.88E-04	8.96E-03	6.24E-02	5.61E-02			
Internal dose rate	mGy/d	ldrat16	1.5E-05	3.9E-05	1.4E-03	3.8E-04	4.2E-03	6.0E-03	=Crad16*ldcf	
Fraction of time on site	-	fts16	1.00							
External dose rate	mGy/d	Xdrat16	9.6E-04						=Xgrat*24*fts16/1000	
Internal plus external	mGy/d	tdrat16	7.0E-03						=SUM(ldrat16)+Xdrat16	
Absorbed Doses - Long-Tailed Duck - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad17	1.80E-04	5.95E-04	9.11E-03	6.35E-02	5.62E-02			
Internal dose rate	mGy/d	ldrat17	2.6E-05	3.9E-05	1.4E-03	3.8E-04	4.2E-03	6.1E-03	=Crad17*ldcf	
Fraction of time on site	-	fts17	1.00							
External dose rate	mGy/d	Xdrat17	9.6E-04						=Xgrat*24*fts17/1000	
Internal plus external	mGy/d	tdrat17	7.0E-03						=SUM(ldrat17)+Xdrat17	
Absorbed Doses - Merganser - Rock Lake										
Concentration	Bq/g	Crad18	7.69E-06	3.15E-04	3.98E-04	1.98E-02	7.05E-03			
Internal dose rate	mGy/d	ldrat18	1.1E-06	2.1E-05	6.3E-05	1.2E-04	5.2E-04	7.3E-04	=Crad18*ldcf	
Fraction of time on site	-	fts18	1.00							
External dose rate	mGy/d	Xdrat18	9.6E-04						=Xgrat*24*fts18/1000	
Internal plus external	mGy/d	tdrat18	1.7E-03						=SUM(ldrat18)+Xdrat18	
Absorbed Doses - Merganser - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad19	7.79E-06	3.09E-04	3.71E-04	1.98E-02	6.68E-03			
Internal dose rate	mGy/d	ldrat19	1.1E-06	2.0E-05	5.9E-05	1.2E-04	4.9E-04	6.9E-04	=Crad19*ldcf	
Fraction of time on site	-	fts19	1.00							
External dose rate	mGy/d	Xdrat19	9.6E-04						=Xgrat*24*fts19/1000	
Internal plus external	mGy/d	tdrat19	1.7E-03						=SUM(ldrat19)+Xdrat19	
Absorbed Doses - Merganser - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad20	7.95E-06	3.12E-04	3.74E-04	1.98E-02	6.73E-03			
Internal dose rate	mGy/d	ldrat20	1.1E-06	2.1E-05	5.9E-05	1.2E-04	5.0E-04	7.0E-04	=Crad20*ldcf	
Fraction of time on site	-	fts20	1.00							
External dose rate	mGy/d	Xdrat20	9.6E-04						=Xgrat*24*fts20/1000	
Internal plus external	mGy/d	tdrat20	1.7E-03						=SUM(ldrat20)+Xdrat20	
Absorbed Doses - Muskox - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad21	1.18E-04	1.86E-04	2.87E-04	6.76E-04	2.04E-02			
Internal dose rate	mGy/d	ldrat21	1.7E-05	1.2E-05	4.6E-05	4.1E-06	1.5E-03	1.6E-03	=Crad21*ldcf	
Fraction of time on site	-	fts21	1.00							
External dose rate	mGy/d	Xdrat21	9.6E-04						=Xgrat*24*fts21/1000	
Internal plus external	mGy/d	tdrat21	2.6E-03						=SUM(ldrat21)+Xdrat21	
Absorbed Doses - Muskox - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad22	1.08E-04	3.39E-03	5.61E-03	1.37E-01	3.66E-02			
Internal dose rate	mGy/d	ldrat22	1.5E-05	2.2E-04	8.9E-04	8.3E-04	2.7E-03	4.7E-03	=Crad22*ldcf	
Fraction of time on site	-	fts22	1.00							
External dose rate	mGy/d	Xdrat22	9.6E-04						=Xgrat*24*fts22/1000	
Internal plus external	mGy/d	tdrat22	5.6E-03						=SUM(ldrat22)+Xdrat22	
Absorbed Doses - Northern Pintail - Rock Lake										
Concentration	Bq/g	Crad23	2.34E-05	4.59E-03	2.26E-03	1.68E-01	6.11E-02			
Internal dose rate	mGy/d	ldrat23	3.3E-06	3.0E-04	3.6E-04	1.0E-03	4.5E-03	6.2E-03	=Crad23*ldcf	
Fraction of time on site	-	fts23	1.00							
External dose rate	mGy/d	Xdrat23	9.6E-04						=Xgrat*24*fts23/1000	
Internal plus external	mGy/d	tdrat23	7.2E-03						=SUM(ldrat23)+Xdrat23	

Table H.2-2

Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

Absorbed Doses - Northern Pintail - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad24	3.49E-05	4.46E-03	2.18E-03	1.63E-01	5.87E-02			
Internal dose rate	mGy/d	ldrat24	5.0E-06	2.9E-04	3.5E-04	9.8E-04	4.3E-03	6.0E-03	=Crad24*ldcf	
Fraction of time on site	-	fts24	1.00							
External dose rate	mGy/d	Xdrat24	9.6E-04						=Xgrat*24*fts24/1000	
Internal plus external	mGy/d	tdrat24	6.9E-03						=SUM(ldrat24)+Xdrat24	
Absorbed Doses - Northern Pintail - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad25	5.40E-05	4.51E-03	2.22E-03	1.66E-01	5.90E-02			
Internal dose rate	mGy/d	ldrat25	7.7E-06	3.0E-04	3.5E-04	1.0E-03	4.4E-03	6.0E-03	=Crad25*ldcf	
Fraction of time on site	-	fts25	1.00							
External dose rate	mGy/d	Xdrat25	9.6E-04						=Xgrat*24*fts25/1000	
Internal plus external	mGy/d	tdrat25	7.0E-03						=SUM(ldrat25)+Xdrat25	
Absorbed Doses - Ptarmigan - Rock Lake Watershed										
Concentration	Bq/g	Crad26	4.30E-05	9.05E-04	2.19E-03	3.88E-01	1.43E-01			
Internal dose rate	mGy/d	ldrat26	6.1E-06	6.0E-05	3.5E-04	2.3E-03	1.1E-02	1.3E-02	=Crad26*ldcf	
Fraction of time on site	-	fts26	1.00							
External dose rate	mGy/d	Xdrat26	9.6E-04						=Xgrat*24*fts26/1000	
Internal plus external	mGy/d	tdrat26	1.4E-02						=SUM(ldrat26)+Xdrat26	
Absorbed Doses - Ptarmigan - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad27	4.92E-05	9.06E-04	2.22E-03	3.89E-01	1.43E-01			
Internal dose rate	mGy/d	ldrat27	7.0E-06	6.0E-05	3.5E-04	2.3E-03	1.1E-02	1.3E-02	=Crad27*ldcf	
Fraction of time on site	-	fts27	1.00							
External dose rate	mGy/d	Xdrat27	9.6E-04						=Xgrat*24*fts27/1000	
Internal plus external	mGy/d	tdrat27	1.4E-02						=SUM(ldrat27)+Xdrat27	
Absorbed Doses - Ptarmigan - Kiggavik Camp										
Concentration	Bq/g	Crad28	6.42E-05	1.02E-03	2.39E-03	3.90E-01	1.44E-01			
Internal dose rate	mGy/d	ldrat28	9.1E-06	6.7E-05	3.8E-04	2.4E-03	1.1E-02	1.3E-02	=Crad28*ldcf	
Fraction of time on site	-	fts28	1.00							
External dose rate	mGy/d	Xdrat28	9.6E-04						=Xgrat*24*fts28/1000	
Internal plus external	mGy/d	tdrat28	1.4E-02						=SUM(ldrat28)+Xdrat28	
Absorbed Doses - Ptarmigan - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad29	6.35E-05	9.08E-04	2.21E-03	3.89E-01	1.43E-01			
Internal dose rate	mGy/d	ldrat29	9.0E-06	6.0E-05	3.5E-04	2.3E-03	1.1E-02	1.3E-02	=Crad29*ldcf	
Fraction of time on site	-	fts29	1.00							
External dose rate	mGy/d	Xdrat29	9.6E-04						=Xgrat*24*fts29/1000	
Internal plus external	mGy/d	tdrat29	1.4E-02						=SUM(ldrat29)+Xdrat29	
Absorbed Doses - Sandpiper - Rock Lake										
Concentration	Bq/g	Crad30	1.96E-04	2.14E-03	1.53E-02	1.83E-01	1.19E-01			
Internal dose rate	mGy/d	ldrat30	2.8E-05	1.4E-04	2.4E-03	1.1E-03	8.8E-03	1.3E-02	=Crad30*ldcf	
Fraction of time on site	-	fts30	1.00							
External dose rate	mGy/d	Xdrat30	9.6E-04						=Xgrat*24*fts30/1000	
Internal plus external	mGy/d	tdrat30	1.3E-02						=SUM(ldrat30)+Xdrat30	
Absorbed Doses - Sandpiper - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad31	2.92E-04	2.11E-03	1.48E-02	1.79E-01	1.17E-01			
Internal dose rate	mGy/d	ldrat31	4.1E-05	1.4E-04	2.3E-03	1.1E-03	8.6E-03	1.2E-02	=Crad31*ldcf	
Fraction of time on site	-	fts31	1.00							
External dose rate	mGy/d	Xdrat31	9.6E-04						=Xgrat*24*fts31/1000	
Internal plus external	mGy/d	tdrat31	1.3E-02						=SUM(ldrat31)+Xdrat31	
Absorbed Doses - Sandpiper - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad32	4.14E-04	2.11E-03	1.48E-02	1.79E-01	1.19E-01			
Internal dose rate	mGy/d	ldrat32	5.9E-05	1.4E-04	2.4E-03	1.1E-03	8.8E-03	1.2E-02	=Crad32*ldcf	
Fraction of time on site	-	fts32	1.00							
External dose rate	mGy/d	Xdrat32	9.6E-04						=Xgrat*24*fts32/1000	
Internal plus external	mGy/d	tdrat32	1.3E-02						=SUM(ldrat32)+Xdrat32	
Absorbed Doses - Shrew - Rock Lake Watershed										
Concentration	Bq/g	Crad33	3.38E-04	8.11E-04	4.38E-03	3.80E-02	6.81E-03			
Internal dose rate	mGy/d	ldrat33	4.8E-05	5.3E-05	7.0E-04	2.3E-04	5.0E-04	1.5E-03	=Crad33*ldcf	
Fraction of time on site	-	fts33	1.00							
External dose rate	mGy/d	Xdrat33	9.6E-04						=Xgrat*24*fts33/1000	
Internal plus external	mGy/d	tdrat33	2.5E-03						=SUM(ldrat33)+Xdrat33	
Absorbed Doses - Shrew - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad34	3.59E-04	8.26E-04	4.64E-03	3.82E-02	6.87E-03			
Internal dose rate	mGy/d	ldrat34	5.1E-05	5.4E-05	7.4E-04	2.3E-04	5.1E-04	1.6E-03	=Crad34*ldcf	
Fraction of time on site	-	fts34	1.00							
External dose rate	mGy/d	Xdrat34	9.6E-04						=Xgrat*24*fts34/1000	
Internal plus external	mGy/d	tdrat34	2.5E-03						=SUM(ldrat34)+Xdrat34	
Absorbed Doses - Shrew - Kiggavik Camp										
Concentration	Bq/g	Crad35	4.58E-03	5.90E-03	1.78E-02	6.87E-02	2.64E-02			
Internal dose rate	mGy/d	ldrat35	6.5E-04	3.9E-04	2.8E-03	4.1E-04	2.0E-03	6.2E-03	=Crad35*ldcf	
Fraction of time on site	-	fts35	1.00							
External dose rate	mGy/d	Xdrat35	9.6E-04						=Xgrat*24*fts35/1000	
Internal plus external	mGy/d	tdrat35	7.2E-03						=SUM(ldrat35)+Xdrat35	
Absorbed Doses - Shrew - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad36	7.03E-04	1.19E-03	5.13E-03	3.97E-02	8.00E-03			
Internal dose rate	mGy/d	ldrat36	1.0E-04	7.8E-05	8.2E-04	2.4E-04	5.9E-04	1.8E-03	=Crad36*ldcf	
Fraction of time on site	-	fts36	1.00							

Table H.2-2

Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

External dose rate	mGy/d	Xdrat36	2.7E-04							=Xgrat*24*fts36/3600
Internal plus external	mGy/d	tdrat36	2.1E-03							=SUM(ldrat36)+Xdrat36
Absorbed Doses - Squirrel - Rock Lake Watershed										
Concentration	Bq/g	Crad37	9.06E-05	3.42E-03	6.41E-03	8.31E-02	1.01E-02			
Internal dose rate	mGy/d	ldrat37	1.3E-05	2.3E-04	1.0E-03	5.0E-04	7.5E-04	2.5E-03		=Crad37*ldcf
Fraction of time on site	-	fts37	1.00							
External dose rate	mGy/d	Xdrat37	9.6E-04							=Xgrat*24*fts37/1000
Internal plus external	mGy/d	tdrat37	3.5E-03							=SUM(ldrat37)+Xdrat37
Absorbed Doses - Squirrel - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad38	9.03E-05	3.42E-03	6.41E-03	8.31E-02	1.01E-02			
Internal dose rate	mGy/d	ldrat38	1.3E-05	2.3E-04	1.0E-03	5.0E-04	7.5E-04	2.5E-03		=Crad38*ldcf
Fraction of time on site	-	fts38	1.00							
External dose rate	mGy/d	Xdrat38	9.6E-04							=Xgrat*24*fts38/1000
Internal plus external	mGy/d	tdrat38	3.5E-03							=SUM(ldrat38)+Xdrat38
Absorbed Doses - Squirrel - Kiggavik Camp										
Concentration	Bq/g	Crad39	1.71E-04	3.45E-03	6.61E-03	8.33E-02	1.01E-02			
Internal dose rate	mGy/d	ldrat39	2.4E-05	2.3E-04	1.1E-03	5.0E-04	7.5E-04	2.6E-03		=Crad39*ldcf
Fraction of time on site	-	fts39	1.00							
External dose rate	mGy/d	Xdrat39	9.6E-04							=Xgrat*24*fts39/1000
Internal plus external	mGy/d	tdrat39	3.5E-03							=SUM(ldrat39)+Xdrat39

Table H.2-2

Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

Absorbed Doses - Squirrel - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad40	9.27E-05	3.42E-03	6.42E-03	8.31E-02	1.01E-02			
Internal dose rate	mGy/d	Idrat40	1.3E-05	2.3E-04	1.0E-03	5.0E-04	7.5E-04	2.5E-03	=Crad40*Idcf	
Fraction of time on site	-	fts40	1.00							
External dose rate	mGy/d	Xdrat40	9.6E-04						=Xgrat*24*fts40/1000	
Internal plus external	mGy/d	tdrat40	3.5E-03						=SUM(Idrat40)+Xdrat40	
Absorbed Doses - Wolf - LSA										
Concentration	Bq/g	Crad41	4.47E-05	2.94E-05	2.20E-05	1.44E-05	7.66E-03			
Internal dose rate	mGy/d	Idrat41	6.3E-06	1.9E-06	3.5E-06	8.7E-08	5.7E-04	5.8E-04	=Crad41*Idcf	
Fraction of time on site	-	fts41	1.00							
External dose rate	mGy/d	Xdrat41	9.6E-04						=Xgrat*24*fts41/1000	
Internal plus external	mGy/d	tdrat41	1.5E-03						=SUM(Idrat41)+Xdrat41	
Absorbed Doses - Wolf - RSA										
Concentration	Bq/g	Crad42	4.48E-05	2.94E-05	2.20E-05	1.44E-05	7.68E-03			
Internal dose rate	mGy/d	Idrat42	6.4E-06	1.9E-06	3.5E-06	8.7E-08	5.7E-04	5.8E-04	=Crad42*Idcf	
Fraction of time on site	-	fts42	1.00							
External dose rate	mGy/d	Xdrat42	9.6E-04						=Xgrat*24*fts42/1000	
Internal plus external	mGy/d	tdrat42	1.5E-03						=SUM(Idrat42)+Xdrat42	
Absorbed Doses - Wolverine - LSA										
Concentration	Bq/g	Crad43	7.28E-05	1.17E-04	2.17E-04	4.90E-04	1.83E-03			
Internal dose rate	mGy/d	Idrat43	1.0E-05	7.7E-06	3.5E-05	3.0E-06	1.4E-04	1.9E-04	=Crad43*Idcf	
Fraction of time on site	-	fts43	1.00							
External dose rate	mGy/d	Xdrat43	9.6E-04						=Xgrat*24*fts43/1000	
Internal plus external	mGy/d	tdrat43	1.2E-03						=SUM(Idrat43)+Xdrat43	
Absorbed Doses - Wolverine - RSA										
Concentration	Bq/g	Crad44	6.64E-05	1.16E-04	2.15E-04	4.78E-04	1.81E-03			
Internal dose rate	mGy/d	Idrat44	9.4E-06	7.6E-06	3.4E-05	2.9E-06	1.3E-04	1.9E-04	=Crad44*Idcf	
Fraction of time on site	-	fts44	1.00							
External dose rate	mGy/d	Xdrat44	9.6E-04						=Xgrat*24*fts44/1000	
Internal plus external	mGy/d	tdrat44	1.1E-03						=SUM(Idrat44)+Xdrat44	
Equivalent Doses - Bear - LSA										
RBE for alpha	Sv/Gy	RBE	10							
High LET dose rate	mSv/d	Hletdr	8.3E-05	1.0E-04	1.2E-04	1.0E-06	4.8E-03	5.1E-03	=Idrat*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr	9.6E-04						=Xdrat	
Total dose rate	mSv/d	tdr	6.0E-03						=SUM(Hletdr)+Lletdr	
Equivalent Doses - Caribou - LSA										
High LET dose rate	mSv/d	Hletdr2	3.1E-04	9.4E-05	5.1E-04	1.5E-05	5.7E-02	5.8E-02	=Idrat2*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr2	9.6E-04						=Xdrat2	
Total dose rate	mSv/d	tdr2	5.9E-02						=SUM(Hletdr2)+Lletdr2	
Equivalent Doses - Caribou - RSA										
High LET dose rate	mSv/d	Hletdr3	2.0E-04	8.9E-05	4.9E-04	1.5E-05	5.7E-02	5.8E-02	=Idrat3*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr3	9.6E-04						=Xdrat3	
Total dose rate	mSv/d	tdr3	5.9E-02						=SUM(Hletdr3)+Lletdr3	
Equivalent Doses - Falcon - LSA										
High LET dose rate	mSv/d	Hletdr4	1.9E-05	2.4E-04	2.2E-03	2.7E-03	3.7E-02	4.2E-02	=Idrat4*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr4	9.6E-04						=Xdrat4	
Total dose rate	mSv/d	tdr4	4.3E-02						=SUM(Hletdr4)+Lletdr4	
Equivalent Doses - Falcon - RSA										
High LET dose rate	mSv/d	Hletdr5	1.6E-05	2.3E-04	2.2E-03	2.7E-03	3.7E-02	4.2E-02	=Idrat5*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr5	9.6E-04						=Xdrat5	
Total dose rate	mSv/d	tdr5	4.3E-02						=SUM(Hletdr5)+Lletdr5	
Equivalent Doses - Fox - LSA										
High LET dose rate	mSv/d	Hletdr6	8.6E-05	6.6E-05	2.2E-04	3.2E-06	2.8E-03	3.2E-03	=Idrat6*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr6	9.6E-04						=Xdrat6	
Total dose rate	mSv/d	tdr6	4.1E-03						=SUM(Hletdr6)+Lletdr6	
Equivalent Doses - Lemming - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr7	6.4E-04	2.6E-03	1.1E-02	1.1E-03	1.8E-02	3.3E-02	=Idrat7*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr7	9.6E-04						=Xdrat7	
Total dose rate	mSv/d	tdr7	3.4E-02						=SUM(Hletdr7)+Lletdr7	
Equivalent Doses - Lemming - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr8	5.6E-04	2.6E-03	1.1E-02	1.0E-03	1.7E-02	3.2E-02	=Idrat8*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr8	9.6E-04						=Xdrat8	
Total dose rate	mSv/d	tdr8	3.3E-02						=SUM(Hletdr8)+Lletdr8	
Equivalent Doses - Lemming - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr9	9.7E-03	1.0E-02	5.1E-02	1.7E-03	4.5E-02	1.2E-01	=Idrat9*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr9	9.6E-04						=Xdrat9	
Total dose rate	mSv/d	tdr9	1.2E-01						=SUM(Hletdr9)+Lletdr9	
Equivalent Doses - Lemming - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr10	1.1E-03	2.9E-03	1.2E-02	1.1E-03	2.0E-02	3.7E-02	=Idrat10*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr10	9.6E-04						=Xdrat10	
Total dose rate	mSv/d	tdr10	3.8E-02						=SUM(Hletdr10)+Lletdr10	

Table H.2-2

Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

Equivalent Doses - Lapland Longspur - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr11	6.5E-05	2.2E-03	8.5E-03	8.2E-04	2.7E-02	3.9E-02	=ldrat11*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr11	9.6E-04						=Xdrat11	
Total dose rate	mSv/d	tdr11	4.0E-02						=SUM(Hletdr11)+Lletdr11	
Equivalent Doses - Lapland Longspur - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr12	9.4E-05	2.2E-03	8.8E-03	8.3E-04	2.8E-02	4.0E-02	=ldrat12*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr12	9.6E-04						=Xdrat12	
Total dose rate	mSv/d	tdr12	4.1E-02						=SUM(Hletdr12)+Lletdr12	
Equivalent Doses - Lapland Longspur - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr13	2.0E-04	2.5E-03	1.1E-02	9.7E-04	2.9E-02	4.4E-02	=ldrat13*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr13	9.6E-04						=Xdrat13	
Total dose rate	mSv/d	tdr13	4.4E-02						=SUM(Hletdr13)+Lletdr13	
Equivalent Doses - Lapland Longspur - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr14	1.5E-04	2.2E-03	8.9E-03	8.3E-04	2.7E-02	3.9E-02	=ldrat14*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr14	9.6E-04						=Xdrat14	
Total dose rate	mSv/d	tdr14	4.0E-02						=SUM(Hletdr14)+Lletdr14	
Equivalent Doses - Long-Tailed Duck - Rock Lake										
High LET dose rate	mSv/d	Hletdr15	7.9E-05	4.0E-04	1.5E-02	3.9E-04	4.3E-02	5.8E-02	=ldrat15*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr15	9.6E-04						=Xdrat15	
Total dose rate	mSv/d	tdr15	5.9E-02						=SUM(Hletdr15)+Lletdr15	
Equivalent Doses - Long-Tailed Duck - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr16	1.5E-04	3.9E-04	1.4E-02	3.8E-04	4.2E-02	5.7E-02	=ldrat16*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr16	9.6E-04						=Xdrat16	
Total dose rate	mSv/d	tdr16	5.8E-02						=SUM(Hletdr16)+Lletdr16	
Equivalent Doses - Long-Tailed Duck - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr17	2.6E-04	3.9E-04	1.4E-02	3.8E-04	4.2E-02	5.7E-02	=ldrat17*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr17	9.6E-04						=Xdrat17	
Total dose rate	mSv/d	tdr17	5.8E-02						=SUM(Hletdr17)+Lletdr17	
Equivalent Doses - Merganser - Rock Lake										
High LET dose rate	mSv/d	Hletdr18	1.1E-05	2.1E-04	6.3E-04	1.2E-04	5.2E-03	6.2E-03	=ldrat18*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr18	9.6E-04						=Xdrat18	
Total dose rate	mSv/d	tdr18	7.2E-03						=SUM(Hletdr18)+Lletdr18	
Equivalent Doses - Merganser - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr19	1.1E-05	2.0E-04	5.9E-04	1.2E-04	4.9E-03	5.9E-03	=ldrat19*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr19	9.6E-04						=Xdrat19	
Total dose rate	mSv/d	tdr19	6.8E-03						=SUM(Hletdr19)+Lletdr19	
Equivalent Doses - Merganser - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr20	1.1E-05	2.1E-04	5.9E-04	1.2E-04	5.0E-03	5.9E-03	=ldrat20*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr20	9.6E-04						=Xdrat20	
Total dose rate	mSv/d	tdr20	6.9E-03						=SUM(Hletdr20)+Lletdr20	
Equivalent Doses - Muskox - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr21	1.7E-04	1.2E-04	4.6E-04	4.1E-06	1.5E-02	1.6E-02	=ldrat21*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr21	9.6E-04						=Xdrat21	
Total dose rate	mSv/d	tdr21	1.7E-02						=SUM(Hletdr21)+Lletdr21	
Equivalent Doses - Muskox - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr22	1.5E-04	2.2E-03	8.9E-03	8.3E-04	2.7E-02	3.9E-02	=ldrat22*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr22	9.6E-04						=Xdrat22	
Total dose rate	mSv/d	tdr22	4.0E-02						=SUM(Hletdr22)+Lletdr22	
Equivalent Doses - Northern Pintail - Rock Lake										
High LET dose rate	mSv/d	Hletdr23	3.3E-05	3.0E-03	3.6E-03	1.0E-03	4.5E-02	5.3E-02	=ldrat23*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr23	9.6E-04						=Xdrat23	
Total dose rate	mSv/d	tdr23	5.4E-02						=SUM(Hletdr23)+Lletdr23	
Equivalent Doses - Northern Pintail - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr24	5.0E-05	2.9E-03	3.5E-03	9.8E-04	4.3E-02	5.1E-02	=ldrat24*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr24	9.6E-04						=Xdrat24	
Total dose rate	mSv/d	tdr24	5.2E-02						=SUM(Hletdr24)+Lletdr24	
Equivalent Doses - Northern Pintail - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr25	7.7E-05	3.0E-03	3.5E-03	1.0E-03	4.4E-02	5.1E-02	=ldrat25*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr25	9.6E-04						=Xdrat25	
Total dose rate	mSv/d	tdr25	5.2E-02						=SUM(Hletdr25)+Lletdr25	
Equivalent Doses - Ptarmigan - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr26	6.1E-05	6.0E-04	3.5E-03	2.3E-03	1.1E-01	1.1E-01	=ldrat26*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr26	9.6E-04						=Xdrat26	
Total dose rate	mSv/d	tdr26	1.1E-01						=SUM(Hletdr26)+Lletdr26	
Equivalent Doses - Ptarmigan - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr27	7.0E-05	6.0E-04	3.5E-03	2.3E-03	1.1E-01	1.1E-01	=ldrat27*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr27	9.6E-04						=Xdrat27	
Total dose rate	mSv/d	tdr27	1.1E-01						=SUM(Hletdr27)+Lletdr27	

Table H.2-2

Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

Equivalent Doses - Ptarmigan - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr28	9.1E-05	6.7E-04	3.8E-03	2.4E-03	1.1E-01	1.1E-01	=Idrat28*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr28	9.6E-04						=Xdrat28	
Total dose rate	mSv/d	tdr28	1.1E-01						=SUM(Hletdr28)+Lletdr28	
Equivalent Doses - Ptarmigan - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr29	9.0E-05	6.0E-04	3.5E-03	2.3E-03	1.1E-01	1.1E-01	=Idrat29*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr29	9.6E-04						=Xdrat29	
Total dose rate	mSv/d	tdr29	1.1E-01						=SUM(Hletdr29)+Lletdr29	
Equivalent Doses - Sandpiper - Rock Lake										
High LET dose rate	mSv/d	Hletdr30	2.8E-04	1.4E-03	2.4E-02	1.1E-03	8.8E-02	1.2E-01	=Idrat30*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr30	9.6E-04						=Xdrat30	
Total dose rate	mSv/d	tdr30	1.2E-01						=SUM(Hletdr30)+Lletdr30	
Equivalent Doses - Sandpiper - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr31	4.1E-04	1.4E-03	2.3E-02	1.1E-03	8.6E-02	1.1E-01	=Idrat31*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr31	9.6E-04						=Xdrat31	
Total dose rate	mSv/d	tdr31	1.1E-01						=SUM(Hletdr31)+Lletdr31	
Equivalent Doses - Sandpiper - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr32	5.9E-04	1.4E-03	2.4E-02	1.1E-03	8.8E-02	1.1E-01	=Idrat32*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr32	9.6E-04						=Xdrat32	
Total dose rate	mSv/d	tdr32	1.2E-01						=SUM(Hletdr32)+Lletdr32	
Equivalent Doses - Shrew - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr33	4.8E-04	5.3E-04	7.0E-03	2.3E-04	5.0E-03	1.3E-02	=Idrat33*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr33	9.6E-04						=Xdrat33	
Total dose rate	mSv/d	tdr33	1.4E-02						=SUM(Hletdr33)+Lletdr33	
Equivalent Doses - Shrew - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr34	5.1E-04	5.4E-04	7.4E-03	2.3E-04	5.1E-03	1.4E-02	=Idrat34*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr34	9.6E-04						=Xdrat34	
Total dose rate	mSv/d	tdr34	1.5E-02						=SUM(Hletdr34)+Lletdr34	
Equivalent Doses - Shrew - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr35	6.5E-03	3.9E-03	2.8E-02	4.1E-04	2.0E-02	5.9E-02	=Idrat35*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr35	9.6E-04						=Xdrat35	
Total dose rate	mSv/d	tdr35	6.0E-02						=SUM(Hletdr35)+Lletdr35	
Equivalent Doses - Shrew - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr36	1.0E-03	7.8E-04	8.2E-03	2.4E-04	5.9E-03	1.6E-02	=Idrat36*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr36	2.7E-04						=Xdrat36	
Total dose rate	mSv/d	tdr36	1.6E-02						=SUM(Hletdr36)+Lletdr36	
Equivalent Doses - Squirrel - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr37	1.3E-04	2.3E-03	1.0E-02	5.0E-04	7.5E-03	2.1E-02	=Idrat37*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr37	9.6E-04						=Xdrat37	
Total dose rate	mSv/d	tdr37	2.2E-02						=SUM(Hletdr37)+Lletdr37	
Equivalent Doses - Squirrel - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr38	1.3E-04	2.3E-03	1.0E-02	5.0E-04	7.5E-03	2.1E-02	=Idrat38*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr38	9.6E-04						=Xdrat38	
Total dose rate	mSv/d	tdr38	2.2E-02						=SUM(Hletdr38)+Lletdr38	
Equivalent Doses - Squirrel - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr39	2.4E-04	2.3E-03	1.1E-02	5.0E-04	7.5E-03	2.1E-02	=Idrat39*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr39	9.6E-04						=Xdrat39	
Total dose rate	mSv/d	tdr39	2.2E-02						=SUM(Hletdr39)+Lletdr39	
Equivalent Doses - Squirrel - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr40	1.3E-04	2.3E-03	1.0E-02	5.0E-04	7.5E-03	2.1E-02	=Idrat40*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr40	9.6E-04						=Xdrat40	
Total dose rate	mSv/d	tdr40	2.2E-02						=SUM(Hletdr40)+Lletdr40	
Equivalent Doses - Wolf - LSA										
High LET dose rate	mSv/d	Hletdr41	6.3E-05	1.9E-05	3.5E-05	8.7E-08	5.7E-03	5.8E-03	=Idrat41*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr41	9.6E-04						=Xdrat41	
Total dose rate	mSv/d	tdr41	6.7E-03						=SUM(Hletdr41)+Lletdr41	
Equivalent Doses - Wolf - RSA										
High LET dose rate	mSv/d	Hletdr42	6.4E-05	1.9E-05	3.5E-05	8.7E-08	5.7E-03	5.8E-03	=Idrat42*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr42	9.6E-04						=Xdrat42	
Total dose rate	mSv/d	tdr42	6.8E-03						=SUM(Hletdr42)+Lletdr42	
Equivalent Doses - Wolverine - LSA										
High LET dose rate	mSv/d	Hletdr43	1.0E-04	7.7E-05	3.5E-04	3.0E-06	1.4E-03	1.9E-03	=Idrat43*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr43	9.6E-04						=Xdrat43	
Total dose rate	mSv/d	tdr43	2.8E-03						=SUM(Hletdr43)+Lletdr43	
Equivalent Doses - Wolverine - RSA										
High LET dose rate	mSv/d	Hletdr44	9.4E-05	7.6E-05	3.4E-04	2.9E-06	1.3E-03	1.9E-03	=Idrat44*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr44	9.6E-04						=Xdrat44	
Total dose rate	mSv/d	tdr44	2.8E-03						=SUM(Hletdr44)+Lletdr44	

Table H.2-2
Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

SUMMARY

3 Screening Criterion in mGy/d	Total Absorbed Dose mGy/d	Total Equivalent Dose mSv/d	Index (Absorbed Dose)	Index (Equivalent Dose)
Bear - LSA	1.5E-03	6.0E-03	4.9E-04	2.0E-03
Caribou - LSA	6.8E-03	5.9E-02	2.3E-03	2.0E-02
Caribou - RSA	6.7E-03	5.9E-02	2.2E-03	2.0E-02
Falcon - LSA	7.6E-03	4.3E-02	2.5E-03	1.4E-02
Falcon - RSA	7.6E-03	4.3E-02	2.5E-03	1.4E-02
Fox - LSA	1.3E-03	4.1E-03	4.3E-04	1.4E-03
Lemming - Rock Lake Watershed	5.2E-03	3.4E-02	1.7E-03	1.1E-02
Lemming - JSL @ Kiggavik Discharge	5.1E-03	3.3E-02	1.7E-03	1.1E-02
Lemming - Kiggavik Camp	1.4E-02	1.2E-01	4.7E-03	3.9E-02
Lemming - JSL @ Sissons Discharge	5.6E-03	3.8E-02	1.9E-03	1.3E-02
Lapland Longspur - Rock Lake Watershed	5.6E-03	4.0E-02	1.9E-03	1.3E-02
Lapland Longspur - JSL @ Kiggavik Discharge	5.7E-03	4.1E-02	1.9E-03	1.4E-02
Lapland Longspur - Kiggavik Camp	6.2E-03	4.4E-02	2.1E-03	1.5E-02
Lapland Longspur - JSL @ Sissons Discharge	5.6E-03	4.0E-02	1.9E-03	1.3E-02
Long-Tailed Duck - Rock Lake	7.1E-03	5.9E-02	2.4E-03	2.0E-02
Long-Tailed Duck - JSL @ Kiggavik Discharge	7.0E-03	5.8E-02	2.3E-03	1.9E-02
Long-Tailed Duck - JSL @ Sissons Discharge	7.0E-03	5.8E-02	2.3E-03	1.9E-02
Merganser - Rock Lake	1.7E-03	7.2E-03	5.6E-04	2.4E-03
Merganser - JSL @ Kiggavik Discharge	1.7E-03	6.8E-03	5.5E-04	2.3E-03
Merganser - JSL @ Sissons Discharge	1.7E-03	6.9E-03	5.5E-04	2.3E-03
Muskox - JSL @ Kiggavik Discharge	2.6E-03	1.7E-02	8.5E-04	5.6E-03
Muskox - JSL @ Sissons Discharge	5.6E-03	4.0E-02	1.9E-03	1.3E-02
Northern Pintail - Rock Lake	7.2E-03	5.4E-02	2.4E-03	1.8E-02
Northern Pintail - JSL @ Kiggavik Discharge	6.9E-03	5.2E-02	2.3E-03	1.7E-02
Northern Pintail - JSL @ Sissons Discharge	7.0E-03	5.2E-02	2.3E-03	1.7E-02
Ptarmigan - Rock Lake Watershed	1.4E-02	1.1E-01	4.8E-03	3.8E-02
Ptarmigan - JSL @ Kiggavik Discharge	1.4E-02	1.1E-01	4.8E-03	3.8E-02
Ptarmigan - Kiggavik Camp	1.4E-02	1.1E-01	4.8E-03	3.8E-02
Ptarmigan - JSL @ Sissons Discharge	1.4E-02	1.1E-01	4.8E-03	3.8E-02
Sandpiper - Rock Lake	1.3E-02	1.2E-01	4.5E-03	3.9E-02
Sandpiper - JSL @ Kiggavik Discharge	1.3E-02	1.1E-01	4.4E-03	3.8E-02
Sandpiper - JSL @ Sissons Discharge	1.3E-02	1.2E-01	4.5E-03	3.9E-02
Shrew - Rock Lake Watershed	2.5E-03	1.4E-02	8.3E-04	4.7E-03
Shrew - JSL @ Kiggavik Discharge	2.5E-03	1.5E-02	8.5E-04	4.9E-03
Shrew - Kiggavik Camp	7.2E-03	6.0E-02	2.4E-03	2.0E-02
Shrew - JSL @ Sissons Discharge	2.1E-03	1.6E-02	7.0E-04	5.5E-03
Squirrel - Rock Lake Watershed	3.5E-03	2.2E-02	1.2E-03	7.2E-03
Squirrel - JSL @ Kiggavik Discharge	3.5E-03	2.2E-02	1.2E-03	7.2E-03
Squirrel - Kiggavik Camp	3.5E-03	2.2E-02	1.2E-03	7.3E-03
Squirrel - JSL @ Sissons Discharge	3.5E-03	2.2E-02	1.2E-03	7.2E-03
Wolf - LSA	1.5E-03	6.7E-03	5.1E-04	2.2E-03
Wolf - RSA	1.5E-03	6.8E-03	5.1E-04	2.3E-03
Wolverine - LSA	1.2E-03	2.8E-03	3.8E-04	9.5E-04
Wolverine - RSA	1.1E-03	2.8E-03	3.8E-04	9.4E-04

U-238+ Internal U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235
Ra-226+ Internal Ra-226 + 0.3* (Rn-222 + ...Po-214)
Pb-210+ Internal Pb-210 + Bi-210

Table H.2-2

Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

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DOSES TO SELECTED VECs - Average Total Dose

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Absorbed Doses - Bear - LSA									
Concentration	Bq/g	Crad	1.27E-05	3.36E-05	2.28E-05	5.31E-05	1.79E-03		
Internal Dose Factor	mGy/d per Bq/g	ldcf	1.4E-01	6.6E-02	1.6E-01	6.0E-03	7.4E-02		
Internal dose rate	mGy/d	ldrat	1.8E-06	2.2E-06	3.6E-06	3.2E-07	1.3E-04	1.4E-04	=Crad*ldcf
External Gamma rate	uGy/h	Xgrat	0.04						
Fraction of time on site	-	fts	1.00						
External dose rate	mGy/d	Xdrat	9.6E-04						=Xgrat*24*fts/1000
Internal plus external	mGy/d	tdrat	1.1E-03						=SUM(ldrat)+Xdrat
Absorbed Doses - Caribou - LSA									
Concentration	Bq/g	Crad2	2.99E-05	4.43E-05	8.68E-05	9.05E-04	2.39E-02		
Internal dose rate	mGy/d	ldrat2	4.3E-06	2.9E-06	1.4E-05	5.5E-06	1.8E-03	1.8E-03	=Crad2*ldcf
Fraction of time on site	-	fts2	1.00						
External dose rate	mGy/d	Xdrat2	9.6E-04						=Xgrat*24*fts2/1000
Internal plus external	mGy/d	tdrat2	2.8E-03						=SUM(ldrat2)+Xdrat2
Absorbed Doses - Caribou - RSA									
Concentration	Bq/g	Crad3	2.99E-05	4.43E-05	8.68E-05	9.05E-04	2.39E-02		
Internal dose rate	mGy/d	ldrat3	4.3E-06	2.9E-06	1.4E-05	5.5E-06	1.8E-03	1.8E-03	=Crad3*ldcf
Fraction of time on site	-	fts3	1.00						
External dose rate	mGy/d	Xdrat3	9.6E-04						=Xgrat*24*fts3/1000
Internal plus external	mGy/d	tdrat3	2.8E-03						=SUM(ldrat3)+Xdrat3
Absorbed Doses - Falcon - LSA									
Concentration	Bq/g	Crad4	3.85E-06	1.20E-04	3.99E-04	1.34E-01	1.47E-02		
Internal dose rate	mGy/d	ldrat4	5.5E-07	7.9E-06	6.3E-05	8.1E-04	1.1E-03	2.0E-03	=Crad4*ldcf
Fraction of time on site	-	fts4	1.00						
External dose rate	mGy/d	Xdrat4	9.6E-04						=Xgrat*24*fts4/1000
Internal plus external	mGy/d	tdrat4	2.9E-03						=SUM(ldrat4)+Xdrat4
Absorbed Doses - Falcon - RSA									
Concentration	Bq/g	Crad5	3.84E-06	1.20E-04	3.98E-04	1.34E-01	1.47E-02		
Internal dose rate	mGy/d	ldrat5	5.5E-07	7.9E-06	6.3E-05	8.1E-04	1.1E-03	2.0E-03	=Crad5*ldcf
Fraction of time on site	-	fts5	1.00						
External dose rate	mGy/d	Xdrat5	9.6E-04						=Xgrat*24*fts5/1000
Internal plus external	mGy/d	tdrat5	2.9E-03						=SUM(ldrat5)+Xdrat5
Absorbed Doses - Fox - LSA									
Concentration	Bq/g	Crad6	8.52E-06	2.48E-05	5.34E-05	1.28E-04	1.09E-03		
Internal dose rate	mGy/d	ldrat6	1.2E-06	1.6E-06	8.5E-06	7.7E-07	8.0E-05	9.2E-05	=Crad6*ldcf
Fraction of time on site	-	fts6	1.00						
External dose rate	mGy/d	Xdrat6	9.6E-04						=Xgrat*24*fts6/1000
Internal plus external	mGy/d	tdrat6	1.1E-03						=SUM(ldrat6)+Xdrat6
Absorbed Doses - Lemming - Rock Lake Watershed									
Concentration	Bq/g	Crad7	3.23E-05	1.14E-03	2.26E-03	4.72E-02	6.01E-03		
Internal dose rate	mGy/d	ldrat7	4.6E-06	7.5E-05	3.6E-04	2.8E-04	4.4E-04	1.2E-03	=Crad7*ldcf
Fraction of time on site	-	fts7	1.00						
External dose rate	mGy/d	Xdrat7	9.6E-04						=Xgrat*24*fts7/1000
Internal plus external	mGy/d	tdrat7	2.1E-03						=SUM(ldrat7)+Xdrat7
Absorbed Doses - Lemming - JSL @ Kiggavik Discharge									
Concentration	Bq/g	Crad8	3.23E-05	1.14E-03	2.26E-03	4.72E-02	6.01E-03		
Internal dose rate	mGy/d	ldrat8	4.6E-06	7.5E-05	3.6E-04	2.8E-04	4.4E-04	1.2E-03	=Crad8*ldcf
Fraction of time on site	-	fts8	1.00						
External dose rate	mGy/d	Xdrat8	9.6E-04						=Xgrat*24*fts8/1000
Internal plus external	mGy/d	tdrat8	2.1E-03						=SUM(ldrat8)+Xdrat8
Absorbed Doses - Lemming - Kiggavik Camp									
Concentration	Bq/g	Crad9	3.45E-05	1.14E-03	2.26E-03	4.73E-02	6.02E-03		
Internal dose rate	mGy/d	ldrat9	4.9E-06	7.5E-05	3.6E-04	2.9E-04	4.5E-04	1.2E-03	=Crad9*ldcf
Fraction of time on site	-	fts9	1.00						
External dose rate	mGy/d	Xdrat9	9.6E-04						=Xgrat*24*fts9/1000
Internal plus external	mGy/d	tdrat9	2.1E-03						=SUM(ldrat9)+Xdrat9
Absorbed Doses - Lemming - JSL @ Sissons Discharge									
Concentration	Bq/g	Crad10	3.24E-05	1.14E-03	2.26E-03	4.72E-02	6.01E-03		
Internal dose rate	mGy/d	ldrat10	4.6E-06	7.5E-05	3.6E-04	2.8E-04	4.4E-04	1.2E-03	=Crad10*ldcf
Fraction of time on site	-	fts10	1.00						
External dose rate	mGy/d	Xdrat10	9.6E-04						=Xgrat*24*fts10/1000
Internal plus external	mGy/d	tdrat10	2.1E-03						=SUM(ldrat10)+Xdrat10
Absorbed Doses - Lapland Longspur - Rock Lake Watershed									
Concentration	Bq/g	Crad11	1.15E-05	7.43E-04	1.58E-03	3.56E-02	1.28E-02		
Internal dose rate	mGy/d	ldrat11	1.6E-06	4.9E-05	2.5E-04	2.1E-04	9.5E-04	1.5E-03	=Crad11*ldcf
Fraction of time on site	-	fts11	1.00						
External dose rate	mGy/d	Xdrat11	9.6E-04						=Xgrat*24*fts11/1000
Internal plus external	mGy/d	tdrat11	2.4E-03						=SUM(ldrat11)+Xdrat11

Table H.2-2

Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

Absorbed Doses - Lapland Longspur - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad12	1.54E-05	7.45E-04	1.62E-03	3.59E-02	1.32E-02			
Internal dose rate	mGy/d	ldrat12	2.2E-06	4.9E-05	2.6E-04	2.2E-04	9.8E-04	1.5E-03	=Crad12*ldcf	
Fraction of time on site	-	fts12	1.00							
External dose rate	mGy/d	Xdrat12	9.6E-04						=Xgrat*24*fts12/1000	
Internal plus external	mGy/d	tdrat12	2.5E-03						=SUM(ldrat12)+Xdrat12	
Absorbed Doses - Lapland Longspur - Kiggavik Camp										
Concentration	Bq/g	Crad13	3.57E-06	7.43E-04	1.55E-03	3.54E-02	1.27E-02			
Internal dose rate	mGy/d	ldrat13	5.1E-07	4.9E-05	2.5E-04	2.1E-04	9.4E-04	1.4E-03	=Crad13*ldcf	
Fraction of time on site	-	fts13	1.00							
External dose rate	mGy/d	Xdrat13	9.6E-04						=Xgrat*24*fts13/1000	
Internal plus external	mGy/d	tdrat13	2.4E-03						=SUM(ldrat13)+Xdrat13	
Absorbed Doses - Lapland Longspur - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad14	1.98E-05	7.44E-04	1.58E-03	3.57E-02	1.29E-02			
Internal dose rate	mGy/d	ldrat14	2.8E-06	4.9E-05	2.5E-04	2.1E-04	9.6E-04	1.5E-03	=Crad14*ldcf	
Fraction of time on site	-	fts14	1.00							
External dose rate	mGy/d	Xdrat14	9.6E-04						=Xgrat*24*fts14/1000	
Internal plus external	mGy/d	tdrat14	2.4E-03						=SUM(ldrat14)+Xdrat14	
Absorbed Doses - Long-Tailed Duck - Rock Lake										
Concentration	Bq/g	Crad15	1.95E-05	2.01E-04	2.30E-03	1.99E-02	1.55E-02			
Internal dose rate	mGy/d	ldrat15	2.8E-06	1.3E-05	3.6E-04	1.2E-04	1.1E-03	1.6E-03	=Crad15*ldcf	
Fraction of time on site	-	fts15	1.00							
External dose rate	mGy/d	Xdrat15	9.6E-04						=Xgrat*24*fts15/1000	
Internal plus external	mGy/d	tdrat15	2.6E-03						=SUM(ldrat15)+Xdrat15	
Absorbed Doses - Long-Tailed Duck - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad16	2.55E-05	1.95E-04	2.21E-03	1.93E-02	1.50E-02			
Internal dose rate	mGy/d	ldrat16	3.6E-06	1.3E-05	3.5E-04	1.2E-04	1.1E-03	1.6E-03	=Crad16*ldcf	
Fraction of time on site	-	fts16	1.00							
External dose rate	mGy/d	Xdrat16	9.6E-04						=Xgrat*24*fts16/1000	
Internal plus external	mGy/d	tdrat16	2.6E-03						=SUM(ldrat16)+Xdrat16	
Absorbed Doses - Long-Tailed Duck - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad17	3.34E-05	1.96E-04	2.22E-03	1.93E-02	1.51E-02			
Internal dose rate	mGy/d	ldrat17	4.7E-06	1.3E-05	3.5E-04	1.2E-04	1.1E-03	1.6E-03	=Crad17*ldcf	
Fraction of time on site	-	fts17	1.00							
External dose rate	mGy/d	Xdrat17	9.6E-04						=Xgrat*24*fts17/1000	
Internal plus external	mGy/d	tdrat17	2.6E-03						=SUM(ldrat17)+Xdrat17	
Absorbed Doses - Merganser - Rock Lake										
Concentration	Bq/g	Crad18	2.29E-06	8.27E-05	1.25E-04	6.29E-03	2.11E-03			
Internal dose rate	mGy/d	ldrat18	3.3E-07	5.4E-06	2.0E-05	3.8E-05	1.6E-04	2.2E-04	=Crad18*ldcf	
Fraction of time on site	-	fts18	1.00							
External dose rate	mGy/d	Xdrat18	9.6E-04						=Xgrat*24*fts18/1000	
Internal plus external	mGy/d	tdrat18	1.2E-03						=SUM(ldrat18)+Xdrat18	
Absorbed Doses - Merganser - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad19	2.31E-06	7.99E-05	1.18E-04	6.10E-03	2.03E-03			
Internal dose rate	mGy/d	ldrat19	3.3E-07	5.3E-06	1.9E-05	3.7E-05	1.5E-04	2.1E-04	=Crad19*ldcf	
Fraction of time on site	-	fts19	1.00							
External dose rate	mGy/d	Xdrat19	9.6E-04						=Xgrat*24*fts19/1000	
Internal plus external	mGy/d	tdrat19	1.2E-03						=SUM(ldrat19)+Xdrat19	
Absorbed Doses - Merganser - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad20	2.32E-06	8.02E-05	1.18E-04	6.12E-03	2.04E-03			
Internal dose rate	mGy/d	ldrat20	3.3E-07	5.3E-06	1.9E-05	3.7E-05	1.5E-04	2.1E-04	=Crad20*ldcf	
Fraction of time on site	-	fts20	1.00							
External dose rate	mGy/d	Xdrat20	9.6E-04						=Xgrat*24*fts20/1000	
Internal plus external	mGy/d	tdrat20	1.2E-03						=SUM(ldrat20)+Xdrat20	
Absorbed Doses - Muskox - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad21	3.12E-05	5.03E-05	7.12E-05	2.23E-04	6.91E-03			
Internal dose rate	mGy/d	ldrat21	4.4E-06	3.3E-06	1.1E-05	1.3E-06	5.1E-04	5.3E-04	=Crad21*ldcf	
Fraction of time on site	-	fts21	1.00							
External dose rate	mGy/d	Xdrat21	9.6E-04						=Xgrat*24*fts21/1000	
Internal plus external	mGy/d	tdrat21	1.5E-03						=SUM(ldrat21)+Xdrat21	
Absorbed Doses - Muskox - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad22	1.98E-05	7.44E-04	1.58E-03	3.57E-02	1.29E-02			
Internal dose rate	mGy/d	ldrat22	2.8E-06	4.9E-05	2.5E-04	2.1E-04	9.6E-04	1.5E-03	=Crad22*ldcf	
Fraction of time on site	-	fts22	1.00							
External dose rate	mGy/d	Xdrat22	9.6E-04						=Xgrat*24*fts22/1000	
Internal plus external	mGy/d	tdrat22	2.4E-03						=SUM(ldrat22)+Xdrat22	
Absorbed Doses - Northern Pintail - Rock Lake										
Concentration	Bq/g	Crad23	7.17E-06	1.15E-03	6.60E-04	5.23E-02	1.76E-02			
Internal dose rate	mGy/d	ldrat23	1.0E-06	7.5E-05	1.0E-04	3.2E-04	1.3E-03	1.8E-03	=Crad23*ldcf	
Fraction of time on site	-	fts23	1.00							
External dose rate	mGy/d	Xdrat23	9.6E-04						=Xgrat*24*fts23/1000	
Internal plus external	mGy/d	tdrat23	2.8E-03						=SUM(ldrat23)+Xdrat23	

Table H.2-2

Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

Absorbed Doses - Northern Pintail - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad24	9.04E-06	1.11E-03	6.37E-04	5.05E-02	1.70E-02			
Internal dose rate	mGy/d	Idrat24	1.3E-06	7.3E-05	1.0E-04	3.0E-04	1.3E-03	1.7E-03	=Crad24*Idcf	
Fraction of time on site	-	fts24	1.00							
External dose rate	mGy/d	Xdrat24	9.6E-04						=Xgrat*24*fts24/1000	
Internal plus external	mGy/d	tdrat24	2.7E-03						=SUM(Idrat24)+Xdrat24	
Absorbed Doses - Northern Pintail - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad25	1.11E-05	1.11E-03	6.41E-04	5.08E-02	1.71E-02			
Internal dose rate	mGy/d	Idrat25	1.6E-06	7.3E-05	1.0E-04	3.1E-04	1.3E-03	1.7E-03	=Crad25*Idcf	
Fraction of time on site	-	fts25	1.00							
External dose rate	mGy/d	Xdrat25	9.6E-04						=Xgrat*24*fts25/1000	
Internal plus external	mGy/d	tdrat25	2.7E-03						=SUM(Idrat25)+Xdrat25	
Absorbed Doses - Ptarmigan - Rock Lake Watershed										
Concentration	Bq/g	Crad26	1.15E-05	2.25E-04	6.65E-04	1.38E-01	4.75E-02			
Internal dose rate	mGy/d	Idrat26	1.6E-06	1.5E-05	1.1E-04	8.3E-04	3.5E-03	4.5E-03	=Crad26*Idcf	
Fraction of time on site	-	fts26	1.00							
External dose rate	mGy/d	Xdrat26	9.6E-04						=Xgrat*24*fts26/1000	
Internal plus external	mGy/d	tdrat26	5.4E-03						=SUM(Idrat26)+Xdrat26	
Absorbed Doses - Ptarmigan - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad27	1.29E-05	2.26E-04	6.77E-04	1.38E-01	4.76E-02			
Internal dose rate	mGy/d	Idrat27	1.8E-06	1.5E-05	1.1E-04	8.3E-04	3.5E-03	4.5E-03	=Crad27*Idcf	
Fraction of time on site	-	fts27	1.00							
External dose rate	mGy/d	Xdrat27	9.6E-04						=Xgrat*24*fts27/1000	
Internal plus external	mGy/d	tdrat27	5.4E-03						=SUM(Idrat27)+Xdrat27	
Absorbed Doses - Ptarmigan - Kiggavik Camp										
Concentration	Bq/g	Crad28	9.50E-06	2.26E-04	6.55E-04	1.38E-01	4.75E-02			
Internal dose rate	mGy/d	Idrat28	1.3E-06	1.5E-05	1.0E-04	8.3E-04	3.5E-03	4.5E-03	=Crad28*Idcf	
Fraction of time on site	-	fts28	1.00							
External dose rate	mGy/d	Xdrat28	9.6E-04						=Xgrat*24*fts28/1000	
Internal plus external	mGy/d	tdrat28	5.4E-03						=SUM(Idrat28)+Xdrat28	
Absorbed Doses - Ptarmigan - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad29	1.44E-05	2.26E-04	6.65E-04	1.38E-01	4.75E-02			
Internal dose rate	mGy/d	Idrat29	2.0E-06	1.5E-05	1.1E-04	8.3E-04	3.5E-03	4.5E-03	=Crad29*Idcf	
Fraction of time on site	-	fts29	1.00							
External dose rate	mGy/d	Xdrat29	9.6E-04						=Xgrat*24*fts29/1000	
Internal plus external	mGy/d	tdrat29	5.4E-03						=SUM(Idrat29)+Xdrat29	
Absorbed Doses - Sandpiper - Rock Lake										
Concentration	Bq/g	Crad30	4.85E-05	7.57E-04	3.86E-03	5.69E-02	3.46E-02			
Internal dose rate	mGy/d	Idrat30	6.9E-06	5.0E-05	6.1E-04	3.4E-04	2.6E-03	3.6E-03	=Crad30*Idcf	
Fraction of time on site	-	fts30	1.00							
External dose rate	mGy/d	Xdrat30	9.6E-04						=Xgrat*24*fts30/1000	
Internal plus external	mGy/d	tdrat30	4.5E-03						=SUM(Idrat30)+Xdrat30	
Absorbed Doses - Sandpiper - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad31	6.12E-05	7.46E-04	3.73E-03	5.57E-02	3.36E-02			
Internal dose rate	mGy/d	Idrat31	8.7E-06	4.9E-05	5.9E-04	3.4E-04	2.5E-03	3.5E-03	=Crad31*Idcf	
Fraction of time on site	-	fts31	1.00							
External dose rate	mGy/d	Xdrat31	9.6E-04						=Xgrat*24*fts31/1000	
Internal plus external	mGy/d	tdrat31	4.4E-03						=SUM(Idrat31)+Xdrat31	
Absorbed Doses - Sandpiper - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad32	7.38E-05	7.46E-04	3.74E-03	5.57E-02	3.38E-02			
Internal dose rate	mGy/d	Idrat32	1.0E-05	4.9E-05	6.0E-04	3.4E-04	2.5E-03	3.5E-03	=Crad32*Idcf	
Fraction of time on site	-	fts32	1.00							
External dose rate	mGy/d	Xdrat32	9.6E-04						=Xgrat*24*fts32/1000	
Internal plus external	mGy/d	tdrat32	4.5E-03						=SUM(Idrat32)+Xdrat32	
Absorbed Doses - Shrew - Rock Lake Watershed										
Concentration	Bq/g	Crad33	3.27E-05	1.90E-04	1.27E-03	1.12E-02	2.07E-03			
Internal dose rate	mGy/d	Idrat33	4.6E-06	1.3E-05	2.0E-04	6.8E-05	1.5E-04	4.4E-04	=Crad33*Idcf	
Fraction of time on site	-	fts33	1.00							
External dose rate	mGy/d	Xdrat33	9.6E-04						=Xgrat*24*fts33/1000	
Internal plus external	mGy/d	tdrat33	1.4E-03						=SUM(Idrat33)+Xdrat33	
Absorbed Doses - Shrew - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad34	4.66E-05	2.01E-04	1.38E-03	1.13E-02	2.12E-03			
Internal dose rate	mGy/d	Idrat34	6.6E-06	1.3E-05	2.2E-04	6.8E-05	1.6E-04	4.6E-04	=Crad34*Idcf	
Fraction of time on site	-	fts34	1.00							
External dose rate	mGy/d	Xdrat34	9.6E-04						=Xgrat*24*fts34/1000	
Internal plus external	mGy/d	tdrat34	1.4E-03						=SUM(Idrat34)+Xdrat34	
Absorbed Doses - Shrew - Kiggavik Camp										
Concentration	Bq/g	Crad35	3.16E-06	1.85E-04	1.18E-03	1.11E-02	2.05E-03			
Internal dose rate	mGy/d	Idrat35	4.5E-07	1.2E-05	1.9E-04	6.7E-05	1.5E-04	4.2E-04	=Crad35*Idcf	
Fraction of time on site	-	fts35	1.00							
External dose rate	mGy/d	Xdrat35	9.6E-04						=Xgrat*24*fts35/1000	
Internal plus external	mGy/d	tdrat35	1.4E-03						=SUM(Idrat35)+Xdrat35	
Absorbed Doses - Shrew - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad36	6.26E-05	1.93E-04	1.27E-03	1.12E-02	2.09E-03			
Internal dose rate	mGy/d	Idrat36	8.9E-06	1.3E-05	2.0E-04	6.8E-05	1.5E-04	4.5E-04	=Crad36*Idcf	
Fraction of time on site	-	fts36	1.00							

Table H.2-2
Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

External dose rate	mGy/d	Xdrat36	2.7E-04							=Xgrat*24*fts36/3600
Internal plus external	mGy/d	tdrat36	7.1E-04							=SUM(ldrat36)+Xdrat36
Absorbed Doses - Squirrel - Rock Lake Watershed										
Concentration	Bq/g	Crad37	2.71E-05	9.87E-04	1.48E-03	1.97E-02	2.34E-03			
Internal dose rate	mGy/d	ldrat37	3.8E-06	6.5E-05	2.4E-04	1.2E-04	1.7E-04	6.0E-04		=Crad37*ldcf
Fraction of time on site	-	fts37	1.00							
External dose rate	mGy/d	Xdrat37	9.6E-04							=Xgrat*24*fts37/1000
Internal plus external	mGy/d	tdrat37	1.6E-03							=SUM(ldrat37)+Xdrat37
Absorbed Doses - Squirrel - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad38	2.70E-05	9.87E-04	1.48E-03	1.97E-02	2.34E-03			
Internal dose rate	mGy/d	ldrat38	3.8E-06	6.5E-05	2.4E-04	1.2E-04	1.7E-04	6.0E-04		=Crad38*ldcf
Fraction of time on site	-	fts38	1.00							
External dose rate	mGy/d	Xdrat38	9.6E-04							=Xgrat*24*fts38/1000
Internal plus external	mGy/d	tdrat38	1.6E-03							=SUM(ldrat38)+Xdrat38
Absorbed Doses - Squirrel - Kiggavik Camp										
Concentration	Bq/g	Crad39	2.88E-05	9.92E-04	1.48E-03	1.97E-02	2.34E-03			
Internal dose rate	mGy/d	ldrat39	4.1E-06	6.5E-05	2.4E-04	1.2E-04	1.7E-04	6.0E-04		=Crad39*ldcf
Fraction of time on site	-	fts39	1.00							
External dose rate	mGy/d	Xdrat39	9.6E-04							=Xgrat*24*fts39/1000
Internal plus external	mGy/d	tdrat39	1.6E-03							=SUM(ldrat39)+Xdrat39

Table H.2-2
Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

Absorbed Doses - Squirrel - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad40	2.71E-05	9.87E-04	1.48E-03	1.97E-02	2.34E-03			
Internal dose rate	mGy/d	Idrat40	3.9E-06	6.5E-05	2.4E-04	1.2E-04	1.7E-04	6.0E-04	=Crad40*Idcf	
Fraction of time on site	-	fts40	1.00							
External dose rate	mGy/d	Xdrat40	9.6E-04						=Xgrat*24*fts40/1000	
Internal plus external	mGy/d	tdrat40	1.6E-03						=SUM(Idrat40)+Xdrat40	
Absorbed Doses - Wolf - LSA										
Concentration	Bq/g	Crad41	1.16E-05	9.61E-06	6.02E-06	3.68E-06	1.90E-03			
Internal dose rate	mGy/d	Idrat41	1.6E-06	6.3E-07	9.6E-07	2.2E-08	1.4E-04	1.4E-04	=Crad41*Idcf	
Fraction of time on site	-	fts41	1.00							
External dose rate	mGy/d	Xdrat41	9.6E-04						=Xgrat*24*fts41/1000	
Internal plus external	mGy/d	tdrat41	1.1E-03						=SUM(Idrat41)+Xdrat41	
Absorbed Doses - Wolf - RSA										
Concentration	Bq/g	Crad42	1.17E-05	9.60E-06	6.02E-06	3.68E-06	1.90E-03			
Internal dose rate	mGy/d	Idrat42	1.7E-06	6.3E-07	9.6E-07	2.2E-08	1.4E-04	1.4E-04	=Crad42*Idcf	
Fraction of time on site	-	fts42	1.00							
External dose rate	mGy/d	Xdrat42	9.6E-04						=Xgrat*24*fts42/1000	
Internal plus external	mGy/d	tdrat42	1.1E-03						=SUM(Idrat42)+Xdrat42	
Absorbed Doses - Wolverine - LSA										
Concentration	Bq/g	Crad43	1.57E-05	3.36E-05	5.34E-05	1.05E-04	4.77E-04			
Internal dose rate	mGy/d	Idrat43	2.2E-06	2.2E-06	8.5E-06	6.3E-07	3.5E-05	4.9E-05	=Crad43*Idcf	
Fraction of time on site	-	fts43	1.00							
External dose rate	mGy/d	Xdrat43	9.6E-04						=Xgrat*24*fts43/1000	
Internal plus external	mGy/d	tdrat43	1.0E-03						=SUM(Idrat43)+Xdrat43	
Absorbed Doses - Wolverine - RSA										
Concentration	Bq/g	Crad44	1.57E-05	3.37E-05	5.34E-05	1.05E-04	4.77E-04			
Internal dose rate	mGy/d	Idrat44	2.2E-06	2.2E-06	8.5E-06	6.3E-07	3.5E-05	4.9E-05	=Crad44*Idcf	
Fraction of time on site	-	fts44	1.00							
External dose rate	mGy/d	Xdrat44	9.6E-04						=Xgrat*24*fts44/1000	
Internal plus external	mGy/d	tdrat44	1.0E-03						=SUM(Idrat44)+Xdrat44	
Equivalent Doses - Bear - LSA										
RBE for alpha	Sv/Gy	RBE	10							
High LET dose rate	mSv/d	Hletdr	1.8E-05	2.2E-05	3.6E-05	3.2E-07	1.3E-03	1.4E-03	=Idrat*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr	9.6E-04						=Xdrat	
Total dose rate	mSv/d	tdr	2.4E-03						=SUM(Hletdr)+Lletdr	
Equivalent Doses - Caribou - LSA										
High LET dose rate	mSv/d	Hletdr2	4.3E-05	2.9E-05	1.4E-04	5.5E-06	1.8E-02	1.8E-02	=Idrat2*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr2	9.6E-04						=Xdrat2	
Total dose rate	mSv/d	tdr2	1.9E-02						=SUM(Hletdr2)+Lletdr2	
Equivalent Doses - Caribou - RSA										
High LET dose rate	mSv/d	Hletdr3	4.3E-05	2.9E-05	1.4E-04	5.5E-06	1.8E-02	1.8E-02	=Idrat3*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr3	9.6E-04						=Xdrat3	
Total dose rate	mSv/d	tdr3	1.9E-02						=SUM(Hletdr3)+Lletdr3	
Equivalent Doses - Falcon - LSA										
High LET dose rate	mSv/d	Hletdr4	5.5E-06	7.9E-05	6.3E-04	8.1E-04	1.1E-02	1.2E-02	=Idrat4*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr4	9.6E-04						=Xdrat4	
Total dose rate	mSv/d	tdr4	1.3E-02						=SUM(Hletdr4)+Lletdr4	
Equivalent Doses - Falcon - RSA										
High LET dose rate	mSv/d	Hletdr5	5.5E-06	7.9E-05	6.3E-04	8.1E-04	1.1E-02	1.2E-02	=Idrat5*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr5	9.6E-04						=Xdrat5	
Total dose rate	mSv/d	tdr5	1.3E-02						=SUM(Hletdr5)+Lletdr5	
Equivalent Doses - Fox - LSA										
High LET dose rate	mSv/d	Hletdr6	1.2E-05	1.6E-05	8.5E-05	7.7E-07	8.0E-04	9.2E-04	=Idrat6*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr6	9.6E-04						=Xdrat6	
Total dose rate	mSv/d	tdr6	1.9E-03						=SUM(Hletdr6)+Lletdr6	
Equivalent Doses - Lemming - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr7	4.6E-05	7.5E-04	3.6E-03	2.8E-04	4.4E-03	9.1E-03	=Idrat7*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr7	9.6E-04						=Xdrat7	
Total dose rate	mSv/d	tdr7	1.0E-02						=SUM(Hletdr7)+Lletdr7	
Equivalent Doses - Lemming - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr8	4.6E-05	7.5E-04	3.6E-03	2.8E-04	4.4E-03	9.1E-03	=Idrat8*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr8	9.6E-04						=Xdrat8	
Total dose rate	mSv/d	tdr8	1.0E-02						=SUM(Hletdr8)+Lletdr8	
Equivalent Doses - Lemming - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr9	4.9E-05	7.5E-04	3.6E-03	2.9E-04	4.5E-03	9.1E-03	=Idrat9*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr9	9.6E-04						=Xdrat9	
Total dose rate	mSv/d	tdr9	1.0E-02						=SUM(Hletdr9)+Lletdr9	
Equivalent Doses - Lemming - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr10	4.6E-05	7.5E-04	3.6E-03	2.8E-04	4.4E-03	9.1E-03	=Idrat10*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr10	9.6E-04						=Xdrat10	
Total dose rate	mSv/d	tdr10	1.0E-02						=SUM(Hletdr10)+Lletdr10	

Table H.2-2

Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

Equivalent Doses - Lapland Longspur - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr11	1.6E-05	4.9E-04	2.5E-03	2.1E-04	9.5E-03	1.3E-02	=Idrat11*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr11	9.6E-04						=Xdrat11	
Total dose rate	mSv/d	tdr11	1.4E-02						=SUM(Hletdr11)+Lletdr11	
Equivalent Doses - Lapland Longspur - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr12	2.2E-05	4.9E-04	2.6E-03	2.2E-04	9.8E-03	1.3E-02	=Idrat12*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr12	9.6E-04						=Xdrat12	
Total dose rate	mSv/d	tdr12	1.4E-02						=SUM(Hletdr12)+Lletdr12	
Equivalent Doses - Lapland Longspur - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr13	5.1E-06	4.9E-04	2.5E-03	2.1E-04	9.4E-03	1.3E-02	=Idrat13*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr13	9.6E-04						=Xdrat13	
Total dose rate	mSv/d	tdr13	1.3E-02						=SUM(Hletdr13)+Lletdr13	
Equivalent Doses - Lapland Longspur - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr14	2.8E-05	4.9E-04	2.5E-03	2.1E-04	9.6E-03	1.3E-02	=Idrat14*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr14	9.6E-04						=Xdrat14	
Total dose rate	mSv/d	tdr14	1.4E-02						=SUM(Hletdr14)+Lletdr14	
Equivalent Doses - Long-Tailed Duck - Rock Lake										
High LET dose rate	mSv/d	Hletdr15	2.8E-05	1.3E-04	3.6E-03	1.2E-04	1.1E-02	1.5E-02	=Idrat15*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr15	9.6E-04						=Xdrat15	
Total dose rate	mSv/d	tdr15	1.6E-02						=SUM(Hletdr15)+Lletdr15	
Equivalent Doses - Long-Tailed Duck - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr16	3.6E-05	1.3E-04	3.5E-03	1.2E-04	1.1E-02	1.5E-02	=Idrat16*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr16	9.6E-04						=Xdrat16	
Total dose rate	mSv/d	tdr16	1.6E-02						=SUM(Hletdr16)+Lletdr16	
Equivalent Doses - Long-Tailed Duck - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr17	4.7E-05	1.3E-04	3.5E-03	1.2E-04	1.1E-02	1.5E-02	=Idrat17*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr17	9.6E-04						=Xdrat17	
Total dose rate	mSv/d	tdr17	1.6E-02						=SUM(Hletdr17)+Lletdr17	
Equivalent Doses - Merganser - Rock Lake										
High LET dose rate	mSv/d	Hletdr18	3.3E-06	5.4E-05	2.0E-04	3.8E-05	1.6E-03	1.9E-03	=Idrat18*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr18	9.6E-04						=Xdrat18	
Total dose rate	mSv/d	tdr18	2.8E-03						=SUM(Hletdr18)+Lletdr18	
Equivalent Doses - Merganser - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr19	3.3E-06	5.3E-05	1.9E-04	3.7E-05	1.5E-03	1.8E-03	=Idrat19*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr19	9.6E-04						=Xdrat19	
Total dose rate	mSv/d	tdr19	2.7E-03						=SUM(Hletdr19)+Lletdr19	
Equivalent Doses - Merganser - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr20	3.3E-06	5.3E-05	1.9E-04	3.7E-05	1.5E-03	1.8E-03	=Idrat20*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr20	9.6E-04						=Xdrat20	
Total dose rate	mSv/d	tdr20	2.8E-03						=SUM(Hletdr20)+Lletdr20	
Equivalent Doses - Muskox - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr21	4.4E-05	3.3E-05	1.1E-04	1.3E-06	5.1E-03	5.3E-03	=Idrat21*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr21	9.6E-04						=Xdrat21	
Total dose rate	mSv/d	tdr21	6.3E-03						=SUM(Hletdr21)+Lletdr21	
Equivalent Doses - Muskox - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr22	2.8E-05	4.9E-04	2.5E-03	2.1E-04	9.6E-03	1.3E-02	=Idrat22*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr22	9.6E-04						=Xdrat22	
Total dose rate	mSv/d	tdr22	1.4E-02						=SUM(Hletdr22)+Lletdr22	
Equivalent Doses - Northern Pintail - Rock Lake										
High LET dose rate	mSv/d	Hletdr23	1.0E-05	7.5E-04	1.0E-03	3.2E-04	1.3E-02	1.5E-02	=Idrat23*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr23	9.6E-04						=Xdrat23	
Total dose rate	mSv/d	tdr23	1.6E-02						=SUM(Hletdr23)+Lletdr23	
Equivalent Doses - Northern Pintail - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr24	1.3E-05	7.3E-04	1.0E-03	3.0E-04	1.3E-02	1.5E-02	=Idrat24*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr24	9.6E-04						=Xdrat24	
Total dose rate	mSv/d	tdr24	1.6E-02						=SUM(Hletdr24)+Lletdr24	
Equivalent Doses - Northern Pintail - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr25	1.6E-05	7.3E-04	1.0E-03	3.1E-04	1.3E-02	1.5E-02	=Idrat25*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr25	9.6E-04						=Xdrat25	
Total dose rate	mSv/d	tdr25	1.6E-02						=SUM(Hletdr25)+Lletdr25	
Equivalent Doses - Ptarmigan - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr26	1.6E-05	1.5E-04	1.1E-03	8.3E-04	3.5E-02	3.7E-02	=Idrat26*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr26	9.6E-04						=Xdrat26	
Total dose rate	mSv/d	tdr26	3.8E-02						=SUM(Hletdr26)+Lletdr26	
Equivalent Doses - Ptarmigan - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr27	1.8E-05	1.5E-04	1.1E-03	8.3E-04	3.5E-02	3.7E-02	=Idrat27*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr27	9.6E-04						=Xdrat27	
Total dose rate	mSv/d	tdr27	3.8E-02						=SUM(Hletdr27)+Lletdr27	

Table H.2-2

Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

Equivalent Doses - Ptarmigan - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr28	1.3E-05	1.5E-04	1.0E-03	8.3E-04	3.5E-02	3.7E-02	=Idrat28*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr28	9.6E-04						=Xdrat28	
Total dose rate	mSv/d	tdr28	3.8E-02						=SUM(Hletdr28)+Lletdr28	
Equivalent Doses - Ptarmigan - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr29	2.0E-05	1.5E-04	1.1E-03	8.3E-04	3.5E-02	3.7E-02	=Idrat29*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr29	9.6E-04						=Xdrat29	
Total dose rate	mSv/d	tdr29	3.8E-02						=SUM(Hletdr29)+Lletdr29	
Equivalent Doses - Sandpiper - Rock Lake										
High LET dose rate	mSv/d	Hletdr30	6.9E-05	5.0E-04	6.1E-03	3.4E-04	2.6E-02	3.3E-02	=Idrat30*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr30	9.6E-04						=Xdrat30	
Total dose rate	mSv/d	tdr30	3.4E-02						=SUM(Hletdr30)+Lletdr30	
Equivalent Doses - Sandpiper - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr31	8.7E-05	4.9E-04	5.9E-03	3.4E-04	2.5E-02	3.2E-02	=Idrat31*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr31	9.6E-04						=Xdrat31	
Total dose rate	mSv/d	tdr31	3.3E-02						=SUM(Hletdr31)+Lletdr31	
Equivalent Doses - Sandpiper - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr32	1.0E-04	4.9E-04	6.0E-03	3.4E-04	2.5E-02	3.2E-02	=Idrat32*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr32	9.6E-04						=Xdrat32	
Total dose rate	mSv/d	tdr32	3.3E-02						=SUM(Hletdr32)+Lletdr32	
Equivalent Doses - Shrew - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr33	4.6E-05	1.3E-04	2.0E-03	6.8E-05	1.5E-03	3.8E-03	=Idrat33*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr33	9.6E-04						=Xdrat33	
Total dose rate	mSv/d	tdr33	4.8E-03						=SUM(Hletdr33)+Lletdr33	
Equivalent Doses - Shrew - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr34	6.6E-05	1.3E-04	2.2E-03	6.8E-05	1.6E-03	4.0E-03	=Idrat34*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr34	9.6E-04						=Xdrat34	
Total dose rate	mSv/d	tdr34	5.0E-03						=SUM(Hletdr34)+Lletdr34	
Equivalent Doses - Shrew - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr35	4.5E-06	1.2E-04	1.9E-03	6.7E-05	1.5E-03	3.6E-03	=Idrat35*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr35	9.6E-04						=Xdrat35	
Total dose rate	mSv/d	tdr35	4.5E-03						=SUM(Hletdr35)+Lletdr35	
Equivalent Doses - Shrew - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr36	8.9E-05	1.3E-04	2.0E-03	6.8E-05	1.5E-03	3.8E-03	=Idrat36*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr36	2.7E-04						=Xdrat36	
Total dose rate	mSv/d	tdr36	4.1E-03						=SUM(Hletdr36)+Lletdr36	
Equivalent Doses - Squirrel - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr37	3.8E-05	6.5E-04	2.4E-03	1.2E-04	1.7E-03	4.9E-03	=Idrat37*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr37	9.6E-04						=Xdrat37	
Total dose rate	mSv/d	tdr37	5.9E-03						=SUM(Hletdr37)+Lletdr37	
Equivalent Doses - Squirrel - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr38	3.8E-05	6.5E-04	2.4E-03	1.2E-04	1.7E-03	4.9E-03	=Idrat38*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr38	9.6E-04						=Xdrat38	
Total dose rate	mSv/d	tdr38	5.9E-03						=SUM(Hletdr38)+Lletdr38	
Equivalent Doses - Squirrel - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr39	4.1E-05	6.5E-04	2.4E-03	1.2E-04	1.7E-03	4.9E-03	=Idrat39*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr39	9.6E-04						=Xdrat39	
Total dose rate	mSv/d	tdr39	5.9E-03						=SUM(Hletdr39)+Lletdr39	
Equivalent Doses - Squirrel - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr40	3.9E-05	6.5E-04	2.4E-03	1.2E-04	1.7E-03	4.9E-03	=Idrat40*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr40	9.6E-04						=Xdrat40	
Total dose rate	mSv/d	tdr40	5.9E-03						=SUM(Hletdr40)+Lletdr40	
Equivalent Doses - Wolf - LSA										
High LET dose rate	mSv/d	Hletdr41	1.6E-05	6.3E-06	9.6E-06	2.2E-08	1.4E-03	1.4E-03	=Idrat41*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr41	9.6E-04						=Xdrat41	
Total dose rate	mSv/d	tdr41	2.4E-03						=SUM(Hletdr41)+Lletdr41	
Equivalent Doses - Wolf - RSA										
High LET dose rate	mSv/d	Hletdr42	1.7E-05	6.3E-06	9.6E-06	2.2E-08	1.4E-03	1.4E-03	=Idrat42*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr42	9.6E-04						=Xdrat42	
Total dose rate	mSv/d	tdr42	2.4E-03						=SUM(Hletdr42)+Lletdr42	
Equivalent Doses - Wolverine - LSA										
High LET dose rate	mSv/d	Hletdr43	2.2E-05	2.2E-05	8.5E-05	6.3E-07	3.5E-04	4.8E-04	=Idrat43*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr43	9.6E-04						=Xdrat43	
Total dose rate	mSv/d	tdr43	1.4E-03						=SUM(Hletdr43)+Lletdr43	
Equivalent Doses - Wolverine - RSA										
High LET dose rate	mSv/d	Hletdr44	2.2E-05	2.2E-05	8.5E-05	6.3E-07	3.5E-04	4.8E-04	=Idrat44*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr44	9.6E-04						=Xdrat44	
Total dose rate	mSv/d	tdr44	1.4E-03						=SUM(Hletdr44)+Lletdr44	

Table H.2-2
Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

SUMMARY

3 Screening Criterion in mGy/d	Total Absorbed Dose mGy/d	Total Equivalent Dose mSv/d	Index (Absorbed Dose)	Index (Equivalent Dose)
Bear - LSA	1.1E-03	2.4E-03	3.7E-04	7.9E-04
Caribou - LSA	2.8E-03	1.9E-02	9.2E-04	6.3E-03
Caribou - RSA	2.8E-03	1.9E-02	9.2E-04	6.3E-03
Falcon - LSA	2.9E-03	1.3E-02	9.8E-04	4.5E-03
Falcon - RSA	2.9E-03	1.3E-02	9.8E-04	4.4E-03
Fox - LSA	1.1E-03	1.9E-03	3.5E-04	6.3E-04
Lemming - Rock Lake Watershed	2.1E-03	1.0E-02	7.1E-04	3.4E-03
Lemming - JSL @ Kiggavik Discharge	2.1E-03	1.0E-02	7.1E-04	3.4E-03
Lemming - Kiggavik Camp	2.1E-03	1.0E-02	7.1E-04	3.4E-03
Lemming - JSL @ Sissons Discharge	2.1E-03	1.0E-02	7.1E-04	3.4E-03
Lapland Longspur - Rock Lake Watershed	2.4E-03	1.4E-02	8.1E-04	4.6E-03
Lapland Longspur - JSL @ Kiggavik Discharge	2.5E-03	1.4E-02	8.2E-04	4.7E-03
Lapland Longspur - Kiggavik Camp	2.4E-03	1.3E-02	8.0E-04	4.5E-03
Lapland Longspur - JSL @ Sissons Discharge	2.4E-03	1.4E-02	8.1E-04	4.6E-03
Long-Tailed Duck - Rock Lake	2.6E-03	1.6E-02	8.7E-04	5.5E-03
Long-Tailed Duck - JSL @ Kiggavik Discharge	2.6E-03	1.6E-02	8.5E-04	5.3E-03
Long-Tailed Duck - JSL @ Sissons Discharge	2.6E-03	1.6E-02	8.6E-04	5.3E-03
Merganser - Rock Lake	1.2E-03	2.8E-03	3.9E-04	9.4E-04
Merganser - JSL @ Kiggavik Discharge	1.2E-03	2.7E-03	3.9E-04	9.1E-04
Merganser - JSL @ Sissons Discharge	1.2E-03	2.8E-03	3.9E-04	9.2E-04
Muskox - JSL @ Kiggavik Discharge	1.5E-03	6.3E-03	5.0E-04	2.1E-03
Muskox - JSL @ Sissons Discharge	2.4E-03	1.4E-02	8.1E-04	4.6E-03
Northern Pintail - Rock Lake	2.8E-03	1.6E-02	9.2E-04	5.4E-03
Northern Pintail - JSL @ Kiggavik Discharge	2.7E-03	1.6E-02	9.0E-04	5.2E-03
Northern Pintail - JSL @ Sissons Discharge	2.7E-03	1.6E-02	9.0E-04	5.2E-03
Ptarmigan - Rock Lake Watershed	5.4E-03	3.8E-02	1.8E-03	1.3E-02
Ptarmigan - JSL @ Kiggavik Discharge	5.4E-03	3.8E-02	1.8E-03	1.3E-02
Ptarmigan - Kiggavik Camp	5.4E-03	3.8E-02	1.8E-03	1.3E-02
Ptarmigan - JSL @ Sissons Discharge	5.4E-03	3.8E-02	1.8E-03	1.3E-02
Sandpiper - Rock Lake	4.5E-03	3.4E-02	1.5E-03	1.1E-02
Sandpiper - JSL @ Kiggavik Discharge	4.4E-03	3.3E-02	1.5E-03	1.1E-02
Sandpiper - JSL @ Sissons Discharge	4.5E-03	3.3E-02	1.5E-03	1.1E-02
Shrew - Rock Lake Watershed	1.4E-03	4.8E-03	4.7E-04	1.6E-03
Shrew - JSL @ Kiggavik Discharge	1.4E-03	5.0E-03	4.7E-04	1.7E-03
Shrew - Kiggavik Camp	1.4E-03	4.5E-03	4.6E-04	1.5E-03
Shrew - JSL @ Sissons Discharge	7.1E-04	4.1E-03	2.4E-04	1.4E-03
Squirrel - Rock Lake Watershed	1.6E-03	5.9E-03	5.2E-04	2.0E-03
Squirrel - JSL @ Kiggavik Discharge	1.6E-03	5.9E-03	5.2E-04	2.0E-03
Squirrel - Kiggavik Camp	1.6E-03	5.9E-03	5.2E-04	2.0E-03
Squirrel - JSL @ Sissons Discharge	1.6E-03	5.9E-03	5.2E-04	2.0E-03
Wolf - LSA	1.1E-03	2.4E-03	3.7E-04	8.0E-04
Wolf - RSA	1.1E-03	2.4E-03	3.7E-04	8.0E-04
Wolverine - LSA	1.0E-03	1.4E-03	3.4E-04	4.8E-04
Wolverine - RSA	1.0E-03	1.4E-03	3.4E-04	4.8E-04

U-238+ Internal U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235
Ra-226+ Internal Ra-226 + 0.3* (Rn-222 + ...Po-214)
Pb-210+ Internal Pb-210 + Bi-210

Table H.2-2

Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

2043

DOSES TO SELECTED VECs - 95th Percentile Total Dose

		U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Absorbed Doses - Bear - LSA								
Concentration	Bq/g	Crad	3.88E-05	1.51E-04	6.99E-05	1.74E-04	6.43E-03	
Internal Dose Factor	mGy/d per Bq/g	ldcf	1.4E-01	6.6E-02	1.6E-01	6.0E-03	7.4E-02	
Internal dose rate	mGy/d	ldrat	5.5E-06	9.9E-06	1.1E-05	1.0E-06	4.8E-04	5.0E-04 =Crad*ldcf
External Gamma rate	uGy/h	Xgrat	0.04					
Fraction of time on site	-	fts	1.00					
External dose rate	mGy/d	Xdrat	9.6E-04					=Xgrat*24*fts/1000
Internal plus external	mGy/d	tdrat	1.5E-03					=SUM(ldrat)+Xdrat
Absorbed Doses - Caribou - LSA								
Concentration	Bq/g	Crad2	8.62E-05	1.33E-04	2.95E-04	2.53E-03	7.65E-02	
Internal dose rate	mGy/d	ldrat2	1.2E-05	8.7E-06	4.7E-05	1.5E-05	5.7E-03	=Crad2*ldcf
Fraction of time on site	-	fts2	1.00					
External dose rate	mGy/d	Xdrat2	9.6E-04					=Xgrat*24*fts2/1000
Internal plus external	mGy/d	tdrat2	6.7E-03					=SUM(ldrat2)+Xdrat2
Absorbed Doses - Caribou - RSA								
Concentration	Bq/g	Crad3	8.62E-05	1.33E-04	2.95E-04	2.53E-03	7.65E-02	
Internal dose rate	mGy/d	ldrat3	1.2E-05	8.7E-06	4.7E-05	1.5E-05	5.7E-03	=Crad3*ldcf
Fraction of time on site	-	fts3	1.00					
External dose rate	mGy/d	Xdrat3	9.6E-04					=Xgrat*24*fts3/1000
Internal plus external	mGy/d	tdrat3	6.7E-03					=SUM(ldrat3)+Xdrat3
Absorbed Doses - Falcon - LSA								
Concentration	Bq/g	Crad4	1.15E-05	3.57E-04	1.38E-03	4.41E-01	5.01E-02	
Internal dose rate	mGy/d	ldrat4	1.6E-06	2.3E-05	2.2E-04	2.7E-03	3.7E-03	6.6E-03 =Crad4*ldcf
Fraction of time on site	-	fts4	1.00					
External dose rate	mGy/d	Xdrat4	9.6E-04					=Xgrat*24*fts4/1000
Internal plus external	mGy/d	tdrat4	7.6E-03					=SUM(ldrat4)+Xdrat4
Absorbed Doses - Falcon - RSA								
Concentration	Bq/g	Crad5	1.14E-05	3.56E-04	1.38E-03	4.41E-01	5.00E-02	
Internal dose rate	mGy/d	ldrat5	1.6E-06	2.3E-05	2.2E-04	2.7E-03	3.7E-03	6.6E-03 =Crad5*ldcf
Fraction of time on site	-	fts5	1.00					
External dose rate	mGy/d	Xdrat5	9.6E-04					=Xgrat*24*fts5/1000
Internal plus external	mGy/d	tdrat5	7.6E-03					=SUM(ldrat5)+Xdrat5
Absorbed Doses - Fox - LSA								
Concentration	Bq/g	Crad6	2.13E-05	7.95E-05	1.30E-04	5.17E-04	3.66E-03	
Internal dose rate	mGy/d	ldrat6	3.0E-06	5.2E-06	2.1E-05	3.1E-06	2.7E-04	3.0E-04 =Crad6*ldcf
Fraction of time on site	-	fts6	1.00					
External dose rate	mGy/d	Xdrat6	9.6E-04					=Xgrat*24*fts6/1000
Internal plus external	mGy/d	tdrat6	1.3E-03					=SUM(ldrat6)+Xdrat6
Absorbed Doses - Lemming - Rock Lake Watershed								
Concentration	Bq/g	Crad7	1.51E-04	3.56E-03	6.36E-03	1.69E-01	2.09E-02	
Internal dose rate	mGy/d	ldrat7	2.1E-05	2.3E-04	1.0E-03	1.0E-03	1.5E-03	3.8E-03 =Crad7*ldcf
Fraction of time on site	-	fts7	1.00					
External dose rate	mGy/d	Xdrat7	9.6E-04					=Xgrat*24*fts7/1000
Internal plus external	mGy/d	tdrat7	4.8E-03					=SUM(ldrat7)+Xdrat7
Absorbed Doses - Lemming - JSL @ Kiggavik Discharge								
Concentration	Bq/g	Crad8	1.50E-04	3.56E-03	6.36E-03	1.69E-01	2.09E-02	
Internal dose rate	mGy/d	ldrat8	2.1E-05	2.3E-04	1.0E-03	1.0E-03	1.5E-03	3.8E-03 =Crad8*ldcf
Fraction of time on site	-	fts8	1.00					
External dose rate	mGy/d	Xdrat8	9.6E-04					=Xgrat*24*fts8/1000
Internal plus external	mGy/d	tdrat8	4.8E-03					=SUM(ldrat8)+Xdrat8
Absorbed Doses - Lemming - Kiggavik Camp								
Concentration	Bq/g	Crad9	1.55E-04	3.57E-03	6.37E-03	1.69E-01	2.09E-02	
Internal dose rate	mGy/d	ldrat9	2.2E-05	2.3E-04	1.0E-03	1.0E-03	1.5E-03	3.8E-03 =Crad9*ldcf
Fraction of time on site	-	fts9	1.00					
External dose rate	mGy/d	Xdrat9	9.6E-04					=Xgrat*24*fts9/1000
Internal plus external	mGy/d	tdrat9	4.8E-03					=SUM(ldrat9)+Xdrat9
Absorbed Doses - Lemming - JSL @ Sissons Discharge								
Concentration	Bq/g	Crad10	1.51E-04	3.56E-03	6.36E-03	1.69E-01	2.09E-02	
Internal dose rate	mGy/d	ldrat10	2.1E-05	2.3E-04	1.0E-03	1.0E-03	1.5E-03	3.8E-03 =Crad10*ldcf
Fraction of time on site	-	fts10	1.00					
External dose rate	mGy/d	Xdrat10	9.6E-04					=Xgrat*24*fts10/1000
Internal plus external	mGy/d	tdrat10	4.8E-03					=SUM(ldrat10)+Xdrat10
Absorbed Doses - Lapland Longspur - Rock Lake Watershed								
Concentration	Bq/g	Crad11	4.07E-05	3.37E-03	5.24E-03	1.35E-01	3.62E-02	
Internal dose rate	mGy/d	ldrat11	5.8E-06	2.2E-04	8.3E-04	8.1E-04	2.7E-03	4.6E-03 =Crad11*ldcf
Fraction of time on site	-	fts11	1.00					
External dose rate	mGy/d	Xdrat11	9.6E-04					=Xgrat*24*fts11/1000
Internal plus external	mGy/d	tdrat11	5.5E-03					=SUM(ldrat11)+Xdrat11

Table H.2-2

Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

Absorbed Doses - Lapland Longspur - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad12	5.50E-05	3.38E-03	5.40E-03	1.37E-01	3.73E-02			
Internal dose rate	mGy/d	ldrat12	7.8E-06	2.2E-04	8.6E-04	8.2E-04	2.8E-03	4.7E-03	=Crad12*ldcf	
Fraction of time on site	-	fts12	1.00							
External dose rate	mGy/d	Xdrat12	9.6E-04						=Xgrat*24*fts12/1000	
Internal plus external	mGy/d	tdrat12	5.6E-03						=SUM(ldrat12)+Xdrat12	
Absorbed Doses - Lapland Longspur - Kiggavik Camp										
Concentration	Bq/g	Crad13	1.30E-05	3.37E-03	5.10E-03	1.34E-01	3.57E-02			
Internal dose rate	mGy/d	ldrat13	1.8E-06	2.2E-04	8.1E-04	8.1E-04	2.6E-03	4.5E-03	=Crad13*ldcf	
Fraction of time on site	-	fts13	1.00							
External dose rate	mGy/d	Xdrat13	9.6E-04						=Xgrat*24*fts13/1000	
Internal plus external	mGy/d	tdrat13	5.4E-03						=SUM(ldrat13)+Xdrat13	
Absorbed Doses - Lapland Longspur - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad14	6.24E-05	3.37E-03	5.26E-03	1.35E-01	3.64E-02			
Internal dose rate	mGy/d	ldrat14	8.9E-06	2.2E-04	8.4E-04	8.1E-04	2.7E-03	4.6E-03	=Crad14*ldcf	
Fraction of time on site	-	fts14	1.00							
External dose rate	mGy/d	Xdrat14	9.6E-04						=Xgrat*24*fts14/1000	
Internal plus external	mGy/d	tdrat14	5.5E-03						=SUM(ldrat14)+Xdrat14	
Absorbed Doses - Long-Tailed Duck - Rock Lake										
Concentration	Bq/g	Crad15	5.55E-05	6.03E-04	9.26E-03	6.39E-02	5.78E-02			
Internal dose rate	mGy/d	ldrat15	7.9E-06	4.0E-05	1.5E-03	3.9E-04	4.3E-03	6.2E-03	=Crad15*ldcf	
Fraction of time on site	-	fts15	1.00							
External dose rate	mGy/d	Xdrat15	9.6E-04						=Xgrat*24*fts15/1000	
Internal plus external	mGy/d	tdrat15	7.1E-03						=SUM(ldrat15)+Xdrat15	
Absorbed Doses - Long-Tailed Duck - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad16	8.71E-05	5.84E-04	8.95E-03	6.16E-02	5.56E-02			
Internal dose rate	mGy/d	ldrat16	1.2E-05	3.8E-05	1.4E-03	3.7E-04	4.1E-03	6.0E-03	=Crad16*ldcf	
Fraction of time on site	-	fts16	1.00							
External dose rate	mGy/d	Xdrat16	9.6E-04						=Xgrat*24*fts16/1000	
Internal plus external	mGy/d	tdrat16	6.9E-03						=SUM(ldrat16)+Xdrat16	
Absorbed Doses - Long-Tailed Duck - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad17	1.11E-04	5.86E-04	9.00E-03	6.18E-02	5.58E-02			
Internal dose rate	mGy/d	ldrat17	1.6E-05	3.9E-05	1.4E-03	3.7E-04	4.1E-03	6.0E-03	=Crad17*ldcf	
Fraction of time on site	-	fts17	1.00							
External dose rate	mGy/d	Xdrat17	9.6E-04						=Xgrat*24*fts17/1000	
Internal plus external	mGy/d	tdrat17	7.0E-03						=SUM(ldrat17)+Xdrat17	
Absorbed Doses - Merganser - Rock Lake										
Concentration	Bq/g	Crad18	7.69E-06	3.15E-04	3.99E-04	1.98E-02	7.05E-03			
Internal dose rate	mGy/d	ldrat18	1.1E-06	2.1E-05	6.3E-05	1.2E-04	5.2E-04	7.3E-04	=Crad18*ldcf	
Fraction of time on site	-	fts18	1.00							
External dose rate	mGy/d	Xdrat18	9.6E-04						=Xgrat*24*fts18/1000	
Internal plus external	mGy/d	tdrat18	1.7E-03						=SUM(ldrat18)+Xdrat18	
Absorbed Doses - Merganser - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad19	7.74E-06	3.09E-04	3.71E-04	1.98E-02	6.69E-03			
Internal dose rate	mGy/d	ldrat19	1.1E-06	2.0E-05	5.9E-05	1.2E-04	5.0E-04	6.9E-04	=Crad19*ldcf	
Fraction of time on site	-	fts19	1.00							
External dose rate	mGy/d	Xdrat19	9.6E-04						=Xgrat*24*fts19/1000	
Internal plus external	mGy/d	tdrat19	1.7E-03						=SUM(ldrat19)+Xdrat19	
Absorbed Doses - Merganser - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad20	7.77E-06	3.09E-04	3.73E-04	1.98E-02	6.85E-03			
Internal dose rate	mGy/d	ldrat20	1.1E-06	2.0E-05	5.9E-05	1.2E-04	5.1E-04	7.1E-04	=Crad20*ldcf	
Fraction of time on site	-	fts20	1.00							
External dose rate	mGy/d	Xdrat20	9.6E-04						=Xgrat*24*fts20/1000	
Internal plus external	mGy/d	tdrat20	1.7E-03						=SUM(ldrat20)+Xdrat20	
Absorbed Doses - Muskox - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad21	1.18E-04	1.86E-04	2.87E-04	6.77E-04	2.04E-02			
Internal dose rate	mGy/d	ldrat21	1.7E-05	1.2E-05	4.6E-05	4.1E-06	1.5E-03	1.6E-03	=Crad21*ldcf	
Fraction of time on site	-	fts21	1.00							
External dose rate	mGy/d	Xdrat21	9.6E-04						=Xgrat*24*fts21/1000	
Internal plus external	mGy/d	tdrat21	2.6E-03						=SUM(ldrat21)+Xdrat21	
Absorbed Doses - Muskox - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad22	6.24E-05	3.37E-03	5.26E-03	1.35E-01	3.64E-02			
Internal dose rate	mGy/d	ldrat22	8.9E-06	2.2E-04	8.4E-04	8.1E-04	2.7E-03	4.6E-03	=Crad22*ldcf	
Fraction of time on site	-	fts22	1.00							
External dose rate	mGy/d	Xdrat22	9.6E-04						=Xgrat*24*fts22/1000	
Internal plus external	mGy/d	tdrat22	5.5E-03						=SUM(ldrat22)+Xdrat22	
Absorbed Doses - Northern Pintail - Rock Lake										
Concentration	Bq/g	Crad23	2.34E-05	4.59E-03	2.26E-03	1.68E-01	6.11E-02			
Internal dose rate	mGy/d	ldrat23	3.3E-06	3.0E-04	3.6E-04	1.0E-03	4.5E-03	6.2E-03	=Crad23*ldcf	
Fraction of time on site	-	fts23	1.00							
External dose rate	mGy/d	Xdrat23	9.6E-04						=Xgrat*24*fts23/1000	
Internal plus external	mGy/d	tdrat23	7.2E-03						=SUM(ldrat23)+Xdrat23	

Table H.2-2

Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

Absorbed Doses - Northern Pintail - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad24	2.66E-05	4.43E-03	2.18E-03	1.62E-01	5.96E-02			
Internal dose rate	mGy/d	Idrat24	3.8E-06	2.9E-04	3.5E-04	9.8E-04	4.4E-03	6.0E-03	=Crad24*Idcf	
Fraction of time on site	-	fts24	1.00							
External dose rate	mGy/d	Xdrat24	9.6E-04						=Xgrat*24*fts24/1000	
Internal plus external	mGy/d	tdrat24	7.0E-03						=SUM(Idrat24)+Xdrat24	
Absorbed Doses - Northern Pintail - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad25	3.78E-05	4.45E-03	2.20E-03	1.63E-01	5.90E-02			
Internal dose rate	mGy/d	Idrat25	5.4E-06	2.9E-04	3.5E-04	9.8E-04	4.4E-03	6.0E-03	=Crad25*Idcf	
Fraction of time on site	-	fts25	1.00							
External dose rate	mGy/d	Xdrat25	9.6E-04						=Xgrat*24*fts25/1000	
Internal plus external	mGy/d	tdrat25	7.0E-03						=SUM(Idrat25)+Xdrat25	
Absorbed Doses - Ptarmigan - Rock Lake Watershed										
Concentration	Bq/g	Crad26	4.26E-05	9.01E-04	2.17E-03	3.89E-01	1.43E-01			
Internal dose rate	mGy/d	Idrat26	6.0E-06	5.9E-05	3.5E-04	2.3E-03	1.1E-02	1.3E-02	=Crad26*Idcf	
Fraction of time on site	-	fts26	1.00							
External dose rate	mGy/d	Xdrat26	9.6E-04						=Xgrat*24*fts26/1000	
Internal plus external	mGy/d	tdrat26	1.4E-02						=SUM(Idrat26)+Xdrat26	
Absorbed Doses - Ptarmigan - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad27	4.59E-05	9.03E-04	2.21E-03	3.89E-01	1.43E-01			
Internal dose rate	mGy/d	Idrat27	6.5E-06	5.9E-05	3.5E-04	2.3E-03	1.1E-02	1.3E-02	=Crad27*Idcf	
Fraction of time on site	-	fts27	1.00							
External dose rate	mGy/d	Xdrat27	9.6E-04						=Xgrat*24*fts27/1000	
Internal plus external	mGy/d	tdrat27	1.4E-02						=SUM(Idrat27)+Xdrat27	
Absorbed Doses - Ptarmigan - Kiggavik Camp										
Concentration	Bq/g	Crad28	3.65E-05	9.03E-04	2.10E-03	3.89E-01	1.43E-01			
Internal dose rate	mGy/d	Idrat28	5.2E-06	5.9E-05	3.3E-04	2.3E-03	1.1E-02	1.3E-02	=Crad28*Idcf	
Fraction of time on site	-	fts28	1.00							
External dose rate	mGy/d	Xdrat28	9.6E-04						=Xgrat*24*fts28/1000	
Internal plus external	mGy/d	tdrat28	1.4E-02						=SUM(Idrat28)+Xdrat28	
Absorbed Doses - Ptarmigan - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad29	5.23E-05	9.01E-04	2.16E-03	3.89E-01	1.43E-01			
Internal dose rate	mGy/d	Idrat29	7.4E-06	5.9E-05	3.4E-04	2.3E-03	1.1E-02	1.3E-02	=Crad29*Idcf	
Fraction of time on site	-	fts29	1.00							
External dose rate	mGy/d	Xdrat29	9.6E-04						=Xgrat*24*fts29/1000	
Internal plus external	mGy/d	tdrat29	1.4E-02						=SUM(Idrat29)+Xdrat29	
Absorbed Doses - Sandpiper - Rock Lake										
Concentration	Bq/g	Crad30	1.96E-04	2.14E-03	1.53E-02	1.83E-01	1.19E-01			
Internal dose rate	mGy/d	Idrat30	2.8E-05	1.4E-04	2.4E-03	1.1E-03	8.8E-03	1.3E-02	=Crad30*Idcf	
Fraction of time on site	-	fts30	1.00							
External dose rate	mGy/d	Xdrat30	9.6E-04						=Xgrat*24*fts30/1000	
Internal plus external	mGy/d	tdrat30	1.3E-02						=SUM(Idrat30)+Xdrat30	
Absorbed Doses - Sandpiper - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad31	2.34E-04	2.11E-03	1.48E-02	1.78E-01	1.14E-01			
Internal dose rate	mGy/d	Idrat31	3.3E-05	1.4E-04	2.4E-03	1.1E-03	8.5E-03	1.2E-02	=Crad31*Idcf	
Fraction of time on site	-	fts31	1.00							
External dose rate	mGy/d	Xdrat31	9.6E-04						=Xgrat*24*fts31/1000	
Internal plus external	mGy/d	tdrat31	1.3E-02						=SUM(Idrat31)+Xdrat31	
Absorbed Doses - Sandpiper - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad32	2.56E-04	2.11E-03	1.49E-02	1.79E-01	1.15E-01			
Internal dose rate	mGy/d	Idrat32	3.6E-05	1.4E-04	2.4E-03	1.1E-03	8.5E-03	1.2E-02	=Crad32*Idcf	
Fraction of time on site	-	fts32	1.00							
External dose rate	mGy/d	Xdrat32	9.6E-04						=Xgrat*24*fts32/1000	
Internal plus external	mGy/d	tdrat32	1.3E-02						=SUM(Idrat32)+Xdrat32	
Absorbed Doses - Shrew - Rock Lake Watershed										
Concentration	Bq/g	Crad33	1.03E-04	6.31E-04	4.02E-03	3.64E-02	5.70E-03			
Internal dose rate	mGy/d	Idrat33	1.5E-05	4.2E-05	6.4E-04	2.2E-04	4.2E-04	1.3E-03	=Crad33*Idcf	
Fraction of time on site	-	fts33	1.00							
External dose rate	mGy/d	Xdrat33	9.6E-04						=Xgrat*24*fts33/1000	
Internal plus external	mGy/d	tdrat33	2.3E-03						=SUM(Idrat33)+Xdrat33	
Absorbed Doses - Shrew - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad34	1.42E-04	6.72E-04	4.37E-03	3.68E-02	6.01E-03			
Internal dose rate	mGy/d	Idrat34	2.0E-05	4.4E-05	7.0E-04	2.2E-04	4.4E-04	1.4E-03	=Crad34*Idcf	
Fraction of time on site	-	fts34	1.00							
External dose rate	mGy/d	Xdrat34	9.6E-04						=Xgrat*24*fts34/1000	
Internal plus external	mGy/d	tdrat34	2.4E-03						=SUM(Idrat34)+Xdrat34	
Absorbed Doses - Shrew - Kiggavik Camp										
Concentration	Bq/g	Crad35	9.53E-06	6.00E-04	3.72E-03	3.61E-02	5.69E-03			
Internal dose rate	mGy/d	Idrat35	1.4E-06	3.9E-05	5.9E-04	2.2E-04	4.2E-04	1.3E-03	=Crad35*Idcf	
Fraction of time on site	-	fts35	1.00							
External dose rate	mGy/d	Xdrat35	9.6E-04						=Xgrat*24*fts35/1000	
Internal plus external	mGy/d	tdrat35	2.2E-03						=SUM(Idrat35)+Xdrat35	
Absorbed Doses - Shrew - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad36	2.20E-04	6.31E-04	4.01E-03	3.65E-02	5.84E-03			
Internal dose rate	mGy/d	Idrat36	3.1E-05	4.2E-05	6.4E-04	2.2E-04	4.3E-04	1.4E-03	=Crad36*Idcf	
Fraction of time on site	-	fts36	1.00							

Table H.2-2
Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

External dose rate	mGy/d	Xdrat36	2.7E-04							=Xgrat*24*fts36/3600
Internal plus external	mGy/d	tdrat36	1.6E-03							=SUM(ldrat36)+Xdrat36
Absorbed Doses - Squirrel - Rock Lake Watershed										
Concentration	Bq/g	Crad37	8.97E-05	3.42E-03	6.40E-03	8.32E-02	1.01E-02			
Internal dose rate	mGy/d	ldrat37	1.3E-05	2.3E-04	1.0E-03	5.0E-04	7.5E-04	2.5E-03		=Crad37*ldcf
Fraction of time on site	-	fts37	1.00							
External dose rate	mGy/d	Xdrat37	9.6E-04							=Xgrat*24*fts37/1000
Internal plus external	mGy/d	tdrat37	3.5E-03							=SUM(ldrat37)+Xdrat37
Absorbed Doses - Squirrel - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad38	8.97E-05	3.42E-03	6.40E-03	8.32E-02	1.01E-02			
Internal dose rate	mGy/d	ldrat38	1.3E-05	2.3E-04	1.0E-03	5.0E-04	7.5E-04	2.5E-03		=Crad38*ldcf
Fraction of time on site	-	fts38	1.00							
External dose rate	mGy/d	Xdrat38	9.6E-04							=Xgrat*24*fts38/1000
Internal plus external	mGy/d	tdrat38	3.5E-03							=SUM(ldrat38)+Xdrat38
Absorbed Doses - Squirrel - Kiggavik Camp										
Concentration	Bq/g	Crad39	9.37E-05	3.43E-03	6.42E-03	8.33E-02	1.01E-02			
Internal dose rate	mGy/d	ldrat39	1.3E-05	2.3E-04	1.0E-03	5.0E-04	7.5E-04	2.5E-03		=Crad39*ldcf
Fraction of time on site	-	fts39	1.00							
External dose rate	mGy/d	Xdrat39	9.6E-04							=Xgrat*24*fts39/1000
Internal plus external	mGy/d	tdrat39	3.5E-03							=SUM(ldrat39)+Xdrat39

Table H.2-2

Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

Absorbed Doses - Squirrel - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad40	8.98E-05	3.42E-03	6.40E-03	8.32E-02	1.01E-02			
Internal dose rate	mGy/d	ldrat40	1.3E-05	2.3E-04	1.0E-03	5.0E-04	7.5E-04	2.5E-03	=Crad40*ldcf	
Fraction of time on site	-	fts40	1.00							
External dose rate	mGy/d	Xdrat40	9.6E-04						=Xgrat*24*fts40/1000	
Internal plus external	mGy/d	tdrat40	3.5E-03						=SUM(ldrat40)+Xdrat40	
Absorbed Doses - Wolf - LSA										
Concentration	Bq/g	Crad41	4.16E-05	2.94E-05	2.20E-05	1.44E-05	7.66E-03			
Internal dose rate	mGy/d	ldrat41	5.9E-06	1.9E-06	3.5E-06	8.7E-08	5.7E-04	5.8E-04	=Crad41*ldcf	
Fraction of time on site	-	fts41	1.00							
External dose rate	mGy/d	Xdrat41	9.6E-04						=Xgrat*24*fts41/1000	
Internal plus external	mGy/d	tdrat41	1.5E-03						=SUM(ldrat41)+Xdrat41	
Absorbed Doses - Wolf - RSA										
Concentration	Bq/g	Crad42	4.17E-05	2.94E-05	2.20E-05	1.44E-05	7.66E-03			
Internal dose rate	mGy/d	ldrat42	5.9E-06	1.9E-06	3.5E-06	8.7E-08	5.7E-04	5.8E-04	=Crad42*ldcf	
Fraction of time on site	-	fts42	1.00							
External dose rate	mGy/d	Xdrat42	9.6E-04						=Xgrat*24*fts42/1000	
Internal plus external	mGy/d	tdrat42	1.5E-03						=SUM(ldrat42)+Xdrat42	
Absorbed Doses - Wolverine - LSA										
Concentration	Bq/g	Crad43	5.83E-05	1.16E-04	2.13E-04	4.70E-04	1.79E-03			
Internal dose rate	mGy/d	ldrat43	8.3E-06	7.6E-06	3.4E-05	2.8E-06	1.3E-04	1.9E-04	=Crad43*ldcf	
Fraction of time on site	-	fts43	1.00							
External dose rate	mGy/d	Xdrat43	9.6E-04						=Xgrat*24*fts43/1000	
Internal plus external	mGy/d	tdrat43	1.1E-03						=SUM(ldrat43)+Xdrat43	
Absorbed Doses - Wolverine - RSA										
Concentration	Bq/g	Crad44	5.84E-05	1.16E-04	2.13E-04	4.70E-04	1.79E-03			
Internal dose rate	mGy/d	ldrat44	8.3E-06	7.6E-06	3.4E-05	2.8E-06	1.3E-04	1.9E-04	=Crad44*ldcf	
Fraction of time on site	-	fts44	1.00							
External dose rate	mGy/d	Xdrat44	9.6E-04						=Xgrat*24*fts44/1000	
Internal plus external	mGy/d	tdrat44	1.1E-03						=SUM(ldrat44)+Xdrat44	
Equivalent Doses - Bear - LSA										
RBE for alpha	Sv/Gy	RBE	10							
High LET dose rate	mSv/d	Hletdr	5.5E-05	9.9E-05	1.1E-04	1.0E-06	4.8E-03	5.0E-03	=ldrat*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr	9.6E-04						=Xdrat	
Total dose rate	mSv/d	tdr	6.0E-03						=SUM(Hletdr)+Lletdr	
Equivalent Doses - Caribou - LSA										
High LET dose rate	mSv/d	Hletdr2	1.2E-04	8.7E-05	4.7E-04	1.5E-05	5.7E-02	5.7E-02	=ldrat2*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr2	9.6E-04						=Xdrat2	
Total dose rate	mSv/d	tdr2	5.8E-02						=SUM(Hletdr2)+Lletdr2	
Equivalent Doses - Caribou - RSA										
High LET dose rate	mSv/d	Hletdr3	1.2E-04	8.7E-05	4.7E-04	1.5E-05	5.7E-02	5.7E-02	=ldrat3*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr3	9.6E-04						=Xdrat3	
Total dose rate	mSv/d	tdr3	5.8E-02						=SUM(Hletdr3)+Lletdr3	
Equivalent Doses - Falcon - LSA										
High LET dose rate	mSv/d	Hletdr4	1.6E-05	2.3E-04	2.2E-03	2.7E-03	3.7E-02	4.2E-02	=ldrat4*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr4	9.6E-04						=Xdrat4	
Total dose rate	mSv/d	tdr4	4.3E-02						=SUM(Hletdr4)+Lletdr4	
Equivalent Doses - Falcon - RSA										
High LET dose rate	mSv/d	Hletdr5	1.6E-05	2.3E-04	2.2E-03	2.7E-03	3.7E-02	4.2E-02	=ldrat5*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr5	9.6E-04						=Xdrat5	
Total dose rate	mSv/d	tdr5	4.3E-02						=SUM(Hletdr5)+Lletdr5	
Equivalent Doses - Fox - LSA										
High LET dose rate	mSv/d	Hletdr6	3.0E-05	5.2E-05	2.1E-04	3.1E-06	2.7E-03	3.0E-03	=ldrat6*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr6	9.6E-04						=Xdrat6	
Total dose rate	mSv/d	tdr6	4.0E-03						=SUM(Hletdr6)+Lletdr6	
Equivalent Doses - Lemming - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr7	2.1E-04	2.3E-03	1.0E-02	1.0E-03	1.5E-02	2.9E-02	=ldrat7*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr7	9.6E-04						=Xdrat7	
Total dose rate	mSv/d	tdr7	3.0E-02						=SUM(Hletdr7)+Lletdr7	
Equivalent Doses - Lemming - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr8	2.1E-04	2.3E-03	1.0E-02	1.0E-03	1.5E-02	2.9E-02	=ldrat8*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr8	9.6E-04						=Xdrat8	
Total dose rate	mSv/d	tdr8	3.0E-02						=SUM(Hletdr8)+Lletdr8	
Equivalent Doses - Lemming - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr9	2.2E-04	2.3E-03	1.0E-02	1.0E-03	1.5E-02	2.9E-02	=ldrat9*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr9	9.6E-04						=Xdrat9	
Total dose rate	mSv/d	tdr9	3.0E-02						=SUM(Hletdr9)+Lletdr9	
Equivalent Doses - Lemming - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr10	2.1E-04	2.3E-03	1.0E-02	1.0E-03	1.5E-02	2.9E-02	=ldrat10*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr10	9.6E-04						=Xdrat10	
Total dose rate	mSv/d	tdr10	3.0E-02						=SUM(Hletdr10)+Lletdr10	

Table H.2-2

Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

Equivalent Doses - Lapland Longspur - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr11	5.8E-05	2.2E-03	8.3E-03	8.1E-04	2.7E-02	3.8E-02	=ldrat11*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr11	9.6E-04						=Xdrat11	
Total dose rate	mSv/d	tdr11	3.9E-02						=SUM(Hletdr11)+Lletdr11	
Equivalent Doses - Lapland Longspur - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr12	7.8E-05	2.2E-03	8.6E-03	8.2E-04	2.8E-02	3.9E-02	=ldrat12*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr12	9.6E-04						=Xdrat12	
Total dose rate	mSv/d	tdr12	4.0E-02						=SUM(Hletdr12)+Lletdr12	
Equivalent Doses - Lapland Longspur - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr13	1.8E-05	2.2E-03	8.1E-03	8.1E-04	2.6E-02	3.8E-02	=ldrat13*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr13	9.6E-04						=Xdrat13	
Total dose rate	mSv/d	tdr13	3.9E-02						=SUM(Hletdr13)+Lletdr13	
Equivalent Doses - Lapland Longspur - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr14	8.9E-05	2.2E-03	8.4E-03	8.1E-04	2.7E-02	3.8E-02	=ldrat14*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr14	9.6E-04						=Xdrat14	
Total dose rate	mSv/d	tdr14	3.9E-02						=SUM(Hletdr14)+Lletdr14	
Equivalent Doses - Long-Tailed Duck - Rock Lake										
High LET dose rate	mSv/d	Hletdr15	7.9E-05	4.0E-04	1.5E-02	3.9E-04	4.3E-02	5.8E-02	=ldrat15*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr15	9.6E-04						=Xdrat15	
Total dose rate	mSv/d	tdr15	5.9E-02						=SUM(Hletdr15)+Lletdr15	
Equivalent Doses - Long-Tailed Duck - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr16	1.2E-04	3.8E-04	1.4E-02	3.7E-04	4.1E-02	5.6E-02	=ldrat16*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr16	9.6E-04						=Xdrat16	
Total dose rate	mSv/d	tdr16	5.7E-02						=SUM(Hletdr16)+Lletdr16	
Equivalent Doses - Long-Tailed Duck - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr17	1.6E-04	3.9E-04	1.4E-02	3.7E-04	4.1E-02	5.7E-02	=ldrat17*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr17	9.6E-04						=Xdrat17	
Total dose rate	mSv/d	tdr17	5.8E-02						=SUM(Hletdr17)+Lletdr17	
Equivalent Doses - Merganser - Rock Lake										
High LET dose rate	mSv/d	Hletdr18	1.1E-05	2.1E-04	6.3E-04	1.2E-04	5.2E-03	6.2E-03	=ldrat18*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr18	9.6E-04						=Xdrat18	
Total dose rate	mSv/d	tdr18	7.2E-03						=SUM(Hletdr18)+Lletdr18	
Equivalent Doses - Merganser - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr19	1.1E-05	2.0E-04	5.9E-04	1.2E-04	5.0E-03	5.9E-03	=ldrat19*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr19	9.6E-04						=Xdrat19	
Total dose rate	mSv/d	tdr19	6.8E-03						=SUM(Hletdr19)+Lletdr19	
Equivalent Doses - Merganser - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr20	1.1E-05	2.0E-04	5.9E-04	1.2E-04	5.1E-03	6.0E-03	=ldrat20*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr20	9.6E-04						=Xdrat20	
Total dose rate	mSv/d	tdr20	7.0E-03						=SUM(Hletdr20)+Lletdr20	
Equivalent Doses - Muskox - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr21	1.7E-04	1.2E-04	4.6E-04	4.1E-06	1.5E-02	1.6E-02	=ldrat21*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr21	9.6E-04						=Xdrat21	
Total dose rate	mSv/d	tdr21	1.7E-02						=SUM(Hletdr21)+Lletdr21	
Equivalent Doses - Muskox - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr22	8.9E-05	2.2E-03	8.4E-03	8.1E-04	2.7E-02	3.8E-02	=ldrat22*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr22	9.6E-04						=Xdrat22	
Total dose rate	mSv/d	tdr22	3.9E-02						=SUM(Hletdr22)+Lletdr22	
Equivalent Doses - Northern Pintail - Rock Lake										
High LET dose rate	mSv/d	Hletdr23	3.3E-05	3.0E-03	3.6E-03	1.0E-03	4.5E-02	5.3E-02	=ldrat23*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr23	9.6E-04						=Xdrat23	
Total dose rate	mSv/d	tdr23	5.4E-02						=SUM(Hletdr23)+Lletdr23	
Equivalent Doses - Northern Pintail - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr24	3.8E-05	2.9E-03	3.5E-03	9.8E-04	4.4E-02	5.2E-02	=ldrat24*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr24	9.6E-04						=Xdrat24	
Total dose rate	mSv/d	tdr24	5.2E-02						=SUM(Hletdr24)+Lletdr24	
Equivalent Doses - Northern Pintail - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr25	5.4E-05	2.9E-03	3.5E-03	9.8E-04	4.4E-02	5.1E-02	=ldrat25*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr25	9.6E-04						=Xdrat25	
Total dose rate	mSv/d	tdr25	5.2E-02						=SUM(Hletdr25)+Lletdr25	
Equivalent Doses - Ptarmigan - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr26	6.0E-05	5.9E-04	3.5E-03	2.3E-03	1.1E-01	1.1E-01	=ldrat26*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr26	9.6E-04						=Xdrat26	
Total dose rate	mSv/d	tdr26	1.1E-01						=SUM(Hletdr26)+Lletdr26	
Equivalent Doses - Ptarmigan - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr27	6.5E-05	5.9E-04	3.5E-03	2.3E-03	1.1E-01	1.1E-01	=ldrat27*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr27	9.6E-04						=Xdrat27	
Total dose rate	mSv/d	tdr27	1.1E-01						=SUM(Hletdr27)+Lletdr27	

Table H.2-2

Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

Equivalent Doses - Ptarmigan - Kiggavik Camp									
High LET dose rate	mSv/d	Hletdr28	5.2E-05	5.9E-04	3.3E-03	2.3E-03	1.1E-01	1.1E-01	=ldrat28*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr28	9.6E-04						=Xdrat28
Total dose rate	mSv/d	tdr28	1.1E-01						=SUM(Hletdr28)+Lletdr28
Equivalent Doses - Ptarmigan - JSL @ Sissons Discharge									
High LET dose rate	mSv/d	Hletdr29	7.4E-05	5.9E-04	3.4E-03	2.3E-03	1.1E-01	1.1E-01	=ldrat29*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr29	9.6E-04						=Xdrat29
Total dose rate	mSv/d	tdr29	1.1E-01						=SUM(Hletdr29)+Lletdr29
Equivalent Doses - Sandpiper - Rock Lake									
High LET dose rate	mSv/d	Hletdr30	2.8E-04	1.4E-03	2.4E-02	1.1E-03	8.8E-02	1.2E-01	=ldrat30*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr30	9.6E-04						=Xdrat30
Total dose rate	mSv/d	tdr30	1.2E-01						=SUM(Hletdr30)+Lletdr30
Equivalent Doses - Sandpiper - JSL @ Kiggavik Discharge									
High LET dose rate	mSv/d	Hletdr31	3.3E-04	1.4E-03	2.4E-02	1.1E-03	8.5E-02	1.1E-01	=ldrat31*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr31	9.6E-04						=Xdrat31
Total dose rate	mSv/d	tdr31	1.1E-01						=SUM(Hletdr31)+Lletdr31
Equivalent Doses - Sandpiper - JSL @ Sissons Discharge									
High LET dose rate	mSv/d	Hletdr32	3.6E-04	1.4E-03	2.4E-02	1.1E-03	8.5E-02	1.1E-01	=ldrat32*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr32	9.6E-04						=Xdrat32
Total dose rate	mSv/d	tdr32	1.1E-01						=SUM(Hletdr32)+Lletdr32
Equivalent Doses - Shrew - Rock Lake Watershed									
High LET dose rate	mSv/d	Hletdr33	1.5E-04	4.2E-04	6.4E-03	2.2E-04	4.2E-03	1.1E-02	=ldrat33*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr33	9.6E-04						=Xdrat33
Total dose rate	mSv/d	tdr33	1.2E-02						=SUM(Hletdr33)+Lletdr33
Equivalent Doses - Shrew - JSL @ Kiggavik Discharge									
High LET dose rate	mSv/d	Hletdr34	2.0E-04	4.4E-04	7.0E-03	2.2E-04	4.4E-03	1.2E-02	=ldrat34*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr34	9.6E-04						=Xdrat34
Total dose rate	mSv/d	tdr34	1.3E-02						=SUM(Hletdr34)+Lletdr34
Equivalent Doses - Shrew - Kiggavik Camp									
High LET dose rate	mSv/d	Hletdr35	1.4E-05	3.9E-04	5.9E-03	2.2E-04	4.2E-03	1.1E-02	=ldrat35*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr35	9.6E-04						=Xdrat35
Total dose rate	mSv/d	tdr35	1.2E-02						=SUM(Hletdr35)+Lletdr35
Equivalent Doses - Shrew - JSL @ Sissons Discharge									
High LET dose rate	mSv/d	Hletdr36	3.1E-04	4.2E-04	6.4E-03	2.2E-04	4.3E-03	1.2E-02	=ldrat36*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr36	2.7E-04						=Xdrat36
Total dose rate	mSv/d	tdr36	1.2E-02						=SUM(Hletdr36)+Lletdr36
Equivalent Doses - Squirrel - Rock Lake Watershed									
High LET dose rate	mSv/d	Hletdr37	1.3E-04	2.3E-03	1.0E-02	5.0E-04	7.5E-03	2.1E-02	=ldrat37*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr37	9.6E-04						=Xdrat37
Total dose rate	mSv/d	tdr37	2.2E-02						=SUM(Hletdr37)+Lletdr37
Equivalent Doses - Squirrel - JSL @ Kiggavik Discharge									
High LET dose rate	mSv/d	Hletdr38	1.3E-04	2.3E-03	1.0E-02	5.0E-04	7.5E-03	2.1E-02	=ldrat38*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr38	9.6E-04						=Xdrat38
Total dose rate	mSv/d	tdr38	2.2E-02						=SUM(Hletdr38)+Lletdr38
Equivalent Doses - Squirrel - Kiggavik Camp									
High LET dose rate	mSv/d	Hletdr39	1.3E-04	2.3E-03	1.0E-02	5.0E-04	7.5E-03	2.1E-02	=ldrat39*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr39	9.6E-04						=Xdrat39
Total dose rate	mSv/d	tdr39	2.2E-02						=SUM(Hletdr39)+Lletdr39
Equivalent Doses - Squirrel - JSL @ Sissons Discharge									
High LET dose rate	mSv/d	Hletdr40	1.3E-04	2.3E-03	1.0E-02	5.0E-04	7.5E-03	2.1E-02	=ldrat40*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr40	9.6E-04						=Xdrat40
Total dose rate	mSv/d	tdr40	2.2E-02						=SUM(Hletdr40)+Lletdr40
Equivalent Doses - Wolf - LSA									
High LET dose rate	mSv/d	Hletdr41	5.9E-05	1.9E-05	3.5E-05	8.7E-08	5.7E-03	5.8E-03	=ldrat41*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr41	9.6E-04						=Xdrat41
Total dose rate	mSv/d	tdr41	6.7E-03						=SUM(Hletdr41)+Lletdr41
Equivalent Doses - Wolf - RSA									
High LET dose rate	mSv/d	Hletdr42	5.9E-05	1.9E-05	3.5E-05	8.7E-08	5.7E-03	5.8E-03	=ldrat42*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr42	9.6E-04						=Xdrat42
Total dose rate	mSv/d	tdr42	6.7E-03						=SUM(Hletdr42)+Lletdr42
Equivalent Doses - Wolverine - LSA									
High LET dose rate	mSv/d	Hletdr43	8.3E-05	7.6E-05	3.4E-04	2.8E-06	1.3E-03	1.8E-03	=ldrat43*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr43	9.6E-04						=Xdrat43
Total dose rate	mSv/d	tdr43	2.8E-03						=SUM(Hletdr43)+Lletdr43
Equivalent Doses - Wolverine - RSA									
High LET dose rate	mSv/d	Hletdr44	8.3E-05	7.6E-05	3.4E-04	2.8E-06	1.3E-03	1.8E-03	=ldrat44*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr44	9.6E-04						=Xdrat44
Total dose rate	mSv/d	tdr44	2.8E-03						=SUM(Hletdr44)+Lletdr44

Table H.2-2
Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

SUMMARY

3 Screening Criterion in mGy/d	Total Absorbed Dose mGy/d	Total Equivalent Dose mSv/d	Index (Absorbed Dose)	Index (Equivalent Dose)
Bear - LSA	1.5E-03	6.0E-03	4.9E-04	2.0E-03
Caribou - LSA	6.7E-03	5.8E-02	2.2E-03	1.9E-02
Caribou - RSA	6.7E-03	5.8E-02	2.2E-03	1.9E-02
Falcon - LSA	7.6E-03	4.3E-02	2.5E-03	1.4E-02
Falcon - RSA	7.6E-03	4.3E-02	2.5E-03	1.4E-02
Fox - LSA	1.3E-03	4.0E-03	4.2E-04	1.3E-03
Lemming - Rock Lake Watershed	4.8E-03	3.0E-02	1.6E-03	1.0E-02
Lemming - JSL @ Kiggavik Discharge	4.8E-03	3.0E-02	1.6E-03	1.0E-02
Lemming - Kiggavik Camp	4.8E-03	3.0E-02	1.6E-03	1.0E-02
Lemming - JSL @ Sissons Discharge	4.8E-03	3.0E-02	1.6E-03	1.0E-02
Lapland Longspur - Rock Lake Watershed	5.5E-03	3.9E-02	1.8E-03	1.3E-02
Lapland Longspur - JSL @ Kiggavik Discharge	5.6E-03	4.0E-02	1.9E-03	1.3E-02
Lapland Longspur - Kiggavik Camp	5.4E-03	3.9E-02	1.8E-03	1.3E-02
Lapland Longspur - JSL @ Sissons Discharge	5.5E-03	3.9E-02	1.8E-03	1.3E-02
Long-Tailed Duck - Rock Lake	7.1E-03	5.9E-02	2.4E-03	2.0E-02
Long-Tailed Duck - JSL @ Kiggavik Discharge	6.9E-03	5.7E-02	2.3E-03	1.9E-02
Long-Tailed Duck - JSL @ Sissons Discharge	7.0E-03	5.8E-02	2.3E-03	1.9E-02
Merganser - Rock Lake	1.7E-03	7.2E-03	5.6E-04	2.4E-03
Merganser - JSL @ Kiggavik Discharge	1.7E-03	6.8E-03	5.5E-04	2.3E-03
Merganser - JSL @ Sissons Discharge	1.7E-03	7.0E-03	5.6E-04	2.3E-03
Muskox - JSL @ Kiggavik Discharge	2.6E-03	1.7E-02	8.5E-04	5.6E-03
Muskox - JSL @ Sissons Discharge	5.5E-03	3.9E-02	1.8E-03	1.3E-02
Northern Pintail - Rock Lake	7.2E-03	5.4E-02	2.4E-03	1.8E-02
Northern Pintail - JSL @ Kiggavik Discharge	7.0E-03	5.2E-02	2.3E-03	1.7E-02
Northern Pintail - JSL @ Sissons Discharge	7.0E-03	5.2E-02	2.3E-03	1.7E-02
Ptarmigan - Rock Lake Watershed	1.4E-02	1.1E-01	4.8E-03	3.8E-02
Ptarmigan - JSL @ Kiggavik Discharge	1.4E-02	1.1E-01	4.8E-03	3.8E-02
Ptarmigan - Kiggavik Camp	1.4E-02	1.1E-01	4.8E-03	3.8E-02
Ptarmigan - JSL @ Sissons Discharge	1.4E-02	1.1E-01	4.8E-03	3.8E-02
Sandpiper - Rock Lake	1.3E-02	1.2E-01	4.5E-03	3.9E-02
Sandpiper - JSL @ Kiggavik Discharge	1.3E-02	1.1E-01	4.3E-03	3.7E-02
Sandpiper - JSL @ Sissons Discharge	1.3E-02	1.1E-01	4.4E-03	3.8E-02
Shrew - Rock Lake Watershed	2.3E-03	1.2E-02	7.7E-04	4.1E-03
Shrew - JSL @ Kiggavik Discharge	2.4E-03	1.3E-02	8.0E-04	4.4E-03
Shrew - Kiggavik Camp	2.2E-03	1.2E-02	7.4E-04	3.9E-03
Shrew - JSL @ Sissons Discharge	1.6E-03	1.2E-02	5.4E-04	4.0E-03
Squirrel - Rock Lake Watershed	3.5E-03	2.2E-02	1.2E-03	7.2E-03
Squirrel - JSL @ Kiggavik Discharge	3.5E-03	2.2E-02	1.2E-03	7.2E-03
Squirrel - Kiggavik Camp	3.5E-03	2.2E-02	1.2E-03	7.2E-03
Squirrel - JSL @ Sissons Discharge	3.5E-03	2.2E-02	1.2E-03	7.2E-03
Wolf - LSA	1.5E-03	6.7E-03	5.1E-04	2.2E-03
Wolf - RSA	1.5E-03	6.7E-03	5.1E-04	2.2E-03
Wolverine - LSA	1.1E-03	2.8E-03	3.8E-04	9.3E-04
Wolverine - RSA	1.1E-03	2.8E-03	3.8E-04	9.3E-04

U-238+ Internal U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235
Ra-226+ Internal Ra-226 + 0.3* (Rn-222 + ...Po-214)
Pb-210+ Internal Pb-210 + Bi-210

Table H.2-2

Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

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DOSES TO SELECTED VECs - Average Total Dose

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Absorbed Doses - Bear - LSA									
Concentration	Bq/g	Crad	1.27E-05	3.35E-05	2.28E-05	5.31E-05	1.79E-03		
Internal Dose Factor	mGy/d per Bq/g	ldcf	1.4E-01	6.6E-02	1.6E-01	6.0E-03	7.4E-02		
Internal dose rate	mGy/d	ldrat	1.8E-06	2.2E-06	3.6E-06	3.2E-07	1.3E-04	1.4E-04	=Crad*ldcf
External Gamma rate	uGy/h	Xgrat	0.04						
Fraction of time on site	-	fts	1.00						
External dose rate	mGy/d	Xdrat	9.6E-04						=Xgrat*24*fts/1000
Internal plus external	mGy/d	tdrat	1.1E-03						=SUM(ldrat)+Xdrat
Absorbed Doses - Caribou - LSA									
Concentration	Bq/g	Crad2	2.99E-05	4.43E-05	8.68E-05	9.05E-04	2.39E-02		
Internal dose rate	mGy/d	ldrat2	4.3E-06	2.9E-06	1.4E-05	5.5E-06	1.8E-03	1.8E-03	=Crad2*ldcf
Fraction of time on site	-	fts2	1.00						
External dose rate	mGy/d	Xdrat2	9.6E-04						=Xgrat*24*fts2/1000
Internal plus external	mGy/d	tdrat2	2.8E-03						=SUM(ldrat2)+Xdrat2
Absorbed Doses - Caribou - RSA									
Concentration	Bq/g	Crad3	2.99E-05	4.43E-05	8.68E-05	9.05E-04	2.39E-02		
Internal dose rate	mGy/d	ldrat3	4.3E-06	2.9E-06	1.4E-05	5.5E-06	1.8E-03	1.8E-03	=Crad3*ldcf
Fraction of time on site	-	fts3	1.00						
External dose rate	mGy/d	Xdrat3	9.6E-04						=Xgrat*24*fts3/1000
Internal plus external	mGy/d	tdrat3	2.8E-03						=SUM(ldrat3)+Xdrat3
Absorbed Doses - Falcon - LSA									
Concentration	Bq/g	Crad4	3.80E-06	1.20E-04	3.99E-04	1.34E-01	1.47E-02		
Internal dose rate	mGy/d	ldrat4	5.4E-07	7.9E-06	6.3E-05	8.1E-04	1.1E-03	2.0E-03	=Crad4*ldcf
Fraction of time on site	-	fts4	1.00						
External dose rate	mGy/d	Xdrat4	9.6E-04						=Xgrat*24*fts4/1000
Internal plus external	mGy/d	tdrat4	2.9E-03						=SUM(ldrat4)+Xdrat4
Absorbed Doses - Falcon - RSA									
Concentration	Bq/g	Crad5	3.79E-06	1.20E-04	3.98E-04	1.34E-01	1.47E-02		
Internal dose rate	mGy/d	ldrat5	5.4E-07	7.9E-06	6.3E-05	8.1E-04	1.1E-03	2.0E-03	=Crad5*ldcf
Fraction of time on site	-	fts5	1.00						
External dose rate	mGy/d	Xdrat5	9.6E-04						=Xgrat*24*fts5/1000
Internal plus external	mGy/d	tdrat5	2.9E-03						=SUM(ldrat5)+Xdrat5
Absorbed Doses - Fox - LSA									
Concentration	Bq/g	Crad6	8.21E-06	2.48E-05	5.34E-05	1.28E-04	1.09E-03		
Internal dose rate	mGy/d	ldrat6	1.2E-06	1.6E-06	8.5E-06	7.7E-07	8.0E-05	9.2E-05	=Crad6*ldcf
Fraction of time on site	-	fts6	1.00						
External dose rate	mGy/d	Xdrat6	9.6E-04						=Xgrat*24*fts6/1000
Internal plus external	mGy/d	tdrat6	1.1E-03						=SUM(ldrat6)+Xdrat6
Absorbed Doses - Lemming - Rock Lake Watershed									
Concentration	Bq/g	Crad7	3.23E-05	1.14E-03	2.26E-03	4.73E-02	6.01E-03		
Internal dose rate	mGy/d	ldrat7	4.6E-06	7.5E-05	3.6E-04	2.8E-04	4.4E-04	1.2E-03	=Crad7*ldcf
Fraction of time on site	-	fts7	1.00						
External dose rate	mGy/d	Xdrat7	9.6E-04						=Xgrat*24*fts7/1000
Internal plus external	mGy/d	tdrat7	2.1E-03						=SUM(ldrat7)+Xdrat7
Absorbed Doses - Lemming - JSL @ Kiggavik Discharge									
Concentration	Bq/g	Crad8	3.23E-05	1.14E-03	2.26E-03	4.73E-02	6.01E-03		
Internal dose rate	mGy/d	ldrat8	4.6E-06	7.5E-05	3.6E-04	2.8E-04	4.4E-04	1.2E-03	=Crad8*ldcf
Fraction of time on site	-	fts8	1.00						
External dose rate	mGy/d	Xdrat8	9.6E-04						=Xgrat*24*fts8/1000
Internal plus external	mGy/d	tdrat8	2.1E-03						=SUM(ldrat8)+Xdrat8
Absorbed Doses - Lemming - Kiggavik Camp									
Concentration	Bq/g	Crad9	3.43E-05	1.15E-03	2.26E-03	4.73E-02	6.02E-03		
Internal dose rate	mGy/d	ldrat9	4.9E-06	7.6E-05	3.6E-04	2.9E-04	4.5E-04	1.2E-03	=Crad9*ldcf
Fraction of time on site	-	fts9	1.00						
External dose rate	mGy/d	Xdrat9	9.6E-04						=Xgrat*24*fts9/1000
Internal plus external	mGy/d	tdrat9	2.1E-03						=SUM(ldrat9)+Xdrat9
Absorbed Doses - Lemming - JSL @ Sissons Discharge									
Concentration	Bq/g	Crad10	3.24E-05	1.14E-03	2.26E-03	4.73E-02	6.01E-03		
Internal dose rate	mGy/d	ldrat10	4.6E-06	7.5E-05	3.6E-04	2.8E-04	4.4E-04	1.2E-03	=Crad10*ldcf
Fraction of time on site	-	fts10	1.00						
External dose rate	mGy/d	Xdrat10	9.6E-04						=Xgrat*24*fts10/1000
Internal plus external	mGy/d	tdrat10	2.1E-03						=SUM(ldrat10)+Xdrat10
Absorbed Doses - Lapland Longspur - Rock Lake Watershed									
Concentration	Bq/g	Crad11	1.15E-05	7.43E-04	1.58E-03	3.56E-02	1.28E-02		
Internal dose rate	mGy/d	ldrat11	1.6E-06	4.9E-05	2.5E-04	2.1E-04	9.5E-04	1.5E-03	=Crad11*ldcf
Fraction of time on site	-	fts11	1.00						
External dose rate	mGy/d	Xdrat11	9.6E-04						=Xgrat*24*fts11/1000
Internal plus external	mGy/d	tdrat11	2.4E-03						=SUM(ldrat11)+Xdrat11

Table H.2-2

Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

Absorbed Doses - Lapland Longspur - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad12	1.27E-05	7.45E-04	1.62E-03	3.59E-02	1.32E-02			
Internal dose rate	mGy/d	ldrat12	1.8E-06	4.9E-05	2.6E-04	2.2E-04	9.8E-04	1.5E-03	=Crad12*ldcf	
Fraction of time on site	-	fts12	1.00							
External dose rate	mGy/d	Xdrat12	9.6E-04						=Xgrat*24*fts12/1000	
Internal plus external	mGy/d	tdrat12	2.5E-03						=SUM(ldrat12)+Xdrat12	
Absorbed Doses - Lapland Longspur - Kiggavik Camp										
Concentration	Bq/g	Crad13	3.57E-06	7.44E-04	1.55E-03	3.54E-02	1.27E-02			
Internal dose rate	mGy/d	ldrat13	5.1E-07	4.9E-05	2.5E-04	2.1E-04	9.4E-04	1.4E-03	=Crad13*ldcf	
Fraction of time on site	-	fts13	1.00							
External dose rate	mGy/d	Xdrat13	9.6E-04						=Xgrat*24*fts13/1000	
Internal plus external	mGy/d	tdrat13	2.4E-03						=SUM(ldrat13)+Xdrat13	
Absorbed Doses - Lapland Longspur - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad14	1.17E-05	7.43E-04	1.58E-03	3.56E-02	1.29E-02			
Internal dose rate	mGy/d	ldrat14	1.7E-06	4.9E-05	2.5E-04	2.1E-04	9.5E-04	1.5E-03	=Crad14*ldcf	
Fraction of time on site	-	fts14	1.00							
External dose rate	mGy/d	Xdrat14	9.6E-04						=Xgrat*24*fts14/1000	
Internal plus external	mGy/d	tdrat14	2.4E-03						=SUM(ldrat14)+Xdrat14	
Absorbed Doses - Long-Tailed Duck - Rock Lake										
Concentration	Bq/g	Crad15	1.95E-05	2.01E-04	2.30E-03	1.99E-02	1.55E-02			
Internal dose rate	mGy/d	ldrat15	2.8E-06	1.3E-05	3.6E-04	1.2E-04	1.1E-03	1.6E-03	=Crad15*ldcf	
Fraction of time on site	-	fts15	1.00							
External dose rate	mGy/d	Xdrat15	9.6E-04						=Xgrat*24*fts15/1000	
Internal plus external	mGy/d	tdrat15	2.6E-03						=SUM(ldrat15)+Xdrat15	
Absorbed Doses - Long-Tailed Duck - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad16	1.85E-05	1.95E-04	2.21E-03	1.92E-02	1.49E-02			
Internal dose rate	mGy/d	ldrat16	2.6E-06	1.3E-05	3.5E-04	1.2E-04	1.1E-03	1.6E-03	=Crad16*ldcf	
Fraction of time on site	-	fts16	1.00							
External dose rate	mGy/d	Xdrat16	9.6E-04						=Xgrat*24*fts16/1000	
Internal plus external	mGy/d	tdrat16	2.5E-03						=SUM(ldrat16)+Xdrat16	
Absorbed Doses - Long-Tailed Duck - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad17	1.81E-05	1.95E-04	2.22E-03	1.93E-02	1.50E-02			
Internal dose rate	mGy/d	ldrat17	2.6E-06	1.3E-05	3.5E-04	1.2E-04	1.1E-03	1.6E-03	=Crad17*ldcf	
Fraction of time on site	-	fts17	1.00							
External dose rate	mGy/d	Xdrat17	9.6E-04						=Xgrat*24*fts17/1000	
Internal plus external	mGy/d	tdrat17	2.6E-03						=SUM(ldrat17)+Xdrat17	
Absorbed Doses - Merganser - Rock Lake										
Concentration	Bq/g	Crad18	2.29E-06	8.27E-05	1.25E-04	6.29E-03	2.11E-03			
Internal dose rate	mGy/d	ldrat18	3.3E-07	5.4E-06	2.0E-05	3.8E-05	1.6E-04	2.2E-04	=Crad18*ldcf	
Fraction of time on site	-	fts18	1.00							
External dose rate	mGy/d	Xdrat18	9.6E-04						=Xgrat*24*fts18/1000	
Internal plus external	mGy/d	tdrat18	1.2E-03						=SUM(ldrat18)+Xdrat18	
Absorbed Doses - Merganser - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad19	2.29E-06	7.96E-05	1.17E-04	6.09E-03	2.00E-03			
Internal dose rate	mGy/d	ldrat19	3.3E-07	5.2E-06	1.9E-05	3.7E-05	1.5E-04	2.1E-04	=Crad19*ldcf	
Fraction of time on site	-	fts19	1.00							
External dose rate	mGy/d	Xdrat19	9.6E-04						=Xgrat*24*fts19/1000	
Internal plus external	mGy/d	tdrat19	1.2E-03						=SUM(ldrat19)+Xdrat19	
Absorbed Doses - Merganser - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad20	2.29E-06	7.99E-05	1.18E-04	6.10E-03	2.02E-03			
Internal dose rate	mGy/d	ldrat20	3.2E-07	5.3E-06	1.9E-05	3.7E-05	1.5E-04	2.1E-04	=Crad20*ldcf	
Fraction of time on site	-	fts20	1.00							
External dose rate	mGy/d	Xdrat20	9.6E-04						=Xgrat*24*fts20/1000	
Internal plus external	mGy/d	tdrat20	1.2E-03						=SUM(ldrat20)+Xdrat20	
Absorbed Doses - Muskox - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad21	3.12E-05	5.03E-05	7.12E-05	2.23E-04	6.91E-03			
Internal dose rate	mGy/d	ldrat21	4.4E-06	3.3E-06	1.1E-05	1.3E-06	5.1E-04	5.3E-04	=Crad21*ldcf	
Fraction of time on site	-	fts21	1.00							
External dose rate	mGy/d	Xdrat21	9.6E-04						=Xgrat*24*fts21/1000	
Internal plus external	mGy/d	tdrat21	1.5E-03						=SUM(ldrat21)+Xdrat21	
Absorbed Doses - Muskox - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad22	1.17E-05	7.43E-04	1.58E-03	3.56E-02	1.29E-02			
Internal dose rate	mGy/d	ldrat22	1.7E-06	4.9E-05	2.5E-04	2.1E-04	9.5E-04	1.5E-03	=Crad22*ldcf	
Fraction of time on site	-	fts22	1.00							
External dose rate	mGy/d	Xdrat22	9.6E-04						=Xgrat*24*fts22/1000	
Internal plus external	mGy/d	tdrat22	2.4E-03						=SUM(ldrat22)+Xdrat22	
Absorbed Doses - Northern Pintail - Rock Lake										
Concentration	Bq/g	Crad23	7.17E-06	1.15E-03	6.60E-04	5.23E-02	1.76E-02			
Internal dose rate	mGy/d	ldrat23	1.0E-06	7.5E-05	1.0E-04	3.2E-04	1.3E-03	1.8E-03	=Crad23*ldcf	
Fraction of time on site	-	fts23	1.00							
External dose rate	mGy/d	Xdrat23	9.6E-04						=Xgrat*24*fts23/1000	
Internal plus external	mGy/d	tdrat23	2.8E-03						=SUM(ldrat23)+Xdrat23	

Table H.2-2

Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

Absorbed Doses - Northern Pintail - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad24	6.94E-06	1.10E-03	6.36E-04	5.04E-02	1.68E-02			
Internal dose rate	mGy/d	Idrat24	9.9E-07	7.2E-05	1.0E-04	3.0E-04	1.2E-03	1.7E-03	=Crad24*Idcf	
Fraction of time on site	-	fts24	1.00							
External dose rate	mGy/d	Xdrat24	9.6E-04						=Xgrat*24*fts24/1000	
Internal plus external	mGy/d	tdrat24	2.7E-03						=SUM(Idrat24)+Xdrat24	
Absorbed Doses - Northern Pintail - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad25	6.74E-06	1.11E-03	6.38E-04	5.06E-02	1.70E-02			
Internal dose rate	mGy/d	Idrat25	9.6E-07	7.3E-05	1.0E-04	3.1E-04	1.3E-03	1.7E-03	=Crad25*Idcf	
Fraction of time on site	-	fts25	1.00							
External dose rate	mGy/d	Xdrat25	9.6E-04						=Xgrat*24*fts25/1000	
Internal plus external	mGy/d	tdrat25	2.7E-03						=SUM(Idrat25)+Xdrat25	
Absorbed Doses - Ptarmigan - Rock Lake Watershed										
Concentration	Bq/g	Crad26	1.15E-05	2.26E-04	6.65E-04	1.38E-01	4.75E-02			
Internal dose rate	mGy/d	Idrat26	1.6E-06	1.5E-05	1.1E-04	8.3E-04	3.5E-03	4.5E-03	=Crad26*Idcf	
Fraction of time on site	-	fts26	1.00							
External dose rate	mGy/d	Xdrat26	9.6E-04						=Xgrat*24*fts26/1000	
Internal plus external	mGy/d	tdrat26	5.4E-03						=SUM(Idrat26)+Xdrat26	
Absorbed Doses - Ptarmigan - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad27	1.19E-05	2.26E-04	6.77E-04	1.38E-01	4.77E-02			
Internal dose rate	mGy/d	Idrat27	1.7E-06	1.5E-05	1.1E-04	8.3E-04	3.5E-03	4.5E-03	=Crad27*Idcf	
Fraction of time on site	-	fts27	1.00							
External dose rate	mGy/d	Xdrat27	9.6E-04						=Xgrat*24*fts27/1000	
Internal plus external	mGy/d	tdrat27	5.4E-03						=SUM(Idrat27)+Xdrat27	
Absorbed Doses - Ptarmigan - Kiggavik Camp										
Concentration	Bq/g	Crad28	9.45E-06	2.27E-04	6.56E-04	1.38E-01	4.76E-02			
Internal dose rate	mGy/d	Idrat28	1.3E-06	1.5E-05	1.0E-04	8.3E-04	3.5E-03	4.5E-03	=Crad28*Idcf	
Fraction of time on site	-	fts28	1.00							
External dose rate	mGy/d	Xdrat28	9.6E-04						=Xgrat*24*fts28/1000	
Internal plus external	mGy/d	tdrat28	5.4E-03						=SUM(Idrat28)+Xdrat28	
Absorbed Doses - Ptarmigan - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad29	1.16E-05	2.26E-04	6.64E-04	1.38E-01	4.76E-02			
Internal dose rate	mGy/d	Idrat29	1.6E-06	1.5E-05	1.1E-04	8.3E-04	3.5E-03	4.5E-03	=Crad29*Idcf	
Fraction of time on site	-	fts29	1.00							
External dose rate	mGy/d	Xdrat29	9.6E-04						=Xgrat*24*fts29/1000	
Internal plus external	mGy/d	tdrat29	5.4E-03						=SUM(Idrat29)+Xdrat29	
Absorbed Doses - Sandpiper - Rock Lake										
Concentration	Bq/g	Crad30	4.85E-05	7.57E-04	3.86E-03	5.69E-02	3.46E-02			
Internal dose rate	mGy/d	Idrat30	6.9E-06	5.0E-05	6.1E-04	3.4E-04	2.6E-03	3.6E-03	=Crad30*Idcf	
Fraction of time on site	-	fts30	1.00							
External dose rate	mGy/d	Xdrat30	9.6E-04						=Xgrat*24*fts30/1000	
Internal plus external	mGy/d	tdrat30	4.5E-03						=SUM(Idrat30)+Xdrat30	
Absorbed Doses - Sandpiper - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad31	4.69E-05	7.45E-04	3.72E-03	5.55E-02	3.32E-02			
Internal dose rate	mGy/d	Idrat31	6.7E-06	4.9E-05	5.9E-04	3.3E-04	2.5E-03	3.4E-03	=Crad31*Idcf	
Fraction of time on site	-	fts31	1.00							
External dose rate	mGy/d	Xdrat31	9.6E-04						=Xgrat*24*fts31/1000	
Internal plus external	mGy/d	tdrat31	4.4E-03						=SUM(Idrat31)+Xdrat31	
Absorbed Doses - Sandpiper - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad32	4.58E-05	7.45E-04	3.74E-03	5.55E-02	3.34E-02			
Internal dose rate	mGy/d	Idrat32	6.5E-06	4.9E-05	5.9E-04	3.3E-04	2.5E-03	3.5E-03	=Crad32*Idcf	
Fraction of time on site	-	fts32	1.00							
External dose rate	mGy/d	Xdrat32	9.6E-04						=Xgrat*24*fts32/1000	
Internal plus external	mGy/d	tdrat32	4.4E-03						=SUM(Idrat32)+Xdrat32	
Absorbed Doses - Shrew - Rock Lake Watershed										
Concentration	Bq/g	Crad33	3.27E-05	1.90E-04	1.27E-03	1.12E-02	2.07E-03			
Internal dose rate	mGy/d	Idrat33	4.6E-06	1.3E-05	2.0E-04	6.8E-05	1.5E-04	4.4E-04	=Crad33*Idcf	
Fraction of time on site	-	fts33	1.00							
External dose rate	mGy/d	Xdrat33	9.6E-04						=Xgrat*24*fts33/1000	
Internal plus external	mGy/d	tdrat33	1.4E-03						=SUM(Idrat33)+Xdrat33	
Absorbed Doses - Shrew - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad34	3.69E-05	2.00E-04	1.37E-03	1.13E-02	2.12E-03			
Internal dose rate	mGy/d	Idrat34	5.2E-06	1.3E-05	2.2E-04	6.8E-05	1.6E-04	4.6E-04	=Crad34*Idcf	
Fraction of time on site	-	fts34	1.00							
External dose rate	mGy/d	Xdrat34	9.6E-04						=Xgrat*24*fts34/1000	
Internal plus external	mGy/d	tdrat34	1.4E-03						=SUM(Idrat34)+Xdrat34	
Absorbed Doses - Shrew - Kiggavik Camp										
Concentration	Bq/g	Crad35	3.15E-06	1.85E-04	1.18E-03	1.11E-02	2.05E-03			
Internal dose rate	mGy/d	Idrat35	4.5E-07	1.2E-05	1.9E-04	6.7E-05	1.5E-04	4.2E-04	=Crad35*Idcf	
Fraction of time on site	-	fts35	1.00							
External dose rate	mGy/d	Xdrat35	9.6E-04						=Xgrat*24*fts35/1000	
Internal plus external	mGy/d	tdrat35	1.4E-03						=SUM(Idrat35)+Xdrat35	
Absorbed Doses - Shrew - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad36	3.34E-05	1.91E-04	1.26E-03	1.12E-02	2.08E-03			
Internal dose rate	mGy/d	Idrat36	4.7E-06	1.3E-05	2.0E-04	6.8E-05	1.5E-04	4.4E-04	=Crad36*Idcf	
Fraction of time on site	-	fts36	1.00							

Table H.2-2
Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

External dose rate	mGy/d	Xdrat36	2.7E-04							=Xgrat*24*fts36/3600
Internal plus external	mGy/d	tdrat36	7.1E-04							=SUM(ldrat36)+Xdrat36
Absorbed Doses - Squirrel - Rock Lake Watershed										
Concentration	Bq/g	Crad37	2.70E-05	9.88E-04	1.48E-03	1.97E-02	2.34E-03			
Internal dose rate	mGy/d	ldrat37	3.8E-06	6.5E-05	2.4E-04	1.2E-04	1.7E-04	6.0E-04		=Crad37*ldcf
Fraction of time on site	-	fts37	1.00							
External dose rate	mGy/d	Xdrat37	9.6E-04							=Xgrat*24*fts37/1000
Internal plus external	mGy/d	tdrat37	1.6E-03							=SUM(ldrat37)+Xdrat37
Absorbed Doses - Squirrel - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad38	2.70E-05	9.87E-04	1.48E-03	1.97E-02	2.34E-03			
Internal dose rate	mGy/d	ldrat38	3.8E-06	6.5E-05	2.4E-04	1.2E-04	1.7E-04	6.0E-04		=Crad38*ldcf
Fraction of time on site	-	fts38	1.00							
External dose rate	mGy/d	Xdrat38	9.6E-04							=Xgrat*24*fts38/1000
Internal plus external	mGy/d	tdrat38	1.6E-03							=SUM(ldrat38)+Xdrat38
Absorbed Doses - Squirrel - Kiggavik Camp										
Concentration	Bq/g	Crad39	2.87E-05	9.95E-04	1.49E-03	1.97E-02	2.35E-03			
Internal dose rate	mGy/d	ldrat39	4.1E-06	6.5E-05	2.4E-04	1.2E-04	1.7E-04	6.0E-04		=Crad39*ldcf
Fraction of time on site	-	fts39	1.00							
External dose rate	mGy/d	Xdrat39	9.6E-04							=Xgrat*24*fts39/1000
Internal plus external	mGy/d	tdrat39	1.6E-03							=SUM(ldrat39)+Xdrat39

Table H.2-2
Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

Absorbed Doses - Squirrel - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad40	2.71E-05	9.88E-04	1.48E-03	1.97E-02	2.34E-03			
Internal dose rate	mGy/d	Idrat40	3.8E-06	6.5E-05	2.4E-04	1.2E-04	1.7E-04	6.0E-04	=Crad40*Idcf	
Fraction of time on site	-	fts40	1.00							
External dose rate	mGy/d	Xdrat40	9.6E-04						=Xgrat*24*fts40/1000	
Internal plus external	mGy/d	tdrat40	1.6E-03						=SUM(Idrat40)+Xdrat40	
Absorbed Doses - Wolf - LSA										
Concentration	Bq/g	Crad41	1.16E-05	9.61E-06	6.02E-06	3.68E-06	1.90E-03			
Internal dose rate	mGy/d	Idrat41	1.6E-06	6.3E-07	9.6E-07	2.2E-08	1.4E-04	1.4E-04	=Crad41*Idcf	
Fraction of time on site	-	fts41	1.00							
External dose rate	mGy/d	Xdrat41	9.6E-04						=Xgrat*24*fts41/1000	
Internal plus external	mGy/d	tdrat41	1.1E-03						=SUM(Idrat41)+Xdrat41	
Absorbed Doses - Wolf - RSA										
Concentration	Bq/g	Crad42	1.16E-05	9.60E-06	6.02E-06	3.68E-06	1.90E-03			
Internal dose rate	mGy/d	Idrat42	1.6E-06	6.3E-07	9.6E-07	2.2E-08	1.4E-04	1.4E-04	=Crad42*Idcf	
Fraction of time on site	-	fts42	1.00							
External dose rate	mGy/d	Xdrat42	9.6E-04						=Xgrat*24*fts42/1000	
Internal plus external	mGy/d	tdrat42	1.1E-03						=SUM(Idrat42)+Xdrat42	
Absorbed Doses - Wolverine - LSA										
Concentration	Bq/g	Crad43	1.56E-05	3.36E-05	5.34E-05	1.05E-04	4.77E-04			
Internal dose rate	mGy/d	Idrat43	2.2E-06	2.2E-06	8.5E-06	6.3E-07	3.5E-05	4.9E-05	=Crad43*Idcf	
Fraction of time on site	-	fts43	1.00							
External dose rate	mGy/d	Xdrat43	9.6E-04						=Xgrat*24*fts43/1000	
Internal plus external	mGy/d	tdrat43	1.0E-03						=SUM(Idrat43)+Xdrat43	
Absorbed Doses - Wolverine - RSA										
Concentration	Bq/g	Crad44	1.56E-05	3.37E-05	5.34E-05	1.05E-04	4.77E-04			
Internal dose rate	mGy/d	Idrat44	2.2E-06	2.2E-06	8.5E-06	6.3E-07	3.5E-05	4.9E-05	=Crad44*Idcf	
Fraction of time on site	-	fts44	1.00							
External dose rate	mGy/d	Xdrat44	9.6E-04						=Xgrat*24*fts44/1000	
Internal plus external	mGy/d	tdrat44	1.0E-03						=SUM(Idrat44)+Xdrat44	
Equivalent Doses - Bear - LSA										
RBE for alpha	Sv/Gy	RBE	10							
High LET dose rate	mSv/d	Hletdr	1.8E-05	2.2E-05	3.6E-05	3.2E-07	1.3E-03	1.4E-03	=Idrat*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr	9.6E-04						=Xdrat	
Total dose rate	mSv/d	tdr	2.4E-03						=SUM(Hletdr)+Lletdr	
Equivalent Doses - Caribou - LSA										
High LET dose rate	mSv/d	Hletdr2	4.3E-05	2.9E-05	1.4E-04	5.5E-06	1.8E-02	1.8E-02	=Idrat2*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr2	9.6E-04						=Xdrat2	
Total dose rate	mSv/d	tdr2	1.9E-02						=SUM(Hletdr2)+Lletdr2	
Equivalent Doses - Caribou - RSA										
High LET dose rate	mSv/d	Hletdr3	4.3E-05	2.9E-05	1.4E-04	5.5E-06	1.8E-02	1.8E-02	=Idrat3*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr3	9.6E-04						=Xdrat3	
Total dose rate	mSv/d	tdr3	1.9E-02						=SUM(Hletdr3)+Lletdr3	
Equivalent Doses - Falcon - LSA										
High LET dose rate	mSv/d	Hletdr4	5.4E-06	7.9E-05	6.3E-04	8.1E-04	1.1E-02	1.2E-02	=Idrat4*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr4	9.6E-04						=Xdrat4	
Total dose rate	mSv/d	tdr4	1.3E-02						=SUM(Hletdr4)+Lletdr4	
Equivalent Doses - Falcon - RSA										
High LET dose rate	mSv/d	Hletdr5	5.4E-06	7.9E-05	6.3E-04	8.1E-04	1.1E-02	1.2E-02	=Idrat5*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr5	9.6E-04						=Xdrat5	
Total dose rate	mSv/d	tdr5	1.3E-02						=SUM(Hletdr5)+Lletdr5	
Equivalent Doses - Fox - LSA										
High LET dose rate	mSv/d	Hletdr6	1.2E-05	1.6E-05	8.5E-05	7.7E-07	8.0E-04	9.2E-04	=Idrat6*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr6	9.6E-04						=Xdrat6	
Total dose rate	mSv/d	tdr6	1.9E-03						=SUM(Hletdr6)+Lletdr6	
Equivalent Doses - Lemming - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr7	4.6E-05	7.5E-04	3.6E-03	2.8E-04	4.4E-03	9.1E-03	=Idrat7*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr7	9.6E-04						=Xdrat7	
Total dose rate	mSv/d	tdr7	1.0E-02						=SUM(Hletdr7)+Lletdr7	
Equivalent Doses - Lemming - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr8	4.6E-05	7.5E-04	3.6E-03	2.8E-04	4.4E-03	9.1E-03	=Idrat8*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr8	9.6E-04						=Xdrat8	
Total dose rate	mSv/d	tdr8	1.0E-02						=SUM(Hletdr8)+Lletdr8	
Equivalent Doses - Lemming - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr9	4.9E-05	7.6E-04	3.6E-03	2.9E-04	4.5E-03	9.1E-03	=Idrat9*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr9	9.6E-04						=Xdrat9	
Total dose rate	mSv/d	tdr9	1.0E-02						=SUM(Hletdr9)+Lletdr9	
Equivalent Doses - Lemming - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr10	4.6E-05	7.5E-04	3.6E-03	2.8E-04	4.4E-03	9.1E-03	=Idrat10*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr10	9.6E-04						=Xdrat10	
Total dose rate	mSv/d	tdr10	1.0E-02						=SUM(Hletdr10)+Lletdr10	

Table H.2-2

Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

Equivalent Doses - Lapland Longspur - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr11	1.6E-05	4.9E-04	2.5E-03	2.1E-04	9.5E-03	1.3E-02	=Idrat11*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr11	9.6E-04						=Xdrat11	
Total dose rate	mSv/d	tdr11	1.4E-02						=SUM(Hletdr11)+Lletdr11	
Equivalent Doses - Lapland Longspur - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr12	1.8E-05	4.9E-04	2.6E-03	2.2E-04	9.8E-03	1.3E-02	=Idrat12*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr12	9.6E-04						=Xdrat12	
Total dose rate	mSv/d	tdr12	1.4E-02						=SUM(Hletdr12)+Lletdr12	
Equivalent Doses - Lapland Longspur - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr13	5.1E-06	4.9E-04	2.5E-03	2.1E-04	9.4E-03	1.3E-02	=Idrat13*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr13	9.6E-04						=Xdrat13	
Total dose rate	mSv/d	tdr13	1.3E-02						=SUM(Hletdr13)+Lletdr13	
Equivalent Doses - Lapland Longspur - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr14	1.7E-05	4.9E-04	2.5E-03	2.1E-04	9.5E-03	1.3E-02	=Idrat14*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr14	9.6E-04						=Xdrat14	
Total dose rate	mSv/d	tdr14	1.4E-02						=SUM(Hletdr14)+Lletdr14	
Equivalent Doses - Long-Tailed Duck - Rock Lake										
High LET dose rate	mSv/d	Hletdr15	2.8E-05	1.3E-04	3.6E-03	1.2E-04	1.1E-02	1.5E-02	=Idrat15*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr15	9.6E-04						=Xdrat15	
Total dose rate	mSv/d	tdr15	1.6E-02						=SUM(Hletdr15)+Lletdr15	
Equivalent Doses - Long-Tailed Duck - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr16	2.6E-05	1.3E-04	3.5E-03	1.2E-04	1.1E-02	1.5E-02	=Idrat16*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr16	9.6E-04						=Xdrat16	
Total dose rate	mSv/d	tdr16	1.6E-02						=SUM(Hletdr16)+Lletdr16	
Equivalent Doses - Long-Tailed Duck - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr17	2.6E-05	1.3E-04	3.5E-03	1.2E-04	1.1E-02	1.5E-02	=Idrat17*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr17	9.6E-04						=Xdrat17	
Total dose rate	mSv/d	tdr17	1.6E-02						=SUM(Hletdr17)+Lletdr17	
Equivalent Doses - Merganser - Rock Lake										
High LET dose rate	mSv/d	Hletdr18	3.3E-06	5.4E-05	2.0E-04	3.8E-05	1.6E-03	1.9E-03	=Idrat18*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr18	9.6E-04						=Xdrat18	
Total dose rate	mSv/d	tdr18	2.8E-03						=SUM(Hletdr18)+Lletdr18	
Equivalent Doses - Merganser - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr19	3.3E-06	5.2E-05	1.9E-04	3.7E-05	1.5E-03	1.8E-03	=Idrat19*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr19	9.6E-04						=Xdrat19	
Total dose rate	mSv/d	tdr19	2.7E-03						=SUM(Hletdr19)+Lletdr19	
Equivalent Doses - Merganser - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr20	3.2E-06	5.3E-05	1.9E-04	3.7E-05	1.5E-03	1.8E-03	=Idrat20*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr20	9.6E-04						=Xdrat20	
Total dose rate	mSv/d	tdr20	2.7E-03						=SUM(Hletdr20)+Lletdr20	
Equivalent Doses - Muskox - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr21	4.4E-05	3.3E-05	1.1E-04	1.3E-06	5.1E-03	5.3E-03	=Idrat21*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr21	9.6E-04						=Xdrat21	
Total dose rate	mSv/d	tdr21	6.3E-03						=SUM(Hletdr21)+Lletdr21	
Equivalent Doses - Muskox - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr22	1.7E-05	4.9E-04	2.5E-03	2.1E-04	9.5E-03	1.3E-02	=Idrat22*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr22	9.6E-04						=Xdrat22	
Total dose rate	mSv/d	tdr22	1.4E-02						=SUM(Hletdr22)+Lletdr22	
Equivalent Doses - Northern Pintail - Rock Lake										
High LET dose rate	mSv/d	Hletdr23	1.0E-05	7.5E-04	1.0E-03	3.2E-04	1.3E-02	1.5E-02	=Idrat23*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr23	9.6E-04						=Xdrat23	
Total dose rate	mSv/d	tdr23	1.6E-02						=SUM(Hletdr23)+Lletdr23	
Equivalent Doses - Northern Pintail - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr24	9.9E-06	7.2E-04	1.0E-03	3.0E-04	1.2E-02	1.5E-02	=Idrat24*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr24	9.6E-04						=Xdrat24	
Total dose rate	mSv/d	tdr24	1.5E-02						=SUM(Hletdr24)+Lletdr24	
Equivalent Doses - Northern Pintail - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr25	9.6E-06	7.3E-04	1.0E-03	3.1E-04	1.3E-02	1.5E-02	=Idrat25*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr25	9.6E-04						=Xdrat25	
Total dose rate	mSv/d	tdr25	1.6E-02						=SUM(Hletdr25)+Lletdr25	
Equivalent Doses - Ptarmigan - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr26	1.6E-05	1.5E-04	1.1E-03	8.3E-04	3.5E-02	3.7E-02	=Idrat26*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr26	9.6E-04						=Xdrat26	
Total dose rate	mSv/d	tdr26	3.8E-02						=SUM(Hletdr26)+Lletdr26	
Equivalent Doses - Ptarmigan - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr27	1.7E-05	1.5E-04	1.1E-03	8.3E-04	3.5E-02	3.7E-02	=Idrat27*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr27	9.6E-04						=Xdrat27	
Total dose rate	mSv/d	tdr27	3.8E-02						=SUM(Hletdr27)+Lletdr27	

Table H.2-2

Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

Equivalent Doses - Ptarmigan - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr28	1.3E-05	1.5E-04	1.0E-03	8.3E-04	3.5E-02	3.7E-02	=Idrat28*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr28	9.6E-04						=Xdrat28	
Total dose rate	mSv/d	tdr28	3.8E-02						=SUM(Hletdr28)+Lletdr28	
Equivalent Doses - Ptarmigan - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr29	1.6E-05	1.5E-04	1.1E-03	8.3E-04	3.5E-02	3.7E-02	=Idrat29*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr29	9.6E-04						=Xdrat29	
Total dose rate	mSv/d	tdr29	3.8E-02						=SUM(Hletdr29)+Lletdr29	
Equivalent Doses - Sandpiper - Rock Lake										
High LET dose rate	mSv/d	Hletdr30	6.9E-05	5.0E-04	6.1E-03	3.4E-04	2.6E-02	3.3E-02	=Idrat30*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr30	9.6E-04						=Xdrat30	
Total dose rate	mSv/d	tdr30	3.4E-02						=SUM(Hletdr30)+Lletdr30	
Equivalent Doses - Sandpiper - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr31	6.7E-05	4.9E-04	5.9E-03	3.3E-04	2.5E-02	3.1E-02	=Idrat31*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr31	9.6E-04						=Xdrat31	
Total dose rate	mSv/d	tdr31	3.2E-02						=SUM(Hletdr31)+Lletdr31	
Equivalent Doses - Sandpiper - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr32	6.5E-05	4.9E-04	5.9E-03	3.3E-04	2.5E-02	3.2E-02	=Idrat32*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr32	9.6E-04						=Xdrat32	
Total dose rate	mSv/d	tdr32	3.3E-02						=SUM(Hletdr32)+Lletdr32	
Equivalent Doses - Shrew - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr33	4.6E-05	1.3E-04	2.0E-03	6.8E-05	1.5E-03	3.8E-03	=Idrat33*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr33	9.6E-04						=Xdrat33	
Total dose rate	mSv/d	tdr33	4.8E-03						=SUM(Hletdr33)+Lletdr33	
Equivalent Doses - Shrew - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr34	5.2E-05	1.3E-04	2.2E-03	6.8E-05	1.6E-03	4.0E-03	=Idrat34*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr34	9.6E-04						=Xdrat34	
Total dose rate	mSv/d	tdr34	5.0E-03						=SUM(Hletdr34)+Lletdr34	
Equivalent Doses - Shrew - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr35	4.5E-06	1.2E-04	1.9E-03	6.7E-05	1.5E-03	3.6E-03	=Idrat35*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr35	9.6E-04						=Xdrat35	
Total dose rate	mSv/d	tdr35	4.5E-03						=SUM(Hletdr35)+Lletdr35	
Equivalent Doses - Shrew - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr36	4.7E-05	1.3E-04	2.0E-03	6.8E-05	1.5E-03	3.8E-03	=Idrat36*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr36	2.7E-04						=Xdrat36	
Total dose rate	mSv/d	tdr36	4.1E-03						=SUM(Hletdr36)+Lletdr36	
Equivalent Doses - Squirrel - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr37	3.8E-05	6.5E-04	2.4E-03	1.2E-04	1.7E-03	4.9E-03	=Idrat37*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr37	9.6E-04						=Xdrat37	
Total dose rate	mSv/d	tdr37	5.9E-03						=SUM(Hletdr37)+Lletdr37	
Equivalent Doses - Squirrel - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr38	3.8E-05	6.5E-04	2.4E-03	1.2E-04	1.7E-03	4.9E-03	=Idrat38*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr38	9.6E-04						=Xdrat38	
Total dose rate	mSv/d	tdr38	5.9E-03						=SUM(Hletdr38)+Lletdr38	
Equivalent Doses - Squirrel - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr39	4.1E-05	6.5E-04	2.4E-03	1.2E-04	1.7E-03	4.9E-03	=Idrat39*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr39	9.6E-04						=Xdrat39	
Total dose rate	mSv/d	tdr39	5.9E-03						=SUM(Hletdr39)+Lletdr39	
Equivalent Doses - Squirrel - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr40	3.8E-05	6.5E-04	2.4E-03	1.2E-04	1.7E-03	4.9E-03	=Idrat40*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr40	9.6E-04						=Xdrat40	
Total dose rate	mSv/d	tdr40	5.9E-03						=SUM(Hletdr40)+Lletdr40	
Equivalent Doses - Wolf - LSA										
High LET dose rate	mSv/d	Hletdr41	1.6E-05	6.3E-06	9.6E-06	2.2E-08	1.4E-03	1.4E-03	=Idrat41*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr41	9.6E-04						=Xdrat41	
Total dose rate	mSv/d	tdr41	2.4E-03						=SUM(Hletdr41)+Lletdr41	
Equivalent Doses - Wolf - RSA										
High LET dose rate	mSv/d	Hletdr42	1.6E-05	6.3E-06	9.6E-06	2.2E-08	1.4E-03	1.4E-03	=Idrat42*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr42	9.6E-04						=Xdrat42	
Total dose rate	mSv/d	tdr42	2.4E-03						=SUM(Hletdr42)+Lletdr42	
Equivalent Doses - Wolverine - LSA										
High LET dose rate	mSv/d	Hletdr43	2.2E-05	2.2E-05	8.5E-05	6.3E-07	3.5E-04	4.8E-04	=Idrat43*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr43	9.6E-04						=Xdrat43	
Total dose rate	mSv/d	tdr43	1.4E-03						=SUM(Hletdr43)+Lletdr43	
Equivalent Doses - Wolverine - RSA										
High LET dose rate	mSv/d	Hletdr44	2.2E-05	2.2E-05	8.5E-05	6.3E-07	3.5E-04	4.8E-04	=Idrat44*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr44	9.6E-04						=Xdrat44	
Total dose rate	mSv/d	tdr44	1.4E-03						=SUM(Hletdr44)+Lletdr44	

Table H.2-2
Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

SUMMARY

3 Screening Criterion in mGy/d	Total Absorbed Dose mGy/d	Total Equivalent Dose mSv/d	Index (Absorbed Dose)	Index (Equivalent Dose)
Bear - LSA	1.1E-03	2.4E-03	3.7E-04	7.9E-04
Caribou - LSA	2.8E-03	1.9E-02	9.2E-04	6.3E-03
Caribou - RSA	2.8E-03	1.9E-02	9.2E-04	6.3E-03
Falcon - LSA	2.9E-03	1.3E-02	9.8E-04	4.4E-03
Falcon - RSA	2.9E-03	1.3E-02	9.8E-04	4.4E-03
Fox - LSA	1.1E-03	1.9E-03	3.5E-04	6.3E-04
Lemming - Rock Lake Watershed	2.1E-03	1.0E-02	7.1E-04	3.4E-03
Lemming - JSL @ Kiggavik Discharge	2.1E-03	1.0E-02	7.1E-04	3.4E-03
Lemming - Kiggavik Camp	2.1E-03	1.0E-02	7.1E-04	3.4E-03
Lemming - JSL @ Sissons Discharge	2.1E-03	1.0E-02	7.1E-04	3.4E-03
Lapland Longspur - Rock Lake Watershed	2.4E-03	1.4E-02	8.1E-04	4.6E-03
Lapland Longspur - JSL @ Kiggavik Discharge	2.5E-03	1.4E-02	8.2E-04	4.7E-03
Lapland Longspur - Kiggavik Camp	2.4E-03	1.3E-02	8.0E-04	4.5E-03
Lapland Longspur - JSL @ Sissons Discharge	2.4E-03	1.4E-02	8.1E-04	4.6E-03
Long-Tailed Duck - Rock Lake	2.6E-03	1.6E-02	8.7E-04	5.5E-03
Long-Tailed Duck - JSL @ Kiggavik Discharge	2.5E-03	1.6E-02	8.5E-04	5.2E-03
Long-Tailed Duck - JSL @ Sissons Discharge	2.6E-03	1.6E-02	8.5E-04	5.3E-03
Merganser - Rock Lake	1.2E-03	2.8E-03	3.9E-04	9.4E-04
Merganser - JSL @ Kiggavik Discharge	1.2E-03	2.7E-03	3.9E-04	9.1E-04
Merganser - JSL @ Sissons Discharge	1.2E-03	2.7E-03	3.9E-04	9.1E-04
Muskox - JSL @ Kiggavik Discharge	1.5E-03	6.3E-03	5.0E-04	2.1E-03
Muskox - JSL @ Sissons Discharge	2.4E-03	1.4E-02	8.1E-04	4.6E-03
Northern Pintail - Rock Lake	2.8E-03	1.6E-02	9.2E-04	5.4E-03
Northern Pintail - JSL @ Kiggavik Discharge	2.7E-03	1.5E-02	8.9E-04	5.2E-03
Northern Pintail - JSL @ Sissons Discharge	2.7E-03	1.6E-02	9.0E-04	5.2E-03
Ptarmigan - Rock Lake Watershed	5.4E-03	3.8E-02	1.8E-03	1.3E-02
Ptarmigan - JSL @ Kiggavik Discharge	5.4E-03	3.8E-02	1.8E-03	1.3E-02
Ptarmigan - Kiggavik Camp	5.4E-03	3.8E-02	1.8E-03	1.3E-02
Ptarmigan - JSL @ Sissons Discharge	5.4E-03	3.8E-02	1.8E-03	1.3E-02
Sandpiper - Rock Lake	4.5E-03	3.4E-02	1.5E-03	1.1E-02
Sandpiper - JSL @ Kiggavik Discharge	4.4E-03	3.2E-02	1.5E-03	1.1E-02
Sandpiper - JSL @ Sissons Discharge	4.4E-03	3.3E-02	1.5E-03	1.1E-02
Shrew - Rock Lake Watershed	1.4E-03	4.8E-03	4.7E-04	1.6E-03
Shrew - JSL @ Kiggavik Discharge	1.4E-03	5.0E-03	4.7E-04	1.7E-03
Shrew - Kiggavik Camp	1.4E-03	4.5E-03	4.6E-04	1.5E-03
Shrew - JSL @ Sissons Discharge	7.1E-04	4.1E-03	2.4E-04	1.4E-03
Squirrel - Rock Lake Watershed	1.6E-03	5.9E-03	5.2E-04	2.0E-03
Squirrel - JSL @ Kiggavik Discharge	1.6E-03	5.9E-03	5.2E-04	2.0E-03
Squirrel - Kiggavik Camp	1.6E-03	5.9E-03	5.2E-04	2.0E-03
Squirrel - JSL @ Sissons Discharge	1.6E-03	5.9E-03	5.2E-04	2.0E-03
Wolf - LSA	1.1E-03	2.4E-03	3.7E-04	8.0E-04
Wolf - RSA	1.1E-03	2.4E-03	3.7E-04	8.0E-04
Wolverine - LSA	1.0E-03	1.4E-03	3.4E-04	4.8E-04
Wolverine - RSA	1.0E-03	1.4E-03	3.4E-04	4.8E-04

U-238+ Internal U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235
Ra-226+ Internal Ra-226 + 0.3* (Rn-222 + ...Po-214)
Pb-210+ Internal Pb-210 + Bi-210

Table H.2-2

Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

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DOSES TO SELECTED VECs - 95th Percentile Total Dose

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals		
Absorbed Doses - Bear - LSA										
Concentration	Bq/g	Crad	3.88E-05	1.51E-04	6.99E-05	1.74E-04	6.44E-03			
Internal Dose Factor	mGy/d per Bq/g	ldcf	1.4E-01	6.6E-02	1.6E-01	6.0E-03	7.4E-02			
Internal dose rate	mGy/d	ldrat	5.5E-06	9.9E-06	1.1E-05	1.1E-06	4.8E-04	5.0E-04	=Crad*ldcf	
External Gamma rate	uGy/h	Xgrat	0.04							
Fraction of time on site	-	fts	1.00							
External dose rate	mGy/d	Xdrat	9.6E-04						=Xgrat*24*fts/1000	
Internal plus external	mGy/d	tdrat	1.5E-03						=SUM(ldrat)+Xdrat	
Absorbed Doses - Caribou - LSA										
Concentration	Bq/g	Crad2	8.62E-05	1.33E-04	2.95E-04	2.53E-03	7.65E-02			
Internal dose rate	mGy/d	ldrat2	1.2E-05	8.7E-06	4.7E-05	1.5E-05	5.7E-03	5.7E-03	=Crad2*ldcf	
Fraction of time on site	-	fts2	1.00							
External dose rate	mGy/d	Xdrat2	9.6E-04						=Xgrat*24*fts2/1000	
Internal plus external	mGy/d	tdrat2	6.7E-03						=SUM(ldrat2)+Xdrat2	
Absorbed Doses - Caribou - RSA										
Concentration	Bq/g	Crad3	8.62E-05	1.33E-04	2.95E-04	2.53E-03	7.65E-02			
Internal dose rate	mGy/d	ldrat3	1.2E-05	8.7E-06	4.7E-05	1.5E-05	5.7E-03	5.7E-03	=Crad3*ldcf	
Fraction of time on site	-	fts3	1.00							
External dose rate	mGy/d	Xdrat3	9.6E-04						=Xgrat*24*fts3/1000	
Internal plus external	mGy/d	tdrat3	6.7E-03						=SUM(ldrat3)+Xdrat3	
Absorbed Doses - Falcon - LSA										
Concentration	Bq/g	Crad4	1.15E-05	3.57E-04	1.38E-03	4.40E-01	5.01E-02			
Internal dose rate	mGy/d	ldrat4	1.6E-06	2.3E-05	2.2E-04	2.7E-03	3.7E-03	6.6E-03	=Crad4*ldcf	
Fraction of time on site	-	fts4	1.00							
External dose rate	mGy/d	Xdrat4	9.6E-04						=Xgrat*24*fts4/1000	
Internal plus external	mGy/d	tdrat4	7.6E-03						=SUM(ldrat4)+Xdrat4	
Absorbed Doses - Falcon - RSA										
Concentration	Bq/g	Crad5	1.14E-05	3.56E-04	1.38E-03	4.40E-01	5.00E-02			
Internal dose rate	mGy/d	ldrat5	1.6E-06	2.3E-05	2.2E-04	2.7E-03	3.7E-03	6.6E-03	=Crad5*ldcf	
Fraction of time on site	-	fts5	1.00							
External dose rate	mGy/d	Xdrat5	9.6E-04						=Xgrat*24*fts5/1000	
Internal plus external	mGy/d	tdrat5	7.6E-03						=SUM(ldrat5)+Xdrat5	
Absorbed Doses - Fox - LSA										
Concentration	Bq/g	Crad6	2.02E-05	7.95E-05	1.30E-04	5.17E-04	3.66E-03			
Internal dose rate	mGy/d	ldrat6	2.9E-06	5.2E-06	2.1E-05	3.1E-06	2.7E-04	3.0E-04	=Crad6*ldcf	
Fraction of time on site	-	fts6	1.00							
External dose rate	mGy/d	Xdrat6	9.6E-04						=Xgrat*24*fts6/1000	
Internal plus external	mGy/d	tdrat6	1.3E-03						=SUM(ldrat6)+Xdrat6	
Absorbed Doses - Lemming - Rock Lake Watershed										
Concentration	Bq/g	Crad7	1.50E-04	3.56E-03	6.36E-03	1.69E-01	2.09E-02			
Internal dose rate	mGy/d	ldrat7	2.1E-05	2.3E-04	1.0E-03	1.0E-03	1.5E-03	3.8E-03	=Crad7*ldcf	
Fraction of time on site	-	fts7	1.00							
External dose rate	mGy/d	Xdrat7	9.6E-04						=Xgrat*24*fts7/1000	
Internal plus external	mGy/d	tdrat7	4.8E-03						=SUM(ldrat7)+Xdrat7	
Absorbed Doses - Lemming - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad8	1.50E-04	3.56E-03	6.36E-03	1.69E-01	2.09E-02			
Internal dose rate	mGy/d	ldrat8	2.1E-05	2.3E-04	1.0E-03	1.0E-03	1.5E-03	3.8E-03	=Crad8*ldcf	
Fraction of time on site	-	fts8	1.00							
External dose rate	mGy/d	Xdrat8	9.6E-04						=Xgrat*24*fts8/1000	
Internal plus external	mGy/d	tdrat8	4.8E-03						=SUM(ldrat8)+Xdrat8	
Absorbed Doses - Lemming - Kiggavik Camp										
Concentration	Bq/g	Crad9	1.53E-04	3.58E-03	6.37E-03	1.69E-01	2.09E-02			
Internal dose rate	mGy/d	ldrat9	2.2E-05	2.4E-04	1.0E-03	1.0E-03	1.5E-03	3.8E-03	=Crad9*ldcf	
Fraction of time on site	-	fts9	1.00							
External dose rate	mGy/d	Xdrat9	9.6E-04						=Xgrat*24*fts9/1000	
Internal plus external	mGy/d	tdrat9	4.8E-03						=SUM(ldrat9)+Xdrat9	
Absorbed Doses - Lemming - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad10	1.51E-04	3.56E-03	6.36E-03	1.69E-01	2.09E-02			
Internal dose rate	mGy/d	ldrat10	2.1E-05	2.3E-04	1.0E-03	1.0E-03	1.5E-03	3.8E-03	=Crad10*ldcf	
Fraction of time on site	-	fts10	1.00							
External dose rate	mGy/d	Xdrat10	9.6E-04						=Xgrat*24*fts10/1000	
Internal plus external	mGy/d	tdrat10	4.8E-03						=SUM(ldrat10)+Xdrat10	
Absorbed Doses - Lapland Longspur - Rock Lake Watershed										
Concentration	Bq/g	Crad11	4.07E-05	3.37E-03	5.24E-03	1.35E-01	3.62E-02			
Internal dose rate	mGy/d	ldrat11	5.8E-06	2.2E-04	8.3E-04	8.1E-04	2.7E-03	4.6E-03	=Crad11*ldcf	
Fraction of time on site	-	fts11	1.00							
External dose rate	mGy/d	Xdrat11	9.6E-04						=Xgrat*24*fts11/1000	
Internal plus external	mGy/d	tdrat11	5.5E-03						=SUM(ldrat11)+Xdrat11	

Table H.2-2

Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

Absorbed Doses - Lapland Longspur - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad12	4.40E-05	3.38E-03	5.39E-03	1.36E-01	3.72E-02			
Internal dose rate	mGy/d	ldrat12	6.2E-06	2.2E-04	8.6E-04	8.2E-04	2.8E-03	4.7E-03	=Crad12*ldcf	
Fraction of time on site	-	fts12	1.00							
External dose rate	mGy/d	Xdrat12	9.6E-04						=Xgrat*24*fts12/1000	
Internal plus external	mGy/d	tdrat12	5.6E-03						=SUM(ldrat12)+Xdrat12	
Absorbed Doses - Lapland Longspur - Kiggavik Camp										
Concentration	Bq/g	Crad13	1.30E-05	3.38E-03	5.10E-03	1.34E-01	3.57E-02			
Internal dose rate	mGy/d	ldrat13	1.8E-06	2.2E-04	8.1E-04	8.1E-04	2.6E-03	4.5E-03	=Crad13*ldcf	
Fraction of time on site	-	fts13	1.00							
External dose rate	mGy/d	Xdrat13	9.6E-04						=Xgrat*24*fts13/1000	
Internal plus external	mGy/d	tdrat13	5.4E-03						=SUM(ldrat13)+Xdrat13	
Absorbed Doses - Lapland Longspur - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad14	4.08E-05	3.37E-03	5.22E-03	1.35E-01	3.64E-02			
Internal dose rate	mGy/d	ldrat14	5.8E-06	2.2E-04	8.3E-04	8.1E-04	2.7E-03	4.6E-03	=Crad14*ldcf	
Fraction of time on site	-	fts14	1.00							
External dose rate	mGy/d	Xdrat14	9.6E-04						=Xgrat*24*fts14/1000	
Internal plus external	mGy/d	tdrat14	5.5E-03						=SUM(ldrat14)+Xdrat14	
Absorbed Doses - Long-Tailed Duck - Rock Lake										
Concentration	Bq/g	Crad15	5.55E-05	6.03E-04	9.26E-03	6.39E-02	5.78E-02			
Internal dose rate	mGy/d	ldrat15	7.9E-06	4.0E-05	1.5E-03	3.9E-04	4.3E-03	6.2E-03	=Crad15*ldcf	
Fraction of time on site	-	fts15	1.00							
External dose rate	mGy/d	Xdrat15	9.6E-04						=Xgrat*24*fts15/1000	
Internal plus external	mGy/d	tdrat15	7.1E-03						=SUM(ldrat15)+Xdrat15	
Absorbed Doses - Long-Tailed Duck - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad16	5.74E-05	5.83E-04	8.89E-03	6.15E-02	5.54E-02			
Internal dose rate	mGy/d	ldrat16	8.2E-06	3.8E-05	1.4E-03	3.7E-04	4.1E-03	5.9E-03	=Crad16*ldcf	
Fraction of time on site	-	fts16	1.00							
External dose rate	mGy/d	Xdrat16	9.6E-04						=Xgrat*24*fts16/1000	
Internal plus external	mGy/d	tdrat16	6.9E-03						=SUM(ldrat16)+Xdrat16	
Absorbed Doses - Long-Tailed Duck - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad17	5.29E-05	5.85E-04	8.94E-03	6.18E-02	5.58E-02			
Internal dose rate	mGy/d	ldrat17	7.5E-06	3.9E-05	1.4E-03	3.7E-04	4.1E-03	6.0E-03	=Crad17*ldcf	
Fraction of time on site	-	fts17	1.00							
External dose rate	mGy/d	Xdrat17	9.6E-04						=Xgrat*24*fts17/1000	
Internal plus external	mGy/d	tdrat17	6.9E-03						=SUM(ldrat17)+Xdrat17	
Absorbed Doses - Merganser - Rock Lake										
Concentration	Bq/g	Crad18	7.69E-06	3.15E-04	3.99E-04	1.98E-02	7.05E-03			
Internal dose rate	mGy/d	ldrat18	1.1E-06	2.1E-05	6.3E-05	1.2E-04	5.2E-04	7.3E-04	=Crad18*ldcf	
Fraction of time on site	-	fts18	1.00							
External dose rate	mGy/d	Xdrat18	9.6E-04						=Xgrat*24*fts18/1000	
Internal plus external	mGy/d	tdrat18	1.7E-03						=SUM(ldrat18)+Xdrat18	
Absorbed Doses - Merganser - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad19	7.66E-06	3.08E-04	3.71E-04	1.97E-02	6.67E-03			
Internal dose rate	mGy/d	ldrat19	1.1E-06	2.0E-05	5.9E-05	1.2E-04	4.9E-04	6.9E-04	=Crad19*ldcf	
Fraction of time on site	-	fts19	1.00							
External dose rate	mGy/d	Xdrat19	9.6E-04						=Xgrat*24*fts19/1000	
Internal plus external	mGy/d	tdrat19	1.7E-03						=SUM(ldrat19)+Xdrat19	
Absorbed Doses - Merganser - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad20	7.65E-06	3.09E-04	3.73E-04	1.97E-02	6.68E-03			
Internal dose rate	mGy/d	ldrat20	1.1E-06	2.0E-05	5.9E-05	1.2E-04	4.9E-04	6.9E-04	=Crad20*ldcf	
Fraction of time on site	-	fts20	1.00							
External dose rate	mGy/d	Xdrat20	9.6E-04						=Xgrat*24*fts20/1000	
Internal plus external	mGy/d	tdrat20	1.7E-03						=SUM(ldrat20)+Xdrat20	
Absorbed Doses - Muskox - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad21	1.18E-04	1.86E-04	2.87E-04	6.77E-04	2.04E-02			
Internal dose rate	mGy/d	ldrat21	1.7E-05	1.2E-05	4.6E-05	4.1E-06	1.5E-03	1.6E-03	=Crad21*ldcf	
Fraction of time on site	-	fts21	1.00							
External dose rate	mGy/d	Xdrat21	9.6E-04						=Xgrat*24*fts21/1000	
Internal plus external	mGy/d	tdrat21	2.6E-03						=SUM(ldrat21)+Xdrat21	
Absorbed Doses - Muskox - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad22	4.08E-05	3.37E-03	5.22E-03	1.35E-01	3.64E-02			
Internal dose rate	mGy/d	ldrat22	5.8E-06	2.2E-04	8.3E-04	8.1E-04	2.7E-03	4.6E-03	=Crad22*ldcf	
Fraction of time on site	-	fts22	1.00							
External dose rate	mGy/d	Xdrat22	9.6E-04						=Xgrat*24*fts22/1000	
Internal plus external	mGy/d	tdrat22	5.5E-03						=SUM(ldrat22)+Xdrat22	
Absorbed Doses - Northern Pintail - Rock Lake										
Concentration	Bq/g	Crad23	2.34E-05	4.59E-03	2.26E-03	1.68E-01	6.11E-02			
Internal dose rate	mGy/d	ldrat23	3.3E-06	3.0E-04	3.6E-04	1.0E-03	4.5E-03	6.2E-03	=Crad23*ldcf	
Fraction of time on site	-	fts23	1.00							
External dose rate	mGy/d	Xdrat23	9.6E-04						=Xgrat*24*fts23/1000	
Internal plus external	mGy/d	tdrat23	7.2E-03						=SUM(ldrat23)+Xdrat23	

Table H.2-2
Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

Absorbed Doses - Northern Pintail - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad24	2.14E-05	4.42E-03	2.17E-03	1.62E-01	5.85E-02			
Internal dose rate	mGy/d	Idrat24	3.0E-06	2.9E-04	3.5E-04	9.8E-04	4.3E-03	5.9E-03	=Crad24*Idcf	
Fraction of time on site	-	fts24	1.00							
External dose rate	mGy/d	Xdrat24	9.6E-04						=Xgrat*24*fts24/1000	
Internal plus external	mGy/d	tdrat24	6.9E-03						=SUM(Idrat24)+Xdrat24	
Absorbed Doses - Northern Pintail - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad25	2.14E-05	4.45E-03	2.18E-03	1.63E-01	5.90E-02			
Internal dose rate	mGy/d	Idrat25	3.0E-06	2.9E-04	3.5E-04	9.8E-04	4.4E-03	6.0E-03	=Crad25*Idcf	
Fraction of time on site	-	fts25	1.00							
External dose rate	mGy/d	Xdrat25	9.6E-04						=Xgrat*24*fts25/1000	
Internal plus external	mGy/d	tdrat25	6.9E-03						=SUM(Idrat25)+Xdrat25	
Absorbed Doses - Ptarmigan - Rock Lake Watershed										
Concentration	Bq/g	Crad26	4.26E-05	9.01E-04	2.17E-03	3.89E-01	1.43E-01			
Internal dose rate	mGy/d	Idrat26	6.0E-06	5.9E-05	3.5E-04	2.3E-03	1.1E-02	1.3E-02	=Crad26*Idcf	
Fraction of time on site	-	fts26	1.00							
External dose rate	mGy/d	Xdrat26	9.6E-04						=Xgrat*24*fts26/1000	
Internal plus external	mGy/d	tdrat26	1.4E-02						=SUM(Idrat26)+Xdrat26	
Absorbed Doses - Ptarmigan - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad27	4.35E-05	9.03E-04	2.21E-03	3.89E-01	1.43E-01			
Internal dose rate	mGy/d	Idrat27	6.2E-06	5.9E-05	3.5E-04	2.3E-03	1.1E-02	1.3E-02	=Crad27*Idcf	
Fraction of time on site	-	fts27	1.00							
External dose rate	mGy/d	Xdrat27	9.6E-04						=Xgrat*24*fts27/1000	
Internal plus external	mGy/d	tdrat27	1.4E-02						=SUM(Idrat27)+Xdrat27	
Absorbed Doses - Ptarmigan - Kiggavik Camp										
Concentration	Bq/g	Crad28	3.58E-05	9.05E-04	2.10E-03	3.89E-01	1.44E-01			
Internal dose rate	mGy/d	Idrat28	5.1E-06	6.0E-05	3.3E-04	2.3E-03	1.1E-02	1.3E-02	=Crad28*Idcf	
Fraction of time on site	-	fts28	1.00							
External dose rate	mGy/d	Xdrat28	9.6E-04						=Xgrat*24*fts28/1000	
Internal plus external	mGy/d	tdrat28	1.4E-02						=SUM(Idrat28)+Xdrat28	
Absorbed Doses - Ptarmigan - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad29	4.28E-05	9.02E-04	2.16E-03	3.89E-01	1.43E-01			
Internal dose rate	mGy/d	Idrat29	6.1E-06	5.9E-05	3.4E-04	2.3E-03	1.1E-02	1.3E-02	=Crad29*Idcf	
Fraction of time on site	-	fts29	1.00							
External dose rate	mGy/d	Xdrat29	9.6E-04						=Xgrat*24*fts29/1000	
Internal plus external	mGy/d	tdrat29	1.4E-02						=SUM(Idrat29)+Xdrat29	
Absorbed Doses - Sandpiper - Rock Lake										
Concentration	Bq/g	Crad30	1.96E-04	2.14E-03	1.53E-02	1.83E-01	1.19E-01			
Internal dose rate	mGy/d	Idrat30	2.8E-05	1.4E-04	2.4E-03	1.1E-03	8.8E-03	1.3E-02	=Crad30*Idcf	
Fraction of time on site	-	fts30	1.00							
External dose rate	mGy/d	Xdrat30	9.6E-04						=Xgrat*24*fts30/1000	
Internal plus external	mGy/d	tdrat30	1.3E-02						=SUM(Idrat30)+Xdrat30	
Absorbed Doses - Sandpiper - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad31	1.85E-04	2.11E-03	1.47E-02	1.78E-01	1.14E-01			
Internal dose rate	mGy/d	Idrat31	2.6E-05	1.4E-04	2.3E-03	1.1E-03	8.5E-03	1.2E-02	=Crad31*Idcf	
Fraction of time on site	-	fts31	1.00							
External dose rate	mGy/d	Xdrat31	9.6E-04						=Xgrat*24*fts31/1000	
Internal plus external	mGy/d	tdrat31	1.3E-02						=SUM(Idrat31)+Xdrat31	
Absorbed Doses - Sandpiper - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad32	1.84E-04	2.10E-03	1.48E-02	1.78E-01	1.15E-01			
Internal dose rate	mGy/d	Idrat32	2.6E-05	1.4E-04	2.4E-03	1.1E-03	8.5E-03	1.2E-02	=Crad32*Idcf	
Fraction of time on site	-	fts32	1.00							
External dose rate	mGy/d	Xdrat32	9.6E-04						=Xgrat*24*fts32/1000	
Internal plus external	mGy/d	tdrat32	1.3E-02						=SUM(Idrat32)+Xdrat32	
Absorbed Doses - Shrew - Rock Lake Watershed										
Concentration	Bq/g	Crad33	1.03E-04	6.31E-04	4.02E-03	3.64E-02	5.70E-03			
Internal dose rate	mGy/d	Idrat33	1.5E-05	4.2E-05	6.4E-04	2.2E-04	4.2E-04	1.3E-03	=Crad33*Idcf	
Fraction of time on site	-	fts33	1.00							
External dose rate	mGy/d	Xdrat33	9.6E-04						=Xgrat*24*fts33/1000	
Internal plus external	mGy/d	tdrat33	2.3E-03						=SUM(Idrat33)+Xdrat33	
Absorbed Doses - Shrew - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad34	1.18E-04	6.72E-04	4.37E-03	3.68E-02	5.88E-03			
Internal dose rate	mGy/d	Idrat34	1.7E-05	4.4E-05	6.9E-04	2.2E-04	4.4E-04	1.4E-03	=Crad34*Idcf	
Fraction of time on site	-	fts34	1.00							
External dose rate	mGy/d	Xdrat34	9.6E-04						=Xgrat*24*fts34/1000	
Internal plus external	mGy/d	tdrat34	2.4E-03						=SUM(Idrat34)+Xdrat34	
Absorbed Doses - Shrew - Kiggavik Camp										
Concentration	Bq/g	Crad35	9.52E-06	6.00E-04	3.72E-03	3.61E-02	5.69E-03			
Internal dose rate	mGy/d	Idrat35	1.4E-06	4.0E-05	5.9E-04	2.2E-04	4.2E-04	1.3E-03	=Crad35*Idcf	
Fraction of time on site	-	fts35	1.00							
External dose rate	mGy/d	Xdrat35	9.6E-04						=Xgrat*24*fts35/1000	
Internal plus external	mGy/d	tdrat35	2.2E-03						=SUM(Idrat35)+Xdrat35	
Absorbed Doses - Shrew - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad36	1.04E-04	6.31E-04	4.01E-03	3.64E-02	5.72E-03			
Internal dose rate	mGy/d	Idrat36	1.5E-05	4.2E-05	6.4E-04	2.2E-04	4.2E-04	1.3E-03	=Crad36*Idcf	
Fraction of time on site	-	fts36	1.00							

Table H.2-2
Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

External dose rate	mGy/d	Xdrat36	2.7E-04							=Xgrat*24*fts36/3600
Internal plus external	mGy/d	tdrat36	1.6E-03							=SUM(ldrat36)+Xdrat36
Absorbed Doses - Squirrel - Rock Lake Watershed										
Concentration	Bq/g	Crad37	8.97E-05	3.42E-03	6.40E-03	8.33E-02	1.01E-02			
Internal dose rate	mGy/d	ldrat37	1.3E-05	2.3E-04	1.0E-03	5.0E-04	7.5E-04	2.5E-03		=Crad37*ldcf
Fraction of time on site	-	fts37	1.00							
External dose rate	mGy/d	Xdrat37	9.6E-04							=Xgrat*24*fts37/1000
Internal plus external	mGy/d	tdrat37	3.5E-03							=SUM(ldrat37)+Xdrat37
Absorbed Doses - Squirrel - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad38	8.96E-05	3.42E-03	6.40E-03	8.33E-02	1.01E-02			
Internal dose rate	mGy/d	ldrat38	1.3E-05	2.3E-04	1.0E-03	5.0E-04	7.5E-04	2.5E-03		=Crad38*ldcf
Fraction of time on site	-	fts38	1.00							
External dose rate	mGy/d	Xdrat38	9.6E-04							=Xgrat*24*fts38/1000
Internal plus external	mGy/d	tdrat38	3.5E-03							=SUM(ldrat38)+Xdrat38
Absorbed Doses - Squirrel - Kiggavik Camp										
Concentration	Bq/g	Crad39	9.34E-05	3.44E-03	6.43E-03	8.34E-02	1.01E-02			
Internal dose rate	mGy/d	ldrat39	1.3E-05	2.3E-04	1.0E-03	5.0E-04	7.5E-04	2.5E-03		=Crad39*ldcf
Fraction of time on site	-	fts39	1.00							
External dose rate	mGy/d	Xdrat39	9.6E-04							=Xgrat*24*fts39/1000
Internal plus external	mGy/d	tdrat39	3.5E-03							=SUM(ldrat39)+Xdrat39

Table H.2-2
Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

Absorbed Doses - Squirrel - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad40	8.98E-05	3.42E-03	6.40E-03	8.33E-02	1.01E-02			
Internal dose rate	mGy/d	ldrat40	1.3E-05	2.3E-04	1.0E-03	5.0E-04	7.5E-04	2.5E-03	=Crad40*ldcf	
Fraction of time on site	-	fts40	1.00							
External dose rate	mGy/d	Xdrat40	9.6E-04						=Xgrat*24*fts40/1000	
Internal plus external	mGy/d	tdrat40	3.5E-03						=SUM(ldrat40)+Xdrat40	
Absorbed Doses - Wolf - LSA										
Concentration	Bq/g	Crad41	4.16E-05	2.94E-05	2.20E-05	1.44E-05	7.66E-03			
Internal dose rate	mGy/d	ldrat41	5.9E-06	1.9E-06	3.5E-06	8.7E-08	5.7E-04	5.8E-04	=Crad41*ldcf	
Fraction of time on site	-	fts41	1.00							
External dose rate	mGy/d	Xdrat41	9.6E-04						=Xgrat*24*fts41/1000	
Internal plus external	mGy/d	tdrat41	1.5E-03						=SUM(ldrat41)+Xdrat41	
Absorbed Doses - Wolf - RSA										
Concentration	Bq/g	Crad42	4.16E-05	2.93E-05	2.20E-05	1.44E-05	7.66E-03			
Internal dose rate	mGy/d	ldrat42	5.9E-06	1.9E-06	3.5E-06	8.7E-08	5.7E-04	5.8E-04	=Crad42*ldcf	
Fraction of time on site	-	fts42	1.00							
External dose rate	mGy/d	Xdrat42	9.6E-04						=Xgrat*24*fts42/1000	
Internal plus external	mGy/d	tdrat42	1.5E-03						=SUM(ldrat42)+Xdrat42	
Absorbed Doses - Wolverine - LSA										
Concentration	Bq/g	Crad43	5.83E-05	1.16E-04	2.13E-04	4.70E-04	1.79E-03			
Internal dose rate	mGy/d	ldrat43	8.3E-06	7.6E-06	3.4E-05	2.8E-06	1.3E-04	1.9E-04	=Crad43*ldcf	
Fraction of time on site	-	fts43	1.00							
External dose rate	mGy/d	Xdrat43	9.6E-04						=Xgrat*24*fts43/1000	
Internal plus external	mGy/d	tdrat43	1.1E-03						=SUM(ldrat43)+Xdrat43	
Absorbed Doses - Wolverine - RSA										
Concentration	Bq/g	Crad44	5.82E-05	1.16E-04	2.13E-04	4.70E-04	1.79E-03			
Internal dose rate	mGy/d	ldrat44	8.3E-06	7.6E-06	3.4E-05	2.8E-06	1.3E-04	1.9E-04	=Crad44*ldcf	
Fraction of time on site	-	fts44	1.00							
External dose rate	mGy/d	Xdrat44	9.6E-04						=Xgrat*24*fts44/1000	
Internal plus external	mGy/d	tdrat44	1.1E-03						=SUM(ldrat44)+Xdrat44	
Equivalent Doses - Bear - LSA										
RBE for alpha	Sv/Gy	RBE	10							
High LET dose rate	mSv/d	Hletdr	5.5E-05	9.9E-05	1.1E-04	1.1E-06	4.8E-03	5.0E-03	=ldrat*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr	9.6E-04						=Xdrat	
Total dose rate	mSv/d	tdr	6.0E-03						=SUM(Hletdr)+Lletdr	
Equivalent Doses - Caribou - LSA										
High LET dose rate	mSv/d	Hletdr2	1.2E-04	8.7E-05	4.7E-04	1.5E-05	5.7E-02	5.7E-02	=ldrat2*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr2	9.6E-04						=Xdrat2	
Total dose rate	mSv/d	tdr2	5.8E-02						=SUM(Hletdr2)+Lletdr2	
Equivalent Doses - Caribou - RSA										
High LET dose rate	mSv/d	Hletdr3	1.2E-04	8.7E-05	4.7E-04	1.5E-05	5.7E-02	5.7E-02	=ldrat3*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr3	9.6E-04						=Xdrat3	
Total dose rate	mSv/d	tdr3	5.8E-02						=SUM(Hletdr3)+Lletdr3	
Equivalent Doses - Falcon - LSA										
High LET dose rate	mSv/d	Hletdr4	1.6E-05	2.3E-04	2.2E-03	2.7E-03	3.7E-02	4.2E-02	=ldrat4*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr4	9.6E-04						=Xdrat4	
Total dose rate	mSv/d	tdr4	4.3E-02						=SUM(Hletdr4)+Lletdr4	
Equivalent Doses - Falcon - RSA										
High LET dose rate	mSv/d	Hletdr5	1.6E-05	2.3E-04	2.2E-03	2.7E-03	3.7E-02	4.2E-02	=ldrat5*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr5	9.6E-04						=Xdrat5	
Total dose rate	mSv/d	tdr5	4.3E-02						=SUM(Hletdr5)+Lletdr5	
Equivalent Doses - Fox - LSA										
High LET dose rate	mSv/d	Hletdr6	2.9E-05	5.2E-05	2.1E-04	3.1E-06	2.7E-03	3.0E-03	=ldrat6*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr6	9.6E-04						=Xdrat6	
Total dose rate	mSv/d	tdr6	4.0E-03						=SUM(Hletdr6)+Lletdr6	
Equivalent Doses - Lemming - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr7	2.1E-04	2.3E-03	1.0E-02	1.0E-03	1.5E-02	2.9E-02	=ldrat7*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr7	9.6E-04						=Xdrat7	
Total dose rate	mSv/d	tdr7	3.0E-02						=SUM(Hletdr7)+Lletdr7	
Equivalent Doses - Lemming - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr8	2.1E-04	2.3E-03	1.0E-02	1.0E-03	1.5E-02	2.9E-02	=ldrat8*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr8	9.6E-04						=Xdrat8	
Total dose rate	mSv/d	tdr8	3.0E-02						=SUM(Hletdr8)+Lletdr8	
Equivalent Doses - Lemming - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr9	2.2E-04	2.4E-03	1.0E-02	1.0E-03	1.5E-02	2.9E-02	=ldrat9*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr9	9.6E-04						=Xdrat9	
Total dose rate	mSv/d	tdr9	3.0E-02						=SUM(Hletdr9)+Lletdr9	
Equivalent Doses - Lemming - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr10	2.1E-04	2.3E-03	1.0E-02	1.0E-03	1.5E-02	2.9E-02	=ldrat10*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr10	9.6E-04						=Xdrat10	
Total dose rate	mSv/d	tdr10	3.0E-02						=SUM(Hletdr10)+Lletdr10	

Table H.2-2

Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

Equivalent Doses - Lapland Longspur - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr11	5.8E-05	2.2E-03	8.3E-03	8.1E-04	2.7E-02	3.8E-02	=Idrat11*RBE, except Pb-210	
Low LET dose rate	mSv/d	Lletdr11	9.6E-04						=Xdrat11	
Total dose rate	mSv/d	tdr11	3.9E-02						=SUM(Hletdr11)+Lletdr11	
Equivalent Doses - Lapland Longspur - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr12	6.2E-05	2.2E-03	8.6E-03	8.2E-04	2.8E-02	3.9E-02	=Idrat12*RBE, except Pb-210	
Low LET dose rate	mSv/d	Lletdr12	9.6E-04						=Xdrat12	
Total dose rate	mSv/d	tdr12	4.0E-02						=SUM(Hletdr12)+Lletdr12	
Equivalent Doses - Lapland Longspur - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr13	1.8E-05	2.2E-03	8.1E-03	8.1E-04	2.6E-02	3.8E-02	=Idrat13*RBE, except Pb-210	
Low LET dose rate	mSv/d	Lletdr13	9.6E-04						=Xdrat13	
Total dose rate	mSv/d	tdr13	3.9E-02						=SUM(Hletdr13)+Lletdr13	
Equivalent Doses - Lapland Longspur - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr14	5.8E-05	2.2E-03	8.3E-03	8.1E-04	2.7E-02	3.8E-02	=Idrat14*RBE, except Pb-210	
Low LET dose rate	mSv/d	Lletdr14	9.6E-04						=Xdrat14	
Total dose rate	mSv/d	tdr14	3.9E-02						=SUM(Hletdr14)+Lletdr14	
Equivalent Doses - Long-Tailed Duck - Rock Lake										
High LET dose rate	mSv/d	Hletdr15	7.9E-05	4.0E-04	1.5E-02	3.9E-04	4.3E-02	5.8E-02	=Idrat15*RBE, except Pb-210	
Low LET dose rate	mSv/d	Lletdr15	9.6E-04						=Xdrat15	
Total dose rate	mSv/d	tdr15	5.9E-02						=SUM(Hletdr15)+Lletdr15	
Equivalent Doses - Long-Tailed Duck - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr16	8.2E-05	3.8E-04	1.4E-02	3.7E-04	4.1E-02	5.6E-02	=Idrat16*RBE, except Pb-210	
Low LET dose rate	mSv/d	Lletdr16	9.6E-04						=Xdrat16	
Total dose rate	mSv/d	tdr16	5.7E-02						=SUM(Hletdr16)+Lletdr16	
Equivalent Doses - Long-Tailed Duck - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr17	7.5E-05	3.9E-04	1.4E-02	3.7E-04	4.1E-02	5.6E-02	=Idrat17*RBE, except Pb-210	
Low LET dose rate	mSv/d	Lletdr17	9.6E-04						=Xdrat17	
Total dose rate	mSv/d	tdr17	5.7E-02						=SUM(Hletdr17)+Lletdr17	
Equivalent Doses - Merganser - Rock Lake										
High LET dose rate	mSv/d	Hletdr18	1.1E-05	2.1E-04	6.3E-04	1.2E-04	5.2E-03	6.2E-03	=Idrat18*RBE, except Pb-210	
Low LET dose rate	mSv/d	Lletdr18	9.6E-04						=Xdrat18	
Total dose rate	mSv/d	tdr18	7.2E-03						=SUM(Hletdr18)+Lletdr18	
Equivalent Doses - Merganser - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr19	1.1E-05	2.0E-04	5.9E-04	1.2E-04	4.9E-03	5.9E-03	=Idrat19*RBE, except Pb-210	
Low LET dose rate	mSv/d	Lletdr19	9.6E-04						=Xdrat19	
Total dose rate	mSv/d	tdr19	6.8E-03						=SUM(Hletdr19)+Lletdr19	
Equivalent Doses - Merganser - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr20	1.1E-05	2.0E-04	5.9E-04	1.2E-04	4.9E-03	5.9E-03	=Idrat20*RBE, except Pb-210	
Low LET dose rate	mSv/d	Lletdr20	9.6E-04						=Xdrat20	
Total dose rate	mSv/d	tdr20	6.8E-03						=SUM(Hletdr20)+Lletdr20	
Equivalent Doses - Muskox - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr21	1.7E-04	1.2E-04	4.6E-04	4.1E-06	1.5E-02	1.6E-02	=Idrat21*RBE, except Pb-210	
Low LET dose rate	mSv/d	Lletdr21	9.6E-04						=Xdrat21	
Total dose rate	mSv/d	tdr21	1.7E-02						=SUM(Hletdr21)+Lletdr21	
Equivalent Doses - Muskox - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr22	5.8E-05	2.2E-03	8.3E-03	8.1E-04	2.7E-02	3.8E-02	=Idrat22*RBE, except Pb-210	
Low LET dose rate	mSv/d	Lletdr22	9.6E-04						=Xdrat22	
Total dose rate	mSv/d	tdr22	3.9E-02						=SUM(Hletdr22)+Lletdr22	
Equivalent Doses - Northern Pintail - Rock Lake										
High LET dose rate	mSv/d	Hletdr23	3.3E-05	3.0E-03	3.6E-03	1.0E-03	4.5E-02	5.3E-02	=Idrat23*RBE, except Pb-210	
Low LET dose rate	mSv/d	Lletdr23	9.6E-04						=Xdrat23	
Total dose rate	mSv/d	tdr23	5.4E-02						=SUM(Hletdr23)+Lletdr23	
Equivalent Doses - Northern Pintail - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr24	3.0E-05	2.9E-03	3.5E-03	9.8E-04	4.3E-02	5.1E-02	=Idrat24*RBE, except Pb-210	
Low LET dose rate	mSv/d	Lletdr24	9.6E-04						=Xdrat24	
Total dose rate	mSv/d	tdr24	5.2E-02						=SUM(Hletdr24)+Lletdr24	
Equivalent Doses - Northern Pintail - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr25	3.0E-05	2.9E-03	3.5E-03	9.8E-04	4.4E-02	5.1E-02	=Idrat25*RBE, except Pb-210	
Low LET dose rate	mSv/d	Lletdr25	9.6E-04						=Xdrat25	
Total dose rate	mSv/d	tdr25	5.2E-02						=SUM(Hletdr25)+Lletdr25	
Equivalent Doses - Ptarmigan - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr26	6.0E-05	5.9E-04	3.5E-03	2.3E-03	1.1E-01	1.1E-01	=Idrat26*RBE, except Pb-210	
Low LET dose rate	mSv/d	Lletdr26	9.6E-04						=Xdrat26	
Total dose rate	mSv/d	tdr26	1.1E-01						=SUM(Hletdr26)+Lletdr26	
Equivalent Doses - Ptarmigan - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr27	6.2E-05	5.9E-04	3.5E-03	2.3E-03	1.1E-01	1.1E-01	=Idrat27*RBE, except Pb-210	
Low LET dose rate	mSv/d	Lletdr27	9.6E-04						=Xdrat27	
Total dose rate	mSv/d	tdr27	1.1E-01						=SUM(Hletdr27)+Lletdr27	

Table H.2-2

Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

Equivalent Doses - Ptarmigan - Kiggavik Camp									
High LET dose rate	mSv/d	Hletdr28	5.1E-05	6.0E-04	3.3E-03	2.3E-03	1.1E-01	1.1E-01	=ldrat28*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr28	9.6E-04						=Xdrat28
Total dose rate	mSv/d	tdr28	1.1E-01						=SUM(Hletdr28)+Lletdr28
Equivalent Doses - Ptarmigan - JSL @ Sissons Discharge									
High LET dose rate	mSv/d	Hletdr29	6.1E-05	5.9E-04	3.4E-03	2.3E-03	1.1E-01	1.1E-01	=ldrat29*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr29	9.6E-04						=Xdrat29
Total dose rate	mSv/d	tdr29	1.1E-01						=SUM(Hletdr29)+Lletdr29
Equivalent Doses - Sandpiper - Rock Lake									
High LET dose rate	mSv/d	Hletdr30	2.8E-04	1.4E-03	2.4E-02	1.1E-03	8.8E-02	1.2E-01	=ldrat30*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr30	9.6E-04						=Xdrat30
Total dose rate	mSv/d	tdr30	1.2E-01						=SUM(Hletdr30)+Lletdr30
Equivalent Doses - Sandpiper - JSL @ Kiggavik Discharge									
High LET dose rate	mSv/d	Hletdr31	2.6E-04	1.4E-03	2.3E-02	1.1E-03	8.5E-02	1.1E-01	=ldrat31*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr31	9.6E-04						=Xdrat31
Total dose rate	mSv/d	tdr31	1.1E-01						=SUM(Hletdr31)+Lletdr31
Equivalent Doses - Sandpiper - JSL @ Sissons Discharge									
High LET dose rate	mSv/d	Hletdr32	2.6E-04	1.4E-03	2.4E-02	1.1E-03	8.5E-02	1.1E-01	=ldrat32*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr32	9.6E-04						=Xdrat32
Total dose rate	mSv/d	tdr32	1.1E-01						=SUM(Hletdr32)+Lletdr32
Equivalent Doses - Shrew - Rock Lake Watershed									
High LET dose rate	mSv/d	Hletdr33	1.5E-04	4.2E-04	6.4E-03	2.2E-04	4.2E-03	1.1E-02	=ldrat33*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr33	9.6E-04						=Xdrat33
Total dose rate	mSv/d	tdr33	1.2E-02						=SUM(Hletdr33)+Lletdr33
Equivalent Doses - Shrew - JSL @ Kiggavik Discharge									
High LET dose rate	mSv/d	Hletdr34	1.7E-04	4.4E-04	6.9E-03	2.2E-04	4.4E-03	1.2E-02	=ldrat34*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr34	9.6E-04						=Xdrat34
Total dose rate	mSv/d	tdr34	1.3E-02						=SUM(Hletdr34)+Lletdr34
Equivalent Doses - Shrew - Kiggavik Camp									
High LET dose rate	mSv/d	Hletdr35	1.4E-05	4.0E-04	5.9E-03	2.2E-04	4.2E-03	1.1E-02	=ldrat35*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr35	9.6E-04						=Xdrat35
Total dose rate	mSv/d	tdr35	1.2E-02						=SUM(Hletdr35)+Lletdr35
Equivalent Doses - Shrew - JSL @ Sissons Discharge									
High LET dose rate	mSv/d	Hletdr36	1.5E-04	4.2E-04	6.4E-03	2.2E-04	4.2E-03	1.1E-02	=ldrat36*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr36	2.7E-04						=Xdrat36
Total dose rate	mSv/d	tdr36	1.2E-02						=SUM(Hletdr36)+Lletdr36
Equivalent Doses - Squirrel - Rock Lake Watershed									
High LET dose rate	mSv/d	Hletdr37	1.3E-04	2.3E-03	1.0E-02	5.0E-04	7.5E-03	2.1E-02	=ldrat37*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr37	9.6E-04						=Xdrat37
Total dose rate	mSv/d	tdr37	2.2E-02						=SUM(Hletdr37)+Lletdr37
Equivalent Doses - Squirrel - JSL @ Kiggavik Discharge									
High LET dose rate	mSv/d	Hletdr38	1.3E-04	2.3E-03	1.0E-02	5.0E-04	7.5E-03	2.1E-02	=ldrat38*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr38	9.6E-04						=Xdrat38
Total dose rate	mSv/d	tdr38	2.2E-02						=SUM(Hletdr38)+Lletdr38
Equivalent Doses - Squirrel - Kiggavik Camp									
High LET dose rate	mSv/d	Hletdr39	1.3E-04	2.3E-03	1.0E-02	5.0E-04	7.5E-03	2.1E-02	=ldrat39*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr39	9.6E-04						=Xdrat39
Total dose rate	mSv/d	tdr39	2.2E-02						=SUM(Hletdr39)+Lletdr39
Equivalent Doses - Squirrel - JSL @ Sissons Discharge									
High LET dose rate	mSv/d	Hletdr40	1.3E-04	2.3E-03	1.0E-02	5.0E-04	7.5E-03	2.1E-02	=ldrat40*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr40	9.6E-04						=Xdrat40
Total dose rate	mSv/d	tdr40	2.2E-02						=SUM(Hletdr40)+Lletdr40
Equivalent Doses - Wolf - LSA									
High LET dose rate	mSv/d	Hletdr41	5.9E-05	1.9E-05	3.5E-05	8.7E-08	5.7E-03	5.8E-03	=ldrat41*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr41	9.6E-04						=Xdrat41
Total dose rate	mSv/d	tdr41	6.7E-03						=SUM(Hletdr41)+Lletdr41
Equivalent Doses - Wolf - RSA									
High LET dose rate	mSv/d	Hletdr42	5.9E-05	1.9E-05	3.5E-05	8.7E-08	5.7E-03	5.8E-03	=ldrat42*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr42	9.6E-04						=Xdrat42
Total dose rate	mSv/d	tdr42	6.7E-03						=SUM(Hletdr42)+Lletdr42
Equivalent Doses - Wolverine - LSA									
High LET dose rate	mSv/d	Hletdr43	8.3E-05	7.6E-05	3.4E-04	2.8E-06	1.3E-03	1.8E-03	=ldrat43*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr43	9.6E-04						=Xdrat43
Total dose rate	mSv/d	tdr43	2.8E-03						=SUM(Hletdr43)+Lletdr43
Equivalent Doses - Wolverine - RSA									
High LET dose rate	mSv/d	Hletdr44	8.3E-05	7.6E-05	3.4E-04	2.8E-06	1.3E-03	1.8E-03	=ldrat44*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr44	9.6E-04						=Xdrat44
Total dose rate	mSv/d	tdr44	2.8E-03						=SUM(Hletdr44)+Lletdr44

Table H.2-2
Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

SUMMARY

3 Screening Criterion in mGy/d	Total Absorbed Dose mGy/d	Total Equivalent Dose mSv/d	Index (Absorbed Dose)	Index (Equivalent Dose)
Bear - LSA	1.5E-03	6.0E-03	4.9E-04	2.0E-03
Caribou - LSA	6.7E-03	5.8E-02	2.2E-03	1.9E-02
Caribou - RSA	6.7E-03	5.8E-02	2.2E-03	1.9E-02
Falcon - LSA	7.6E-03	4.3E-02	2.5E-03	1.4E-02
Falcon - RSA	7.6E-03	4.3E-02	2.5E-03	1.4E-02
Fox - LSA	1.3E-03	4.0E-03	4.2E-04	1.3E-03
Lemming - Rock Lake Watershed	4.8E-03	3.0E-02	1.6E-03	1.0E-02
Lemming - JSL @ Kiggavik Discharge	4.8E-03	3.0E-02	1.6E-03	1.0E-02
Lemming - Kiggavik Camp	4.8E-03	3.0E-02	1.6E-03	1.0E-02
Lemming - JSL @ Sissons Discharge	4.8E-03	3.0E-02	1.6E-03	1.0E-02
Lapland Longspur - Rock Lake Watershed	5.5E-03	3.9E-02	1.8E-03	1.3E-02
Lapland Longspur - JSL @ Kiggavik Discharge	5.6E-03	4.0E-02	1.9E-03	1.3E-02
Lapland Longspur - Kiggavik Camp	5.4E-03	3.9E-02	1.8E-03	1.3E-02
Lapland Longspur - JSL @ Sissons Discharge	5.5E-03	3.9E-02	1.8E-03	1.3E-02
Long-Tailed Duck - Rock Lake	7.1E-03	5.9E-02	2.4E-03	2.0E-02
Long-Tailed Duck - JSL @ Kiggavik Discharge	6.9E-03	5.7E-02	2.3E-03	1.9E-02
Long-Tailed Duck - JSL @ Sissons Discharge	6.9E-03	5.7E-02	2.3E-03	1.9E-02
Merganser - Rock Lake	1.7E-03	7.2E-03	5.6E-04	2.4E-03
Merganser - JSL @ Kiggavik Discharge	1.7E-03	6.8E-03	5.5E-04	2.3E-03
Merganser - JSL @ Sissons Discharge	1.7E-03	6.8E-03	5.5E-04	2.3E-03
Muskox - JSL @ Kiggavik Discharge	2.6E-03	1.7E-02	8.5E-04	5.6E-03
Muskox - JSL @ Sissons Discharge	5.5E-03	3.9E-02	1.8E-03	1.3E-02
Northern Pintail - Rock Lake	7.2E-03	5.4E-02	2.4E-03	1.8E-02
Northern Pintail - JSL @ Kiggavik Discharge	6.9E-03	5.2E-02	2.3E-03	1.7E-02
Northern Pintail - JSL @ Sissons Discharge	6.9E-03	5.2E-02	2.3E-03	1.7E-02
Ptarmigan - Rock Lake Watershed	1.4E-02	1.1E-01	4.8E-03	3.8E-02
Ptarmigan - JSL @ Kiggavik Discharge	1.4E-02	1.1E-01	4.8E-03	3.8E-02
Ptarmigan - Kiggavik Camp	1.4E-02	1.1E-01	4.8E-03	3.8E-02
Ptarmigan - JSL @ Sissons Discharge	1.4E-02	1.1E-01	4.8E-03	3.8E-02
Sandpiper - Rock Lake	1.3E-02	1.2E-01	4.5E-03	3.9E-02
Sandpiper - JSL @ Kiggavik Discharge	1.3E-02	1.1E-01	4.3E-03	3.7E-02
Sandpiper - JSL @ Sissons Discharge	1.3E-02	1.1E-01	4.4E-03	3.7E-02
Shrew - Rock Lake Watershed	2.3E-03	1.2E-02	7.7E-04	4.1E-03
Shrew - JSL @ Kiggavik Discharge	2.4E-03	1.3E-02	7.9E-04	4.4E-03
Shrew - Kiggavik Camp	2.2E-03	1.2E-02	7.4E-04	3.9E-03
Shrew - JSL @ Sissons Discharge	1.6E-03	1.2E-02	5.3E-04	3.9E-03
Squirrel - Rock Lake Watershed	3.5E-03	2.2E-02	1.2E-03	7.2E-03
Squirrel - JSL @ Kiggavik Discharge	3.5E-03	2.2E-02	1.2E-03	7.2E-03
Squirrel - Kiggavik Camp	3.5E-03	2.2E-02	1.2E-03	7.2E-03
Squirrel - JSL @ Sissons Discharge	3.5E-03	2.2E-02	1.2E-03	7.2E-03
Wolf - LSA	1.5E-03	6.7E-03	5.1E-04	2.2E-03
Wolf - RSA	1.5E-03	6.7E-03	5.1E-04	2.2E-03
Wolverine - LSA	1.1E-03	2.8E-03	3.8E-04	9.3E-04
Wolverine - RSA	1.1E-03	2.8E-03	3.8E-04	9.3E-04

U-238+ Internal U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235
Ra-226+ Internal Ra-226 + 0.3* (Rn-222 + ...Po-214)
Pb-210+ Internal Pb-210 + Bi-210

Table H.2-2

Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

2065

DOSES TO SELECTED VECs - Average Total Dose

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Absorbed Doses - Bear - LSA									
Concentration	Bq/g	Crad	1.27E-05	3.35E-05	2.28E-05	5.31E-05	1.79E-03		
Internal Dose Factor	mGy/d per Bq/g	ldcf	1.4E-01	6.6E-02	1.6E-01	6.0E-03	7.4E-02		
Internal dose rate	mGy/d	ldrat	1.8E-06	2.2E-06	3.6E-06	3.2E-07	1.3E-04	1.4E-04	=Crad*ldcf
External Gamma rate	uGy/h	Xgrat	0.04						
Fraction of time on site	-	fts	1.00						
External dose rate	mGy/d	Xdrat	9.6E-04						=Xgrat*24*fts/1000
Internal plus external	mGy/d	tdrat	1.1E-03						=SUM(ldrat)+Xdrat
Absorbed Doses - Caribou - LSA									
Concentration	Bq/g	Crad2	2.99E-05	4.43E-05	8.68E-05	9.05E-04	2.39E-02		
Internal dose rate	mGy/d	ldrat2	4.3E-06	2.9E-06	1.4E-05	5.5E-06	1.8E-03	1.8E-03	=Crad2*ldcf
Fraction of time on site	-	fts2	1.00						
External dose rate	mGy/d	Xdrat2	9.6E-04						=Xgrat*24*fts2/1000
Internal plus external	mGy/d	tdrat2	2.8E-03						=SUM(ldrat2)+Xdrat2
Absorbed Doses - Caribou - RSA									
Concentration	Bq/g	Crad3	2.99E-05	4.43E-05	8.68E-05	9.05E-04	2.39E-02		
Internal dose rate	mGy/d	ldrat3	4.3E-06	2.9E-06	1.4E-05	5.5E-06	1.8E-03	1.8E-03	=Crad3*ldcf
Fraction of time on site	-	fts3	1.00						
External dose rate	mGy/d	Xdrat3	9.6E-04						=Xgrat*24*fts3/1000
Internal plus external	mGy/d	tdrat3	2.8E-03						=SUM(ldrat3)+Xdrat3
Absorbed Doses - Falcon - LSA									
Concentration	Bq/g	Crad4	3.80E-06	1.20E-04	3.99E-04	1.34E-01	1.47E-02		
Internal dose rate	mGy/d	ldrat4	5.4E-07	7.9E-06	6.3E-05	8.1E-04	1.1E-03	2.0E-03	=Crad4*ldcf
Fraction of time on site	-	fts4	1.00						
External dose rate	mGy/d	Xdrat4	9.6E-04						=Xgrat*24*fts4/1000
Internal plus external	mGy/d	tdrat4	2.9E-03						=SUM(ldrat4)+Xdrat4
Absorbed Doses - Falcon - RSA									
Concentration	Bq/g	Crad5	3.79E-06	1.20E-04	3.98E-04	1.34E-01	1.47E-02		
Internal dose rate	mGy/d	ldrat5	5.4E-07	7.9E-06	6.3E-05	8.1E-04	1.1E-03	2.0E-03	=Crad5*ldcf
Fraction of time on site	-	fts5	1.00						
External dose rate	mGy/d	Xdrat5	9.6E-04						=Xgrat*24*fts5/1000
Internal plus external	mGy/d	tdrat5	2.9E-03						=SUM(ldrat5)+Xdrat5
Absorbed Doses - Fox - LSA									
Concentration	Bq/g	Crad6	8.18E-06	2.48E-05	5.34E-05	1.29E-04	1.09E-03		
Internal dose rate	mGy/d	ldrat6	1.2E-06	1.6E-06	8.5E-06	7.8E-07	8.0E-05	9.2E-05	=Crad6*ldcf
Fraction of time on site	-	fts6	1.00						
External dose rate	mGy/d	Xdrat6	9.6E-04						=Xgrat*24*fts6/1000
Internal plus external	mGy/d	tdrat6	1.1E-03						=SUM(ldrat6)+Xdrat6
Absorbed Doses - Lemming - Rock Lake Watershed									
Concentration	Bq/g	Crad7	3.23E-05	1.14E-03	2.26E-03	4.73E-02	6.02E-03		
Internal dose rate	mGy/d	ldrat7	4.6E-06	7.5E-05	3.6E-04	2.9E-04	4.5E-04	1.2E-03	=Crad7*ldcf
Fraction of time on site	-	fts7	1.00						
External dose rate	mGy/d	Xdrat7	9.6E-04						=Xgrat*24*fts7/1000
Internal plus external	mGy/d	tdrat7	2.1E-03						=SUM(ldrat7)+Xdrat7
Absorbed Doses - Lemming - JSL @ Kiggavik Discharge									
Concentration	Bq/g	Crad8	3.23E-05	1.14E-03	2.26E-03	4.73E-02	6.02E-03		
Internal dose rate	mGy/d	ldrat8	4.6E-06	7.5E-05	3.6E-04	2.9E-04	4.5E-04	1.2E-03	=Crad8*ldcf
Fraction of time on site	-	fts8	1.00						
External dose rate	mGy/d	Xdrat8	9.6E-04						=Xgrat*24*fts8/1000
Internal plus external	mGy/d	tdrat8	2.1E-03						=SUM(ldrat8)+Xdrat8
Absorbed Doses - Lemming - Kiggavik Camp									
Concentration	Bq/g	Crad9	3.40E-05	1.15E-03	2.27E-03	4.73E-02	6.02E-03		
Internal dose rate	mGy/d	ldrat9	4.8E-06	7.6E-05	3.6E-04	2.9E-04	4.5E-04	1.2E-03	=Crad9*ldcf
Fraction of time on site	-	fts9	1.00						
External dose rate	mGy/d	Xdrat9	9.6E-04						=Xgrat*24*fts9/1000
Internal plus external	mGy/d	tdrat9	2.1E-03						=SUM(ldrat9)+Xdrat9
Absorbed Doses - Lemming - JSL @ Sissons Discharge									
Concentration	Bq/g	Crad10	3.24E-05	1.14E-03	2.26E-03	4.73E-02	6.02E-03		
Internal dose rate	mGy/d	ldrat10	4.6E-06	7.5E-05	3.6E-04	2.9E-04	4.5E-04	1.2E-03	=Crad10*ldcf
Fraction of time on site	-	fts10	1.00						
External dose rate	mGy/d	Xdrat10	9.6E-04						=Xgrat*24*fts10/1000
Internal plus external	mGy/d	tdrat10	2.1E-03						=SUM(ldrat10)+Xdrat10
Absorbed Doses - Lapland Longspur - Rock Lake Watershed									
Concentration	Bq/g	Crad11	1.15E-05	7.43E-04	1.58E-03	3.56E-02	1.28E-02		
Internal dose rate	mGy/d	ldrat11	1.6E-06	4.9E-05	2.5E-04	2.1E-04	9.5E-04	1.5E-03	=Crad11*ldcf
Fraction of time on site	-	fts11	1.00						
External dose rate	mGy/d	Xdrat11	9.6E-04						=Xgrat*24*fts11/1000
Internal plus external	mGy/d	tdrat11	2.4E-03						=SUM(ldrat11)+Xdrat11

Table H.2-2

Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

Absorbed Doses - Lapland Longspur - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad12	1.24E-05	7.45E-04	1.62E-03	3.59E-02	1.32E-02			
Internal dose rate	mGy/d	ldrat12	1.8E-06	4.9E-05	2.6E-04	2.2E-04	9.8E-04	1.5E-03	=Crad12*ldcf	
Fraction of time on site	-	fts12	1.00							
External dose rate	mGy/d	Xdrat12	9.6E-04						=Xgrat*24*fts12/1000	
Internal plus external	mGy/d	tdrat12	2.5E-03						=SUM(ldrat12)+Xdrat12	
Absorbed Doses - Lapland Longspur - Kiggavik Camp										
Concentration	Bq/g	Crad13	3.56E-06	7.44E-04	1.55E-03	3.54E-02	1.27E-02			
Internal dose rate	mGy/d	ldrat13	5.1E-07	4.9E-05	2.5E-04	2.1E-04	9.4E-04	1.4E-03	=Crad13*ldcf	
Fraction of time on site	-	fts13	1.00							
External dose rate	mGy/d	Xdrat13	9.6E-04						=Xgrat*24*fts13/1000	
Internal plus external	mGy/d	tdrat13	2.4E-03						=SUM(ldrat13)+Xdrat13	
Absorbed Doses - Lapland Longspur - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad14	1.17E-05	7.44E-04	1.58E-03	3.56E-02	1.29E-02			
Internal dose rate	mGy/d	ldrat14	1.7E-06	4.9E-05	2.5E-04	2.1E-04	9.5E-04	1.5E-03	=Crad14*ldcf	
Fraction of time on site	-	fts14	1.00							
External dose rate	mGy/d	Xdrat14	9.6E-04						=Xgrat*24*fts14/1000	
Internal plus external	mGy/d	tdrat14	2.4E-03						=SUM(ldrat14)+Xdrat14	
Absorbed Doses - Long-Tailed Duck - Rock Lake										
Concentration	Bq/g	Crad15	1.95E-05	2.01E-04	2.30E-03	1.99E-02	1.55E-02			
Internal dose rate	mGy/d	ldrat15	2.8E-06	1.3E-05	3.6E-04	1.2E-04	1.1E-03	1.6E-03	=Crad15*ldcf	
Fraction of time on site	-	fts15	1.00							
External dose rate	mGy/d	Xdrat15	9.6E-04						=Xgrat*24*fts15/1000	
Internal plus external	mGy/d	tdrat15	2.6E-03						=SUM(ldrat15)+Xdrat15	
Absorbed Doses - Long-Tailed Duck - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad16	1.76E-05	1.95E-04	2.21E-03	1.92E-02	1.49E-02			
Internal dose rate	mGy/d	ldrat16	2.5E-06	1.3E-05	3.5E-04	1.2E-04	1.1E-03	1.6E-03	=Crad16*ldcf	
Fraction of time on site	-	fts16	1.00							
External dose rate	mGy/d	Xdrat16	9.6E-04						=Xgrat*24*fts16/1000	
Internal plus external	mGy/d	tdrat16	2.5E-03						=SUM(ldrat16)+Xdrat16	
Absorbed Doses - Long-Tailed Duck - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad17	1.79E-05	1.95E-04	2.22E-03	1.93E-02	1.50E-02			
Internal dose rate	mGy/d	ldrat17	2.5E-06	1.3E-05	3.5E-04	1.2E-04	1.1E-03	1.6E-03	=Crad17*ldcf	
Fraction of time on site	-	fts17	1.00							
External dose rate	mGy/d	Xdrat17	9.6E-04						=Xgrat*24*fts17/1000	
Internal plus external	mGy/d	tdrat17	2.6E-03						=SUM(ldrat17)+Xdrat17	
Absorbed Doses - Merganser - Rock Lake										
Concentration	Bq/g	Crad18	2.29E-06	8.27E-05	1.25E-04	6.29E-03	2.11E-03			
Internal dose rate	mGy/d	ldrat18	3.3E-07	5.4E-06	2.0E-05	3.8E-05	1.6E-04	2.2E-04	=Crad18*ldcf	
Fraction of time on site	-	fts18	1.00							
External dose rate	mGy/d	Xdrat18	9.6E-04						=Xgrat*24*fts18/1000	
Internal plus external	mGy/d	tdrat18	1.2E-03						=SUM(ldrat18)+Xdrat18	
Absorbed Doses - Merganser - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad19	2.29E-06	7.95E-05	1.17E-04	6.08E-03	2.00E-03			
Internal dose rate	mGy/d	ldrat19	3.3E-07	5.2E-06	1.9E-05	3.7E-05	1.5E-04	2.1E-04	=Crad19*ldcf	
Fraction of time on site	-	fts19	1.00							
External dose rate	mGy/d	Xdrat19	9.6E-04						=Xgrat*24*fts19/1000	
Internal plus external	mGy/d	tdrat19	1.2E-03						=SUM(ldrat19)+Xdrat19	
Absorbed Doses - Merganser - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad20	2.29E-06	7.99E-05	1.18E-04	6.10E-03	2.02E-03			
Internal dose rate	mGy/d	ldrat20	3.2E-07	5.3E-06	1.9E-05	3.7E-05	1.5E-04	2.1E-04	=Crad20*ldcf	
Fraction of time on site	-	fts20	1.00							
External dose rate	mGy/d	Xdrat20	9.6E-04						=Xgrat*24*fts20/1000	
Internal plus external	mGy/d	tdrat20	1.2E-03						=SUM(ldrat20)+Xdrat20	
Absorbed Doses - Muskox - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad21	3.12E-05	5.03E-05	7.12E-05	2.23E-04	6.91E-03			
Internal dose rate	mGy/d	ldrat21	4.4E-06	3.3E-06	1.1E-05	1.3E-06	5.1E-04	5.3E-04	=Crad21*ldcf	
Fraction of time on site	-	fts21	1.00							
External dose rate	mGy/d	Xdrat21	9.6E-04						=Xgrat*24*fts21/1000	
Internal plus external	mGy/d	tdrat21	1.5E-03						=SUM(ldrat21)+Xdrat21	
Absorbed Doses - Muskox - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad22	1.17E-05	7.44E-04	1.58E-03	3.56E-02	1.29E-02			
Internal dose rate	mGy/d	ldrat22	1.7E-06	4.9E-05	2.5E-04	2.1E-04	9.5E-04	1.5E-03	=Crad22*ldcf	
Fraction of time on site	-	fts22	1.00							
External dose rate	mGy/d	Xdrat22	9.6E-04						=Xgrat*24*fts22/1000	
Internal plus external	mGy/d	tdrat22	2.4E-03						=SUM(ldrat22)+Xdrat22	
Absorbed Doses - Northern Pintail - Rock Lake										
Concentration	Bq/g	Crad23	7.17E-06	1.15E-03	6.60E-04	5.23E-02	1.76E-02			
Internal dose rate	mGy/d	ldrat23	1.0E-06	7.5E-05	1.0E-04	3.2E-04	1.3E-03	1.8E-03	=Crad23*ldcf	
Fraction of time on site	-	fts23	1.00							
External dose rate	mGy/d	Xdrat23	9.6E-04						=Xgrat*24*fts23/1000	
Internal plus external	mGy/d	tdrat23	2.8E-03						=SUM(ldrat23)+Xdrat23	

Table H.2-2

Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

Absorbed Doses - Northern Pintail - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad24	6.58E-06	1.10E-03	6.36E-04	5.04E-02	1.68E-02			
Internal dose rate	mGy/d	Idrat24	9.3E-07	7.2E-05	1.0E-04	3.0E-04	1.2E-03	1.7E-03	=Crad24*Idcf	
Fraction of time on site	-	fts24	1.00							
External dose rate	mGy/d	Xdrat24	9.6E-04						=Xgrat*24*fts24/1000	
Internal plus external	mGy/d	tdrat24	2.7E-03						=SUM(Idrat24)+Xdrat24	
Absorbed Doses - Northern Pintail - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad25	6.68E-06	1.11E-03	6.38E-04	5.06E-02	1.70E-02			
Internal dose rate	mGy/d	Idrat25	9.5E-07	7.3E-05	1.0E-04	3.1E-04	1.3E-03	1.7E-03	=Crad25*Idcf	
Fraction of time on site	-	fts25	1.00							
External dose rate	mGy/d	Xdrat25	9.6E-04						=Xgrat*24*fts25/1000	
Internal plus external	mGy/d	tdrat25	2.7E-03						=SUM(Idrat25)+Xdrat25	
Absorbed Doses - Ptarmigan - Rock Lake Watershed										
Concentration	Bq/g	Crad26	1.15E-05	2.26E-04	6.65E-04	1.38E-01	4.76E-02			
Internal dose rate	mGy/d	Idrat26	1.6E-06	1.5E-05	1.1E-04	8.3E-04	3.5E-03	4.5E-03	=Crad26*Idcf	
Fraction of time on site	-	fts26	1.00							
External dose rate	mGy/d	Xdrat26	9.6E-04						=Xgrat*24*fts26/1000	
Internal plus external	mGy/d	tdrat26	5.4E-03						=SUM(Idrat26)+Xdrat26	
Absorbed Doses - Ptarmigan - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad27	1.18E-05	2.26E-04	6.77E-04	1.38E-01	4.77E-02			
Internal dose rate	mGy/d	Idrat27	1.7E-06	1.5E-05	1.1E-04	8.3E-04	3.5E-03	4.5E-03	=Crad27*Idcf	
Fraction of time on site	-	fts27	1.00							
External dose rate	mGy/d	Xdrat27	9.6E-04						=Xgrat*24*fts27/1000	
Internal plus external	mGy/d	tdrat27	5.4E-03						=SUM(Idrat27)+Xdrat27	
Absorbed Doses - Ptarmigan - Kiggavik Camp										
Concentration	Bq/g	Crad28	9.38E-06	2.27E-04	6.56E-04	1.38E-01	4.76E-02			
Internal dose rate	mGy/d	Idrat28	1.3E-06	1.5E-05	1.0E-04	8.3E-04	3.5E-03	4.5E-03	=Crad28*Idcf	
Fraction of time on site	-	fts28	1.00							
External dose rate	mGy/d	Xdrat28	9.6E-04						=Xgrat*24*fts28/1000	
Internal plus external	mGy/d	tdrat28	5.4E-03						=SUM(Idrat28)+Xdrat28	
Absorbed Doses - Ptarmigan - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad29	1.16E-05	2.26E-04	6.64E-04	1.38E-01	4.76E-02			
Internal dose rate	mGy/d	Idrat29	1.6E-06	1.5E-05	1.1E-04	8.3E-04	3.5E-03	4.5E-03	=Crad29*Idcf	
Fraction of time on site	-	fts29	1.00							
External dose rate	mGy/d	Xdrat29	9.6E-04						=Xgrat*24*fts29/1000	
Internal plus external	mGy/d	tdrat29	5.4E-03						=SUM(Idrat29)+Xdrat29	
Absorbed Doses - Sandpiper - Rock Lake										
Concentration	Bq/g	Crad30	4.85E-05	7.57E-04	3.86E-03	5.69E-02	3.46E-02			
Internal dose rate	mGy/d	Idrat30	6.9E-06	5.0E-05	6.1E-04	3.4E-04	2.6E-03	3.6E-03	=Crad30*Idcf	
Fraction of time on site	-	fts30	1.00							
External dose rate	mGy/d	Xdrat30	9.6E-04						=Xgrat*24*fts30/1000	
Internal plus external	mGy/d	tdrat30	4.5E-03						=SUM(Idrat30)+Xdrat30	
Absorbed Doses - Sandpiper - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad31	4.49E-05	7.45E-04	3.72E-03	5.55E-02	3.32E-02			
Internal dose rate	mGy/d	Idrat31	6.4E-06	4.9E-05	5.9E-04	3.3E-04	2.5E-03	3.4E-03	=Crad31*Idcf	
Fraction of time on site	-	fts31	1.00							
External dose rate	mGy/d	Xdrat31	9.6E-04						=Xgrat*24*fts31/1000	
Internal plus external	mGy/d	tdrat31	4.4E-03						=SUM(Idrat31)+Xdrat31	
Absorbed Doses - Sandpiper - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad32	4.56E-05	7.45E-04	3.74E-03	5.55E-02	3.34E-02			
Internal dose rate	mGy/d	Idrat32	6.5E-06	4.9E-05	5.9E-04	3.3E-04	2.5E-03	3.5E-03	=Crad32*Idcf	
Fraction of time on site	-	fts32	1.00							
External dose rate	mGy/d	Xdrat32	9.6E-04						=Xgrat*24*fts32/1000	
Internal plus external	mGy/d	tdrat32	4.4E-03						=SUM(Idrat32)+Xdrat32	
Absorbed Doses - Shrew - Rock Lake Watershed										
Concentration	Bq/g	Crad33	3.27E-05	1.90E-04	1.27E-03	1.12E-02	2.07E-03			
Internal dose rate	mGy/d	Idrat33	4.6E-06	1.3E-05	2.0E-04	6.8E-05	1.5E-04	4.4E-04	=Crad33*Idcf	
Fraction of time on site	-	fts33	1.00							
External dose rate	mGy/d	Xdrat33	9.6E-04						=Xgrat*24*fts33/1000	
Internal plus external	mGy/d	tdrat33	1.4E-03						=SUM(Idrat33)+Xdrat33	
Absorbed Doses - Shrew - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad34	3.58E-05	2.00E-04	1.37E-03	1.13E-02	2.12E-03			
Internal dose rate	mGy/d	Idrat34	5.1E-06	1.3E-05	2.2E-04	6.8E-05	1.6E-04	4.6E-04	=Crad34*Idcf	
Fraction of time on site	-	fts34	1.00							
External dose rate	mGy/d	Xdrat34	9.6E-04						=Xgrat*24*fts34/1000	
Internal plus external	mGy/d	tdrat34	1.4E-03						=SUM(Idrat34)+Xdrat34	
Absorbed Doses - Shrew - Kiggavik Camp										
Concentration	Bq/g	Crad35	3.13E-06	1.85E-04	1.18E-03	1.11E-02	2.05E-03			
Internal dose rate	mGy/d	Idrat35	4.4E-07	1.2E-05	1.9E-04	6.7E-05	1.5E-04	4.2E-04	=Crad35*Idcf	
Fraction of time on site	-	fts35	1.00							
External dose rate	mGy/d	Xdrat35	9.6E-04						=Xgrat*24*fts35/1000	
Internal plus external	mGy/d	tdrat35	1.4E-03						=SUM(Idrat35)+Xdrat35	
Absorbed Doses - Shrew - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad36	3.31E-05	1.91E-04	1.26E-03	1.12E-02	2.08E-03			
Internal dose rate	mGy/d	Idrat36	4.7E-06	1.3E-05	2.0E-04	6.8E-05	1.5E-04	4.4E-04	=Crad36*Idcf	
Fraction of time on site	-	fts36	1.00							

Table H.2-2
Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

External dose rate	mGy/d	Xdrat36	2.7E-04							=Xgrat*24*fts36/3600
Internal plus external	mGy/d	tdrat36	7.1E-04							=SUM(ldrat36)+Xdrat36
Absorbed Doses - Squirrel - Rock Lake Watershed										
Concentration	Bq/g	Crad37	2.70E-05	9.88E-04	1.48E-03	1.97E-02	2.34E-03			
Internal dose rate	mGy/d	ldrat37	3.8E-06	6.5E-05	2.4E-04	1.2E-04	1.7E-04	6.0E-04		=Crad37*ldcf
Fraction of time on site	-	fts37	1.00							
External dose rate	mGy/d	Xdrat37	9.6E-04							=Xgrat*24*fts37/1000
Internal plus external	mGy/d	tdrat37	1.6E-03							=SUM(ldrat37)+Xdrat37
Absorbed Doses - Squirrel - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad38	2.70E-05	9.88E-04	1.48E-03	1.97E-02	2.34E-03			
Internal dose rate	mGy/d	ldrat38	3.8E-06	6.5E-05	2.4E-04	1.2E-04	1.7E-04	6.0E-04		=Crad38*ldcf
Fraction of time on site	-	fts38	1.00							
External dose rate	mGy/d	Xdrat38	9.6E-04							=Xgrat*24*fts38/1000
Internal plus external	mGy/d	tdrat38	1.6E-03							=SUM(ldrat38)+Xdrat38
Absorbed Doses - Squirrel - Kiggavik Camp										
Concentration	Bq/g	Crad39	2.85E-05	9.98E-04	1.49E-03	1.98E-02	2.35E-03			
Internal dose rate	mGy/d	ldrat39	4.1E-06	6.6E-05	2.4E-04	1.2E-04	1.7E-04	6.0E-04		=Crad39*ldcf
Fraction of time on site	-	fts39	1.00							
External dose rate	mGy/d	Xdrat39	9.6E-04							=Xgrat*24*fts39/1000
Internal plus external	mGy/d	tdrat39	1.6E-03							=SUM(ldrat39)+Xdrat39

Table H.2-2
Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

Absorbed Doses - Squirrel - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad40	2.71E-05	9.88E-04	1.48E-03	1.97E-02	2.34E-03			
Internal dose rate	mGy/d	Idrat40	3.8E-06	6.5E-05	2.4E-04	1.2E-04	1.7E-04	6.0E-04	=Crad40*Idcf	
Fraction of time on site	-	fts40	1.00							
External dose rate	mGy/d	Xdrat40	9.6E-04						=Xgrat*24*fts40/1000	
Internal plus external	mGy/d	tdrat40	1.6E-03						=SUM(Idrat40)+Xdrat40	
Absorbed Doses - Wolf - LSA										
Concentration	Bq/g	Crad41	1.16E-05	9.61E-06	6.02E-06	3.68E-06	1.90E-03			
Internal dose rate	mGy/d	Idrat41	1.6E-06	6.3E-07	9.6E-07	2.2E-08	1.4E-04	1.4E-04	=Crad41*Idcf	
Fraction of time on site	-	fts41	1.00							
External dose rate	mGy/d	Xdrat41	9.6E-04						=Xgrat*24*fts41/1000	
Internal plus external	mGy/d	tdrat41	1.1E-03						=SUM(Idrat41)+Xdrat41	
Absorbed Doses - Wolf - RSA										
Concentration	Bq/g	Crad42	1.16E-05	9.60E-06	6.02E-06	3.68E-06	1.90E-03			
Internal dose rate	mGy/d	Idrat42	1.6E-06	6.3E-07	9.6E-07	2.2E-08	1.4E-04	1.4E-04	=Crad42*Idcf	
Fraction of time on site	-	fts42	1.00							
External dose rate	mGy/d	Xdrat42	9.6E-04						=Xgrat*24*fts42/1000	
Internal plus external	mGy/d	tdrat42	1.1E-03						=SUM(Idrat42)+Xdrat42	
Absorbed Doses - Wolverine - LSA										
Concentration	Bq/g	Crad43	1.56E-05	3.36E-05	5.34E-05	1.05E-04	4.77E-04			
Internal dose rate	mGy/d	Idrat43	2.2E-06	2.2E-06	8.5E-06	6.3E-07	3.5E-05	4.9E-05	=Crad43*Idcf	
Fraction of time on site	-	fts43	1.00							
External dose rate	mGy/d	Xdrat43	9.6E-04						=Xgrat*24*fts43/1000	
Internal plus external	mGy/d	tdrat43	1.0E-03						=SUM(Idrat43)+Xdrat43	
Absorbed Doses - Wolverine - RSA										
Concentration	Bq/g	Crad44	1.56E-05	3.37E-05	5.34E-05	1.05E-04	4.77E-04			
Internal dose rate	mGy/d	Idrat44	2.2E-06	2.2E-06	8.5E-06	6.4E-07	3.5E-05	4.9E-05	=Crad44*Idcf	
Fraction of time on site	-	fts44	1.00							
External dose rate	mGy/d	Xdrat44	9.6E-04						=Xgrat*24*fts44/1000	
Internal plus external	mGy/d	tdrat44	1.0E-03						=SUM(Idrat44)+Xdrat44	
Equivalent Doses - Bear - LSA										
RBE for alpha	Sv/Gy	RBE	10							
High LET dose rate	mSv/d	Hletdr	1.8E-05	2.2E-05	3.6E-05	3.2E-07	1.3E-03	1.4E-03	=Idrat*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr	9.6E-04						=Xdrat	
Total dose rate	mSv/d	tdr	2.4E-03						=SUM(Hletdr)+Lletdr	
Equivalent Doses - Caribou - LSA										
High LET dose rate	mSv/d	Hletdr2	4.3E-05	2.9E-05	1.4E-04	5.5E-06	1.8E-02	1.8E-02	=Idrat2*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr2	9.6E-04						=Xdrat2	
Total dose rate	mSv/d	tdr2	1.9E-02						=SUM(Hletdr2)+Lletdr2	
Equivalent Doses - Caribou - RSA										
High LET dose rate	mSv/d	Hletdr3	4.3E-05	2.9E-05	1.4E-04	5.5E-06	1.8E-02	1.8E-02	=Idrat3*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr3	9.6E-04						=Xdrat3	
Total dose rate	mSv/d	tdr3	1.9E-02						=SUM(Hletdr3)+Lletdr3	
Equivalent Doses - Falcon - LSA										
High LET dose rate	mSv/d	Hletdr4	5.4E-06	7.9E-05	6.3E-04	8.1E-04	1.1E-02	1.2E-02	=Idrat4*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr4	9.6E-04						=Xdrat4	
Total dose rate	mSv/d	tdr4	1.3E-02						=SUM(Hletdr4)+Lletdr4	
Equivalent Doses - Falcon - RSA										
High LET dose rate	mSv/d	Hletdr5	5.4E-06	7.9E-05	6.3E-04	8.1E-04	1.1E-02	1.2E-02	=Idrat5*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr5	9.6E-04						=Xdrat5	
Total dose rate	mSv/d	tdr5	1.3E-02						=SUM(Hletdr5)+Lletdr5	
Equivalent Doses - Fox - LSA										
High LET dose rate	mSv/d	Hletdr6	1.2E-05	1.6E-05	8.5E-05	7.8E-07	8.0E-04	9.2E-04	=Idrat6*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr6	9.6E-04						=Xdrat6	
Total dose rate	mSv/d	tdr6	1.9E-03						=SUM(Hletdr6)+Lletdr6	
Equivalent Doses - Lemming - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr7	4.6E-05	7.5E-04	3.6E-03	2.9E-04	4.5E-03	9.1E-03	=Idrat7*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr7	9.6E-04						=Xdrat7	
Total dose rate	mSv/d	tdr7	1.0E-02						=SUM(Hletdr7)+Lletdr7	
Equivalent Doses - Lemming - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr8	4.6E-05	7.5E-04	3.6E-03	2.9E-04	4.5E-03	9.1E-03	=Idrat8*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr8	9.6E-04						=Xdrat8	
Total dose rate	mSv/d	tdr8	1.0E-02						=SUM(Hletdr8)+Lletdr8	
Equivalent Doses - Lemming - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr9	4.8E-05	7.6E-04	3.6E-03	2.9E-04	4.5E-03	9.2E-03	=Idrat9*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr9	9.6E-04						=Xdrat9	
Total dose rate	mSv/d	tdr9	1.0E-02						=SUM(Hletdr9)+Lletdr9	
Equivalent Doses - Lemming - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr10	4.6E-05	7.5E-04	3.6E-03	2.9E-04	4.5E-03	9.1E-03	=Idrat10*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr10	9.6E-04						=Xdrat10	
Total dose rate	mSv/d	tdr10	1.0E-02						=SUM(Hletdr10)+Lletdr10	

Table H.2-2

Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

Equivalent Doses - Lapland Longspur - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr11	1.6E-05	4.9E-04	2.5E-03	2.1E-04	9.5E-03	1.3E-02	=ldrat11*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr11	9.6E-04						=Xdrat11	
Total dose rate	mSv/d	tdr11	1.4E-02						=SUM(Hletdr11)+Lletdr11	
Equivalent Doses - Lapland Longspur - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr12	1.8E-05	4.9E-04	2.6E-03	2.2E-04	9.8E-03	1.3E-02	=ldrat12*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr12	9.6E-04						=Xdrat12	
Total dose rate	mSv/d	tdr12	1.4E-02						=SUM(Hletdr12)+Lletdr12	
Equivalent Doses - Lapland Longspur - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr13	5.1E-06	4.9E-04	2.5E-03	2.1E-04	9.4E-03	1.3E-02	=ldrat13*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr13	9.6E-04						=Xdrat13	
Total dose rate	mSv/d	tdr13	1.3E-02						=SUM(Hletdr13)+Lletdr13	
Equivalent Doses - Lapland Longspur - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr14	1.7E-05	4.9E-04	2.5E-03	2.1E-04	9.5E-03	1.3E-02	=ldrat14*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr14	9.6E-04						=Xdrat14	
Total dose rate	mSv/d	tdr14	1.4E-02						=SUM(Hletdr14)+Lletdr14	
Equivalent Doses - Long-Tailed Duck - Rock Lake										
High LET dose rate	mSv/d	Hletdr15	2.8E-05	1.3E-04	3.6E-03	1.2E-04	1.1E-02	1.5E-02	=ldrat15*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr15	9.6E-04						=Xdrat15	
Total dose rate	mSv/d	tdr15	1.6E-02						=SUM(Hletdr15)+Lletdr15	
Equivalent Doses - Long-Tailed Duck - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr16	2.5E-05	1.3E-04	3.5E-03	1.2E-04	1.1E-02	1.5E-02	=ldrat16*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr16	9.6E-04						=Xdrat16	
Total dose rate	mSv/d	tdr16	1.6E-02						=SUM(Hletdr16)+Lletdr16	
Equivalent Doses - Long-Tailed Duck - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr17	2.5E-05	1.3E-04	3.5E-03	1.2E-04	1.1E-02	1.5E-02	=ldrat17*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr17	9.6E-04						=Xdrat17	
Total dose rate	mSv/d	tdr17	1.6E-02						=SUM(Hletdr17)+Lletdr17	
Equivalent Doses - Merganser - Rock Lake										
High LET dose rate	mSv/d	Hletdr18	3.3E-06	5.4E-05	2.0E-04	3.8E-05	1.6E-03	1.9E-03	=ldrat18*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr18	9.6E-04						=Xdrat18	
Total dose rate	mSv/d	tdr18	2.8E-03						=SUM(Hletdr18)+Lletdr18	
Equivalent Doses - Merganser - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr19	3.3E-06	5.2E-05	1.9E-04	3.7E-05	1.5E-03	1.8E-03	=ldrat19*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr19	9.6E-04						=Xdrat19	
Total dose rate	mSv/d	tdr19	2.7E-03						=SUM(Hletdr19)+Lletdr19	
Equivalent Doses - Merganser - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr20	3.2E-06	5.3E-05	1.9E-04	3.7E-05	1.5E-03	1.8E-03	=ldrat20*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr20	9.6E-04						=Xdrat20	
Total dose rate	mSv/d	tdr20	2.7E-03						=SUM(Hletdr20)+Lletdr20	
Equivalent Doses - Muskox - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr21	4.4E-05	3.3E-05	1.1E-04	1.3E-06	5.1E-03	5.3E-03	=ldrat21*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr21	9.6E-04						=Xdrat21	
Total dose rate	mSv/d	tdr21	6.3E-03						=SUM(Hletdr21)+Lletdr21	
Equivalent Doses - Muskox - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr22	1.7E-05	4.9E-04	2.5E-03	2.1E-04	9.5E-03	1.3E-02	=ldrat22*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr22	9.6E-04						=Xdrat22	
Total dose rate	mSv/d	tdr22	1.4E-02						=SUM(Hletdr22)+Lletdr22	
Equivalent Doses - Northern Pintail - Rock Lake										
High LET dose rate	mSv/d	Hletdr23	1.0E-05	7.5E-04	1.0E-03	3.2E-04	1.3E-02	1.5E-02	=ldrat23*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr23	9.6E-04						=Xdrat23	
Total dose rate	mSv/d	tdr23	1.6E-02						=SUM(Hletdr23)+Lletdr23	
Equivalent Doses - Northern Pintail - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr24	9.3E-06	7.2E-04	1.0E-03	3.0E-04	1.2E-02	1.5E-02	=ldrat24*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr24	9.6E-04						=Xdrat24	
Total dose rate	mSv/d	tdr24	1.5E-02						=SUM(Hletdr24)+Lletdr24	
Equivalent Doses - Northern Pintail - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr25	9.5E-06	7.3E-04	1.0E-03	3.1E-04	1.3E-02	1.5E-02	=ldrat25*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr25	9.6E-04						=Xdrat25	
Total dose rate	mSv/d	tdr25	1.6E-02						=SUM(Hletdr25)+Lletdr25	
Equivalent Doses - Ptarmigan - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr26	1.6E-05	1.5E-04	1.1E-03	8.3E-04	3.5E-02	3.7E-02	=ldrat26*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr26	9.6E-04						=Xdrat26	
Total dose rate	mSv/d	tdr26	3.8E-02						=SUM(Hletdr26)+Lletdr26	
Equivalent Doses - Ptarmigan - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr27	1.7E-05	1.5E-04	1.1E-03	8.3E-04	3.5E-02	3.7E-02	=ldrat27*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr27	9.6E-04						=Xdrat27	
Total dose rate	mSv/d	tdr27	3.8E-02						=SUM(Hletdr27)+Lletdr27	

Table H.2-2

Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

Equivalent Doses - Ptarmigan - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr28	1.3E-05	1.5E-04	1.0E-03	8.3E-04	3.5E-02	3.7E-02	=Idrat28*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr28	9.6E-04						=Xdrat28	
Total dose rate	mSv/d	tdr28	3.8E-02						=SUM(Hletdr28)+Lletdr28	
Equivalent Doses - Ptarmigan - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr29	1.6E-05	1.5E-04	1.1E-03	8.3E-04	3.5E-02	3.7E-02	=Idrat29*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr29	9.6E-04						=Xdrat29	
Total dose rate	mSv/d	tdr29	3.8E-02						=SUM(Hletdr29)+Lletdr29	
Equivalent Doses - Sandpiper - Rock Lake										
High LET dose rate	mSv/d	Hletdr30	6.9E-05	5.0E-04	6.1E-03	3.4E-04	2.6E-02	3.3E-02	=Idrat30*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr30	9.6E-04						=Xdrat30	
Total dose rate	mSv/d	tdr30	3.4E-02						=SUM(Hletdr30)+Lletdr30	
Equivalent Doses - Sandpiper - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr31	6.4E-05	4.9E-04	5.9E-03	3.3E-04	2.5E-02	3.1E-02	=Idrat31*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr31	9.6E-04						=Xdrat31	
Total dose rate	mSv/d	tdr31	3.2E-02						=SUM(Hletdr31)+Lletdr31	
Equivalent Doses - Sandpiper - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr32	6.5E-05	4.9E-04	5.9E-03	3.3E-04	2.5E-02	3.2E-02	=Idrat32*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr32	9.6E-04						=Xdrat32	
Total dose rate	mSv/d	tdr32	3.3E-02						=SUM(Hletdr32)+Lletdr32	
Equivalent Doses - Shrew - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr33	4.6E-05	1.3E-04	2.0E-03	6.8E-05	1.5E-03	3.8E-03	=Idrat33*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr33	9.6E-04						=Xdrat33	
Total dose rate	mSv/d	tdr33	4.8E-03						=SUM(Hletdr33)+Lletdr33	
Equivalent Doses - Shrew - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr34	5.1E-05	1.3E-04	2.2E-03	6.8E-05	1.6E-03	4.0E-03	=Idrat34*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr34	9.6E-04						=Xdrat34	
Total dose rate	mSv/d	tdr34	5.0E-03						=SUM(Hletdr34)+Lletdr34	
Equivalent Doses - Shrew - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr35	4.4E-06	1.2E-04	1.9E-03	6.7E-05	1.5E-03	3.6E-03	=Idrat35*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr35	9.6E-04						=Xdrat35	
Total dose rate	mSv/d	tdr35	4.5E-03						=SUM(Hletdr35)+Lletdr35	
Equivalent Doses - Shrew - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr36	4.7E-05	1.3E-04	2.0E-03	6.8E-05	1.5E-03	3.8E-03	=Idrat36*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr36	2.7E-04						=Xdrat36	
Total dose rate	mSv/d	tdr36	4.1E-03						=SUM(Hletdr36)+Lletdr36	
Equivalent Doses - Squirrel - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr37	3.8E-05	6.5E-04	2.4E-03	1.2E-04	1.7E-03	4.9E-03	=Idrat37*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr37	9.6E-04						=Xdrat37	
Total dose rate	mSv/d	tdr37	5.9E-03						=SUM(Hletdr37)+Lletdr37	
Equivalent Doses - Squirrel - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr38	3.8E-05	6.5E-04	2.4E-03	1.2E-04	1.7E-03	4.9E-03	=Idrat38*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr38	9.6E-04						=Xdrat38	
Total dose rate	mSv/d	tdr38	5.9E-03						=SUM(Hletdr38)+Lletdr38	
Equivalent Doses - Squirrel - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr39	4.1E-05	6.6E-04	2.4E-03	1.2E-04	1.7E-03	4.9E-03	=Idrat39*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr39	9.6E-04						=Xdrat39	
Total dose rate	mSv/d	tdr39	5.9E-03						=SUM(Hletdr39)+Lletdr39	
Equivalent Doses - Squirrel - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr40	3.8E-05	6.5E-04	2.4E-03	1.2E-04	1.7E-03	4.9E-03	=Idrat40*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr40	9.6E-04						=Xdrat40	
Total dose rate	mSv/d	tdr40	5.9E-03						=SUM(Hletdr40)+Lletdr40	
Equivalent Doses - Wolf - LSA										
High LET dose rate	mSv/d	Hletdr41	1.6E-05	6.3E-06	9.6E-06	2.2E-08	1.4E-03	1.4E-03	=Idrat41*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr41	9.6E-04						=Xdrat41	
Total dose rate	mSv/d	tdr41	2.4E-03						=SUM(Hletdr41)+Lletdr41	
Equivalent Doses - Wolf - RSA										
High LET dose rate	mSv/d	Hletdr42	1.6E-05	6.3E-06	9.6E-06	2.2E-08	1.4E-03	1.4E-03	=Idrat42*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr42	9.6E-04						=Xdrat42	
Total dose rate	mSv/d	tdr42	2.4E-03						=SUM(Hletdr42)+Lletdr42	
Equivalent Doses - Wolverine - LSA										
High LET dose rate	mSv/d	Hletdr43	2.2E-05	2.2E-05	8.5E-05	6.3E-07	3.5E-04	4.8E-04	=Idrat43*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr43	9.6E-04						=Xdrat43	
Total dose rate	mSv/d	tdr43	1.4E-03						=SUM(Hletdr43)+Lletdr43	
Equivalent Doses - Wolverine - RSA										
High LET dose rate	mSv/d	Hletdr44	2.2E-05	2.2E-05	8.5E-05	6.4E-07	3.5E-04	4.8E-04	=Idrat44*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr44	9.6E-04						=Xdrat44	
Total dose rate	mSv/d	tdr44	1.4E-03						=SUM(Hletdr44)+Lletdr44	

Table H.2-2
Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

SUMMARY

3 Screening Criterion in mGy/d	Total Absorbed Dose mGy/d	Total Equivalent Dose mSv/d	Index (Absorbed Dose)	Index (Equivalent Dose)
Bear - LSA	1.1E-03	2.4E-03	3.7E-04	7.9E-04
Caribou - LSA	2.8E-03	1.9E-02	9.2E-04	6.3E-03
Caribou - RSA	2.8E-03	1.9E-02	9.2E-04	6.3E-03
Falcon - LSA	2.9E-03	1.3E-02	9.8E-04	4.4E-03
Falcon - RSA	2.9E-03	1.3E-02	9.8E-04	4.4E-03
Fox - LSA	1.1E-03	1.9E-03	3.5E-04	6.3E-04
Lemming - Rock Lake Watershed	2.1E-03	1.0E-02	7.1E-04	3.4E-03
Lemming - JSL @ Kiggavik Discharge	2.1E-03	1.0E-02	7.1E-04	3.4E-03
Lemming - Kiggavik Camp	2.1E-03	1.0E-02	7.1E-04	3.4E-03
Lemming - JSL @ Sissons Discharge	2.1E-03	1.0E-02	7.1E-04	3.4E-03
Lapland Longspur - Rock Lake Watershed	2.4E-03	1.4E-02	8.1E-04	4.6E-03
Lapland Longspur - JSL @ Kiggavik Discharge	2.5E-03	1.4E-02	8.2E-04	4.7E-03
Lapland Longspur - Kiggavik Camp	2.4E-03	1.3E-02	8.0E-04	4.5E-03
Lapland Longspur - JSL @ Sissons Discharge	2.4E-03	1.4E-02	8.1E-04	4.6E-03
Long-Tailed Duck - Rock Lake	2.6E-03	1.6E-02	8.7E-04	5.5E-03
Long-Tailed Duck - JSL @ Kiggavik Discharge	2.5E-03	1.6E-02	8.5E-04	5.2E-03
Long-Tailed Duck - JSL @ Sissons Discharge	2.6E-03	1.6E-02	8.5E-04	5.3E-03
Merganser - Rock Lake	1.2E-03	2.8E-03	3.9E-04	9.4E-04
Merganser - JSL @ Kiggavik Discharge	1.2E-03	2.7E-03	3.9E-04	9.1E-04
Merganser - JSL @ Sissons Discharge	1.2E-03	2.7E-03	3.9E-04	9.1E-04
Muskox - JSL @ Kiggavik Discharge	1.5E-03	6.3E-03	5.0E-04	2.1E-03
Muskox - JSL @ Sissons Discharge	2.4E-03	1.4E-02	8.1E-04	4.6E-03
Northern Pintail - Rock Lake	2.8E-03	1.6E-02	9.2E-04	5.4E-03
Northern Pintail - JSL @ Kiggavik Discharge	2.7E-03	1.5E-02	8.9E-04	5.2E-03
Northern Pintail - JSL @ Sissons Discharge	2.7E-03	1.6E-02	9.0E-04	5.2E-03
Ptarmigan - Rock Lake Watershed	5.4E-03	3.8E-02	1.8E-03	1.3E-02
Ptarmigan - JSL @ Kiggavik Discharge	5.4E-03	3.8E-02	1.8E-03	1.3E-02
Ptarmigan - Kiggavik Camp	5.4E-03	3.8E-02	1.8E-03	1.3E-02
Ptarmigan - JSL @ Sissons Discharge	5.4E-03	3.8E-02	1.8E-03	1.3E-02
Sandpiper - Rock Lake	4.5E-03	3.4E-02	1.5E-03	1.1E-02
Sandpiper - JSL @ Kiggavik Discharge	4.4E-03	3.2E-02	1.5E-03	1.1E-02
Sandpiper - JSL @ Sissons Discharge	4.4E-03	3.3E-02	1.5E-03	1.1E-02
Shrew - Rock Lake Watershed	1.4E-03	4.8E-03	4.7E-04	1.6E-03
Shrew - JSL @ Kiggavik Discharge	1.4E-03	5.0E-03	4.7E-04	1.7E-03
Shrew - Kiggavik Camp	1.4E-03	4.5E-03	4.6E-04	1.5E-03
Shrew - JSL @ Sissons Discharge	7.1E-04	4.1E-03	2.4E-04	1.4E-03
Squirrel - Rock Lake Watershed	1.6E-03	5.9E-03	5.2E-04	2.0E-03
Squirrel - JSL @ Kiggavik Discharge	1.6E-03	5.9E-03	5.2E-04	2.0E-03
Squirrel - Kiggavik Camp	1.6E-03	5.9E-03	5.2E-04	2.0E-03
Squirrel - JSL @ Sissons Discharge	1.6E-03	5.9E-03	5.2E-04	2.0E-03
Wolf - LSA	1.1E-03	2.4E-03	3.7E-04	8.0E-04
Wolf - RSA	1.1E-03	2.4E-03	3.7E-04	8.0E-04
Wolverine - LSA	1.0E-03	1.4E-03	3.4E-04	4.8E-04
Wolverine - RSA	1.0E-03	1.4E-03	3.4E-04	4.8E-04

U-238+ Internal U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235
Ra-226+ Internal Ra-226 + 0.3* (Rn-222 + ...Po-214)
Pb-210+ Internal Pb-210 + Bi-210

Table H.2-2

Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

2065

DOSES TO SELECTED VECs - 95th Percentile Total Dose

		U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Absorbed Doses - Bear - LSA								
Concentration	Bq/g	Crad	3.88E-05	1.51E-04	6.99E-05	1.74E-04	6.45E-03	
Internal Dose Factor	mGy/d per Bq/g	ldcf	1.4E-01	6.6E-02	1.6E-01	6.0E-03	7.4E-02	
Internal dose rate	mGy/d	ldrat	5.5E-06	9.9E-06	1.1E-05	1.1E-06	4.8E-04	5.0E-04 =Crad*ldcf
External Gamma rate	uGy/h	Xgrat	0.04					
Fraction of time on site	-	fts	1.00					
External dose rate	mGy/d	Xdrat	9.6E-04					=Xgrat*24*fts/1000
Internal plus external	mGy/d	tdrat	1.5E-03					=SUM(ldrat)+Xdrat
Absorbed Doses - Caribou - LSA								
Concentration	Bq/g	Crad2	8.62E-05	1.33E-04	2.95E-04	2.53E-03	7.65E-02	
Internal dose rate	mGy/d	ldrat2	1.2E-05	8.7E-06	4.7E-05	1.5E-05	5.7E-03	=Crad2*ldcf
Fraction of time on site	-	fts2	1.00					
External dose rate	mGy/d	Xdrat2	9.6E-04					=Xgrat*24*fts2/1000
Internal plus external	mGy/d	tdrat2	6.7E-03					=SUM(ldrat2)+Xdrat2
Absorbed Doses - Caribou - RSA								
Concentration	Bq/g	Crad3	8.62E-05	1.33E-04	2.95E-04	2.53E-03	7.65E-02	
Internal dose rate	mGy/d	ldrat3	1.2E-05	8.7E-06	4.7E-05	1.5E-05	5.7E-03	=Crad3*ldcf
Fraction of time on site	-	fts3	1.00					
External dose rate	mGy/d	Xdrat3	9.6E-04					=Xgrat*24*fts3/1000
Internal plus external	mGy/d	tdrat3	6.7E-03					=SUM(ldrat3)+Xdrat3
Absorbed Doses - Falcon - LSA								
Concentration	Bq/g	Crad4	1.15E-05	3.57E-04	1.38E-03	4.40E-01	5.01E-02	
Internal dose rate	mGy/d	ldrat4	1.6E-06	2.3E-05	2.2E-04	2.7E-03	3.7E-03	6.6E-03 =Crad4*ldcf
Fraction of time on site	-	fts4	1.00					
External dose rate	mGy/d	Xdrat4	9.6E-04					=Xgrat*24*fts4/1000
Internal plus external	mGy/d	tdrat4	7.6E-03					=SUM(ldrat4)+Xdrat4
Absorbed Doses - Falcon - RSA								
Concentration	Bq/g	Crad5	1.14E-05	3.56E-04	1.38E-03	4.40E-01	5.00E-02	
Internal dose rate	mGy/d	ldrat5	1.6E-06	2.3E-05	2.2E-04	2.7E-03	3.7E-03	6.6E-03 =Crad5*ldcf
Fraction of time on site	-	fts5	1.00					
External dose rate	mGy/d	Xdrat5	9.6E-04					=Xgrat*24*fts5/1000
Internal plus external	mGy/d	tdrat5	7.6E-03					=SUM(ldrat5)+Xdrat5
Absorbed Doses - Fox - LSA								
Concentration	Bq/g	Crad6	2.01E-05	7.95E-05	1.30E-04	5.17E-04	3.67E-03	
Internal dose rate	mGy/d	ldrat6	2.9E-06	5.2E-06	2.1E-05	3.1E-06	2.7E-04	3.0E-04 =Crad6*ldcf
Fraction of time on site	-	fts6	1.00					
External dose rate	mGy/d	Xdrat6	9.6E-04					=Xgrat*24*fts6/1000
Internal plus external	mGy/d	tdrat6	1.3E-03					=SUM(ldrat6)+Xdrat6
Absorbed Doses - Lemming - Rock Lake Watershed								
Concentration	Bq/g	Crad7	1.50E-04	3.56E-03	6.36E-03	1.69E-01	2.09E-02	
Internal dose rate	mGy/d	ldrat7	2.1E-05	2.3E-04	1.0E-03	1.0E-03	1.5E-03	3.8E-03 =Crad7*ldcf
Fraction of time on site	-	fts7	1.00					
External dose rate	mGy/d	Xdrat7	9.6E-04					=Xgrat*24*fts7/1000
Internal plus external	mGy/d	tdrat7	4.8E-03					=SUM(ldrat7)+Xdrat7
Absorbed Doses - Lemming - JSL @ Kiggavik Discharge								
Concentration	Bq/g	Crad8	1.50E-04	3.56E-03	6.36E-03	1.69E-01	2.09E-02	
Internal dose rate	mGy/d	ldrat8	2.1E-05	2.3E-04	1.0E-03	1.0E-03	1.5E-03	3.8E-03 =Crad8*ldcf
Fraction of time on site	-	fts8	1.00					
External dose rate	mGy/d	Xdrat8	9.6E-04					=Xgrat*24*fts8/1000
Internal plus external	mGy/d	tdrat8	4.8E-03					=SUM(ldrat8)+Xdrat8
Absorbed Doses - Lemming - Kiggavik Camp								
Concentration	Bq/g	Crad9	1.53E-04	3.58E-03	6.37E-03	1.69E-01	2.09E-02	
Internal dose rate	mGy/d	ldrat9	2.2E-05	2.4E-04	1.0E-03	1.0E-03	1.5E-03	3.8E-03 =Crad9*ldcf
Fraction of time on site	-	fts9	1.00					
External dose rate	mGy/d	Xdrat9	9.6E-04					=Xgrat*24*fts9/1000
Internal plus external	mGy/d	tdrat9	4.8E-03					=SUM(ldrat9)+Xdrat9
Absorbed Doses - Lemming - JSL @ Sissons Discharge								
Concentration	Bq/g	Crad10	1.50E-04	3.56E-03	6.36E-03	1.69E-01	2.09E-02	
Internal dose rate	mGy/d	ldrat10	2.1E-05	2.3E-04	1.0E-03	1.0E-03	1.5E-03	3.8E-03 =Crad10*ldcf
Fraction of time on site	-	fts10	1.00					
External dose rate	mGy/d	Xdrat10	9.6E-04					=Xgrat*24*fts10/1000
Internal plus external	mGy/d	tdrat10	4.8E-03					=SUM(ldrat10)+Xdrat10
Absorbed Doses - Lapland Longspur - Rock Lake Watershed								
Concentration	Bq/g	Crad11	4.07E-05	3.37E-03	5.24E-03	1.35E-01	3.62E-02	
Internal dose rate	mGy/d	ldrat11	5.8E-06	2.2E-04	8.3E-04	8.1E-04	2.7E-03	4.6E-03 =Crad11*ldcf
Fraction of time on site	-	fts11	1.00					
External dose rate	mGy/d	Xdrat11	9.6E-04					=Xgrat*24*fts11/1000
Internal plus external	mGy/d	tdrat11	5.5E-03					=SUM(ldrat11)+Xdrat11

Table H.2-2

Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

Absorbed Doses - Lapland Longspur - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad12	4.32E-05	3.38E-03	5.39E-03	1.36E-01	3.72E-02			
Internal dose rate	mGy/d	ldrat12	6.1E-06	2.2E-04	8.6E-04	8.2E-04	2.8E-03	4.7E-03	=Crad12*ldcf	
Fraction of time on site	-	fts12	1.00							
External dose rate	mGy/d	Xdrat12	9.6E-04						=Xgrat*24*fts12/1000	
Internal plus external	mGy/d	tdrat12	5.6E-03						=SUM(ldrat12)+Xdrat12	
Absorbed Doses - Lapland Longspur - Kiggavik Camp										
Concentration	Bq/g	Crad13	1.30E-05	3.38E-03	5.10E-03	1.34E-01	3.57E-02			
Internal dose rate	mGy/d	ldrat13	1.8E-06	2.2E-04	8.1E-04	8.1E-04	2.6E-03	4.5E-03	=Crad13*ldcf	
Fraction of time on site	-	fts13	1.00							
External dose rate	mGy/d	Xdrat13	9.6E-04						=Xgrat*24*fts13/1000	
Internal plus external	mGy/d	tdrat13	5.4E-03						=SUM(ldrat13)+Xdrat13	
Absorbed Doses - Lapland Longspur - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad14	4.07E-05	3.37E-03	5.22E-03	1.35E-01	3.64E-02			
Internal dose rate	mGy/d	ldrat14	5.8E-06	2.2E-04	8.3E-04	8.1E-04	2.7E-03	4.6E-03	=Crad14*ldcf	
Fraction of time on site	-	fts14	1.00							
External dose rate	mGy/d	Xdrat14	9.6E-04						=Xgrat*24*fts14/1000	
Internal plus external	mGy/d	tdrat14	5.5E-03						=SUM(ldrat14)+Xdrat14	
Absorbed Doses - Long-Tailed Duck - Rock Lake										
Concentration	Bq/g	Crad15	5.55E-05	6.03E-04	9.26E-03	6.39E-02	5.78E-02			
Internal dose rate	mGy/d	ldrat15	7.9E-06	4.0E-05	1.5E-03	3.9E-04	4.3E-03	6.2E-03	=Crad15*ldcf	
Fraction of time on site	-	fts15	1.00							
External dose rate	mGy/d	Xdrat15	9.6E-04						=Xgrat*24*fts15/1000	
Internal plus external	mGy/d	tdrat15	7.1E-03						=SUM(ldrat15)+Xdrat15	
Absorbed Doses - Long-Tailed Duck - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad16	4.99E-05	5.82E-04	8.89E-03	6.15E-02	5.54E-02			
Internal dose rate	mGy/d	ldrat16	7.1E-06	3.8E-05	1.4E-03	3.7E-04	4.1E-03	5.9E-03	=Crad16*ldcf	
Fraction of time on site	-	fts16	1.00							
External dose rate	mGy/d	Xdrat16	9.6E-04						=Xgrat*24*fts16/1000	
Internal plus external	mGy/d	tdrat16	6.9E-03						=SUM(ldrat16)+Xdrat16	
Absorbed Doses - Long-Tailed Duck - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad17	5.11E-05	5.85E-04	8.94E-03	6.18E-02	5.58E-02			
Internal dose rate	mGy/d	ldrat17	7.2E-06	3.9E-05	1.4E-03	3.7E-04	4.1E-03	6.0E-03	=Crad17*ldcf	
Fraction of time on site	-	fts17	1.00							
External dose rate	mGy/d	Xdrat17	9.6E-04						=Xgrat*24*fts17/1000	
Internal plus external	mGy/d	tdrat17	6.9E-03						=SUM(ldrat17)+Xdrat17	
Absorbed Doses - Merganser - Rock Lake										
Concentration	Bq/g	Crad18	7.69E-06	3.15E-04	3.99E-04	1.98E-02	7.05E-03			
Internal dose rate	mGy/d	ldrat18	1.1E-06	2.1E-05	6.3E-05	1.2E-04	5.2E-04	7.3E-04	=Crad18*ldcf	
Fraction of time on site	-	fts18	1.00							
External dose rate	mGy/d	Xdrat18	9.6E-04						=Xgrat*24*fts18/1000	
Internal plus external	mGy/d	tdrat18	1.7E-03						=SUM(ldrat18)+Xdrat18	
Absorbed Doses - Merganser - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad19	7.65E-06	3.08E-04	3.71E-04	1.97E-02	6.67E-03			
Internal dose rate	mGy/d	ldrat19	1.1E-06	2.0E-05	5.9E-05	1.2E-04	4.9E-04	6.9E-04	=Crad19*ldcf	
Fraction of time on site	-	fts19	1.00							
External dose rate	mGy/d	Xdrat19	9.6E-04						=Xgrat*24*fts19/1000	
Internal plus external	mGy/d	tdrat19	1.7E-03						=SUM(ldrat19)+Xdrat19	
Absorbed Doses - Merganser - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad20	7.64E-06	3.09E-04	3.73E-04	1.97E-02	6.68E-03			
Internal dose rate	mGy/d	ldrat20	1.1E-06	2.0E-05	5.9E-05	1.2E-04	4.9E-04	6.9E-04	=Crad20*ldcf	
Fraction of time on site	-	fts20	1.00							
External dose rate	mGy/d	Xdrat20	9.6E-04						=Xgrat*24*fts20/1000	
Internal plus external	mGy/d	tdrat20	1.7E-03						=SUM(ldrat20)+Xdrat20	
Absorbed Doses - Muskox - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad21	1.18E-04	1.86E-04	2.87E-04	6.77E-04	2.04E-02			
Internal dose rate	mGy/d	ldrat21	1.7E-05	1.2E-05	4.6E-05	4.1E-06	1.5E-03	1.6E-03	=Crad21*ldcf	
Fraction of time on site	-	fts21	1.00							
External dose rate	mGy/d	Xdrat21	9.6E-04						=Xgrat*24*fts21/1000	
Internal plus external	mGy/d	tdrat21	2.6E-03						=SUM(ldrat21)+Xdrat21	
Absorbed Doses - Muskox - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad22	4.07E-05	3.37E-03	5.22E-03	1.35E-01	3.64E-02			
Internal dose rate	mGy/d	ldrat22	5.8E-06	2.2E-04	8.3E-04	8.1E-04	2.7E-03	4.6E-03	=Crad22*ldcf	
Fraction of time on site	-	fts22	1.00							
External dose rate	mGy/d	Xdrat22	9.6E-04						=Xgrat*24*fts22/1000	
Internal plus external	mGy/d	tdrat22	5.5E-03						=SUM(ldrat22)+Xdrat22	
Absorbed Doses - Northern Pintail - Rock Lake										
Concentration	Bq/g	Crad23	2.34E-05	4.59E-03	2.26E-03	1.68E-01	6.11E-02			
Internal dose rate	mGy/d	ldrat23	3.3E-06	3.0E-04	3.6E-04	1.0E-03	4.5E-03	6.2E-03	=Crad23*ldcf	
Fraction of time on site	-	fts23	1.00							
External dose rate	mGy/d	Xdrat23	9.6E-04						=Xgrat*24*fts23/1000	
Internal plus external	mGy/d	tdrat23	7.2E-03						=SUM(ldrat23)+Xdrat23	

Table H.2-2
Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

Absorbed Doses - Northern Pintail - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad24	2.11E-05	4.42E-03	2.17E-03	1.62E-01	5.85E-02			
Internal dose rate	mGy/d	Idrat24	3.0E-06	2.9E-04	3.5E-04	9.8E-04	4.3E-03	5.9E-03	=Crad24*Idcf	
Fraction of time on site	-	fts24	1.00							
External dose rate	mGy/d	Xdrat24	9.6E-04						=Xgrat*24*fts24/1000	
Internal plus external	mGy/d	tdrat24	6.9E-03						=SUM(Idrat24)+Xdrat24	
Absorbed Doses - Northern Pintail - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad25	2.14E-05	4.45E-03	2.18E-03	1.63E-01	5.90E-02			
Internal dose rate	mGy/d	Idrat25	3.0E-06	2.9E-04	3.5E-04	9.8E-04	4.4E-03	6.0E-03	=Crad25*Idcf	
Fraction of time on site	-	fts25	1.00							
External dose rate	mGy/d	Xdrat25	9.6E-04						=Xgrat*24*fts25/1000	
Internal plus external	mGy/d	tdrat25	6.9E-03						=SUM(Idrat25)+Xdrat25	
Absorbed Doses - Ptarmigan - Rock Lake Watershed										
Concentration	Bq/g	Crad26	4.26E-05	9.02E-04	2.17E-03	3.89E-01	1.43E-01			
Internal dose rate	mGy/d	Idrat26	6.0E-06	5.9E-05	3.5E-04	2.3E-03	1.1E-02	1.3E-02	=Crad26*Idcf	
Fraction of time on site	-	fts26	1.00							
External dose rate	mGy/d	Xdrat26	9.6E-04						=Xgrat*24*fts26/1000	
Internal plus external	mGy/d	tdrat26	1.4E-02						=SUM(Idrat26)+Xdrat26	
Absorbed Doses - Ptarmigan - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad27	4.32E-05	9.03E-04	2.21E-03	3.89E-01	1.43E-01			
Internal dose rate	mGy/d	Idrat27	6.1E-06	5.9E-05	3.5E-04	2.3E-03	1.1E-02	1.3E-02	=Crad27*Idcf	
Fraction of time on site	-	fts27	1.00							
External dose rate	mGy/d	Xdrat27	9.6E-04						=Xgrat*24*fts27/1000	
Internal plus external	mGy/d	tdrat27	1.4E-02						=SUM(Idrat27)+Xdrat27	
Absorbed Doses - Ptarmigan - Kiggavik Camp										
Concentration	Bq/g	Crad28	3.52E-05	9.07E-04	2.10E-03	3.89E-01	1.44E-01			
Internal dose rate	mGy/d	Idrat28	5.0E-06	6.0E-05	3.3E-04	2.3E-03	1.1E-02	1.3E-02	=Crad28*Idcf	
Fraction of time on site	-	fts28	1.00							
External dose rate	mGy/d	Xdrat28	9.6E-04						=Xgrat*24*fts28/1000	
Internal plus external	mGy/d	tdrat28	1.4E-02						=SUM(Idrat28)+Xdrat28	
Absorbed Doses - Ptarmigan - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad29	4.27E-05	9.02E-04	2.16E-03	3.89E-01	1.43E-01			
Internal dose rate	mGy/d	Idrat29	6.1E-06	5.9E-05	3.4E-04	2.3E-03	1.1E-02	1.3E-02	=Crad29*Idcf	
Fraction of time on site	-	fts29	1.00							
External dose rate	mGy/d	Xdrat29	9.6E-04						=Xgrat*24*fts29/1000	
Internal plus external	mGy/d	tdrat29	1.4E-02						=SUM(Idrat29)+Xdrat29	
Absorbed Doses - Sandpiper - Rock Lake										
Concentration	Bq/g	Crad30	1.96E-04	2.14E-03	1.53E-02	1.83E-01	1.19E-01			
Internal dose rate	mGy/d	Idrat30	2.8E-05	1.4E-04	2.4E-03	1.1E-03	8.8E-03	1.3E-02	=Crad30*Idcf	
Fraction of time on site	-	fts30	1.00							
External dose rate	mGy/d	Xdrat30	9.6E-04						=Xgrat*24*fts30/1000	
Internal plus external	mGy/d	tdrat30	1.3E-02						=SUM(Idrat30)+Xdrat30	
Absorbed Doses - Sandpiper - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad31	1.81E-04	2.11E-03	1.47E-02	1.78E-01	1.14E-01			
Internal dose rate	mGy/d	Idrat31	2.6E-05	1.4E-04	2.3E-03	1.1E-03	8.5E-03	1.2E-02	=Crad31*Idcf	
Fraction of time on site	-	fts31	1.00							
External dose rate	mGy/d	Xdrat31	9.6E-04						=Xgrat*24*fts31/1000	
Internal plus external	mGy/d	tdrat31	1.3E-02						=SUM(Idrat31)+Xdrat31	
Absorbed Doses - Sandpiper - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad32	1.84E-04	2.10E-03	1.48E-02	1.78E-01	1.15E-01			
Internal dose rate	mGy/d	Idrat32	2.6E-05	1.4E-04	2.4E-03	1.1E-03	8.5E-03	1.2E-02	=Crad32*Idcf	
Fraction of time on site	-	fts32	1.00							
External dose rate	mGy/d	Xdrat32	9.6E-04						=Xgrat*24*fts32/1000	
Internal plus external	mGy/d	tdrat32	1.3E-02						=SUM(Idrat32)+Xdrat32	
Absorbed Doses - Shrew - Rock Lake Watershed										
Concentration	Bq/g	Crad33	1.03E-04	6.31E-04	4.02E-03	3.64E-02	5.70E-03			
Internal dose rate	mGy/d	Idrat33	1.5E-05	4.2E-05	6.4E-04	2.2E-04	4.2E-04	1.3E-03	=Crad33*Idcf	
Fraction of time on site	-	fts33	1.00							
External dose rate	mGy/d	Xdrat33	9.6E-04						=Xgrat*24*fts33/1000	
Internal plus external	mGy/d	tdrat33	2.3E-03						=SUM(Idrat33)+Xdrat33	
Absorbed Doses - Shrew - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad34	1.13E-04	6.72E-04	4.37E-03	3.68E-02	5.88E-03			
Internal dose rate	mGy/d	Idrat34	1.6E-05	4.4E-05	6.9E-04	2.2E-04	4.4E-04	1.4E-03	=Crad34*Idcf	
Fraction of time on site	-	fts34	1.00							
External dose rate	mGy/d	Xdrat34	9.6E-04						=Xgrat*24*fts34/1000	
Internal plus external	mGy/d	tdrat34	2.4E-03						=SUM(Idrat34)+Xdrat34	
Absorbed Doses - Shrew - Kiggavik Camp										
Concentration	Bq/g	Crad35	9.48E-06	6.01E-04	3.72E-03	3.61E-02	5.69E-03			
Internal dose rate	mGy/d	Idrat35	1.3E-06	4.0E-05	5.9E-04	2.2E-04	4.2E-04	1.3E-03	=Crad35*Idcf	
Fraction of time on site	-	fts35	1.00							
External dose rate	mGy/d	Xdrat35	9.6E-04						=Xgrat*24*fts35/1000	
Internal plus external	mGy/d	tdrat35	2.2E-03						=SUM(Idrat35)+Xdrat35	
Absorbed Doses - Shrew - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad36	1.04E-04	6.31E-04	4.01E-03	3.64E-02	5.72E-03			
Internal dose rate	mGy/d	Idrat36	1.5E-05	4.2E-05	6.4E-04	2.2E-04	4.2E-04	1.3E-03	=Crad36*Idcf	
Fraction of time on site	-	fts36	1.00							

Table H.2-2

Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

External dose rate	mGy/d	Xdrat36	2.7E-04							=Xgrat*24*fts36/3600
Internal plus external	mGy/d	tdrat36	1.6E-03							=SUM(ldrat36)+Xdrat36
Absorbed Doses - Squirrel - Rock Lake Watershed										
Concentration	Bq/g	Crad37	8.97E-05	3.42E-03	6.40E-03	8.34E-02	1.01E-02			
Internal dose rate	mGy/d	ldrat37	1.3E-05	2.3E-04	1.0E-03	5.0E-04	7.5E-04	2.5E-03		=Crad37*ldcf
Fraction of time on site	-	fts37	1.00							
External dose rate	mGy/d	Xdrat37	9.6E-04							=Xgrat*24*fts37/1000
Internal plus external	mGy/d	tdrat37	3.5E-03							=SUM(ldrat37)+Xdrat37
Absorbed Doses - Squirrel - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad38	8.96E-05	3.42E-03	6.40E-03	8.34E-02	1.01E-02			
Internal dose rate	mGy/d	ldrat38	1.3E-05	2.3E-04	1.0E-03	5.0E-04	7.5E-04	2.5E-03		=Crad38*ldcf
Fraction of time on site	-	fts38	1.00							
External dose rate	mGy/d	Xdrat38	9.6E-04							=Xgrat*24*fts38/1000
Internal plus external	mGy/d	tdrat38	3.5E-03							=SUM(ldrat38)+Xdrat38
Absorbed Doses - Squirrel - Kiggavik Camp										
Concentration	Bq/g	Crad39	9.30E-05	3.45E-03	6.44E-03	8.35E-02	1.01E-02			
Internal dose rate	mGy/d	ldrat39	1.3E-05	2.3E-04	1.0E-03	5.0E-04	7.5E-04	2.5E-03		=Crad39*ldcf
Fraction of time on site	-	fts39	1.00							
External dose rate	mGy/d	Xdrat39	9.6E-04							=Xgrat*24*fts39/1000
Internal plus external	mGy/d	tdrat39	3.5E-03							=SUM(ldrat39)+Xdrat39

Table H.2-2
Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

Absorbed Doses - Squirrel - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad40	8.97E-05	3.42E-03	6.40E-03	8.34E-02	1.01E-02			
Internal dose rate	mGy/d	Idrat40	1.3E-05	2.3E-04	1.0E-03	5.0E-04	7.5E-04	2.5E-03	=Crad40*Idcf	
Fraction of time on site	-	fts40	1.00							
External dose rate	mGy/d	Xdrat40	9.6E-04						=Xgrat*24*fts40/1000	
Internal plus external	mGy/d	tdrat40	3.5E-03						=SUM(Idrat40)+Xdrat40	
Absorbed Doses - Wolf - LSA										
Concentration	Bq/g	Crad41	4.16E-05	2.94E-05	2.20E-05	1.44E-05	7.66E-03			
Internal dose rate	mGy/d	Idrat41	5.9E-06	1.9E-06	3.5E-06	8.7E-08	5.7E-04	5.8E-04	=Crad41*Idcf	
Fraction of time on site	-	fts41	1.00							
External dose rate	mGy/d	Xdrat41	9.6E-04						=Xgrat*24*fts41/1000	
Internal plus external	mGy/d	tdrat41	1.5E-03						=SUM(Idrat41)+Xdrat41	
Absorbed Doses - Wolf - RSA										
Concentration	Bq/g	Crad42	4.16E-05	2.94E-05	2.20E-05	1.44E-05	7.66E-03			
Internal dose rate	mGy/d	Idrat42	5.9E-06	1.9E-06	3.5E-06	8.7E-08	5.7E-04	5.8E-04	=Crad42*Idcf	
Fraction of time on site	-	fts42	1.00							
External dose rate	mGy/d	Xdrat42	9.6E-04						=Xgrat*24*fts42/1000	
Internal plus external	mGy/d	tdrat42	1.5E-03						=SUM(Idrat42)+Xdrat42	
Absorbed Doses - Wolverine - LSA										
Concentration	Bq/g	Crad43	5.82E-05	1.16E-04	2.13E-04	4.70E-04	1.79E-03			
Internal dose rate	mGy/d	Idrat43	8.3E-06	7.6E-06	3.4E-05	2.8E-06	1.3E-04	1.9E-04	=Crad43*Idcf	
Fraction of time on site	-	fts43	1.00							
External dose rate	mGy/d	Xdrat43	9.6E-04						=Xgrat*24*fts43/1000	
Internal plus external	mGy/d	tdrat43	1.1E-03						=SUM(Idrat43)+Xdrat43	
Absorbed Doses - Wolverine - RSA										
Concentration	Bq/g	Crad44	5.82E-05	1.16E-04	2.13E-04	4.70E-04	1.80E-03			
Internal dose rate	mGy/d	Idrat44	8.3E-06	7.6E-06	3.4E-05	2.8E-06	1.3E-04	1.9E-04	=Crad44*Idcf	
Fraction of time on site	-	fts44	1.00							
External dose rate	mGy/d	Xdrat44	9.6E-04						=Xgrat*24*fts44/1000	
Internal plus external	mGy/d	tdrat44	1.1E-03						=SUM(Idrat44)+Xdrat44	
Equivalent Doses - Bear - LSA										
RBE for alpha	Sv/Gy	RBE	10							
High LET dose rate	mSv/d	Hletdr	5.5E-05	9.9E-05	1.1E-04	1.1E-06	4.8E-03	5.0E-03	=Idrat*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr	9.6E-04						=Xdrat	
Total dose rate	mSv/d	tdr	6.0E-03						=SUM(Hletdr)+Lletdr	
Equivalent Doses - Caribou - LSA										
High LET dose rate	mSv/d	Hletdr2	1.2E-04	8.7E-05	4.7E-04	1.5E-05	5.7E-02	5.7E-02	=Idrat2*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr2	9.6E-04						=Xdrat2	
Total dose rate	mSv/d	tdr2	5.8E-02						=SUM(Hletdr2)+Lletdr2	
Equivalent Doses - Caribou - RSA										
High LET dose rate	mSv/d	Hletdr3	1.2E-04	8.7E-05	4.7E-04	1.5E-05	5.7E-02	5.7E-02	=Idrat3*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr3	9.6E-04						=Xdrat3	
Total dose rate	mSv/d	tdr3	5.8E-02						=SUM(Hletdr3)+Lletdr3	
Equivalent Doses - Falcon - LSA										
High LET dose rate	mSv/d	Hletdr4	1.6E-05	2.3E-04	2.2E-03	2.7E-03	3.7E-02	4.2E-02	=Idrat4*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr4	9.6E-04						=Xdrat4	
Total dose rate	mSv/d	tdr4	4.3E-02						=SUM(Hletdr4)+Lletdr4	
Equivalent Doses - Falcon - RSA										
High LET dose rate	mSv/d	Hletdr5	1.6E-05	2.3E-04	2.2E-03	2.7E-03	3.7E-02	4.2E-02	=Idrat5*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr5	9.6E-04						=Xdrat5	
Total dose rate	mSv/d	tdr5	4.3E-02						=SUM(Hletdr5)+Lletdr5	
Equivalent Doses - Fox - LSA										
High LET dose rate	mSv/d	Hletdr6	2.9E-05	5.2E-05	2.1E-04	3.1E-06	2.7E-03	3.0E-03	=Idrat6*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr6	9.6E-04						=Xdrat6	
Total dose rate	mSv/d	tdr6	4.0E-03						=SUM(Hletdr6)+Lletdr6	
Equivalent Doses - Lemming - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr7	2.1E-04	2.3E-03	1.0E-02	1.0E-03	1.5E-02	2.9E-02	=Idrat7*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr7	9.6E-04						=Xdrat7	
Total dose rate	mSv/d	tdr7	3.0E-02						=SUM(Hletdr7)+Lletdr7	
Equivalent Doses - Lemming - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr8	2.1E-04	2.3E-03	1.0E-02	1.0E-03	1.5E-02	2.9E-02	=Idrat8*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr8	9.6E-04						=Xdrat8	
Total dose rate	mSv/d	tdr8	3.0E-02						=SUM(Hletdr8)+Lletdr8	
Equivalent Doses - Lemming - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr9	2.2E-04	2.4E-03	1.0E-02	1.0E-03	1.5E-02	2.9E-02	=Idrat9*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr9	9.6E-04						=Xdrat9	
Total dose rate	mSv/d	tdr9	3.0E-02						=SUM(Hletdr9)+Lletdr9	
Equivalent Doses - Lemming - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr10	2.1E-04	2.3E-03	1.0E-02	1.0E-03	1.5E-02	2.9E-02	=Idrat10*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr10	9.6E-04						=Xdrat10	
Total dose rate	mSv/d	tdr10	3.0E-02						=SUM(Hletdr10)+Lletdr10	

Table H.2-2

Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

Equivalent Doses - Lapland Longspur - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr11	5.8E-05	2.2E-03	8.3E-03	8.1E-04	2.7E-02	3.8E-02	=ldrat11*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr11	9.6E-04						=Xdrat11	
Total dose rate	mSv/d	tdr11	3.9E-02						=SUM(Hletdr11)+Lletdr11	
Equivalent Doses - Lapland Longspur - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr12	6.1E-05	2.2E-03	8.6E-03	8.2E-04	2.8E-02	3.9E-02	=ldrat12*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr12	9.6E-04						=Xdrat12	
Total dose rate	mSv/d	tdr12	4.0E-02						=SUM(Hletdr12)+Lletdr12	
Equivalent Doses - Lapland Longspur - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr13	1.8E-05	2.2E-03	8.1E-03	8.1E-04	2.6E-02	3.8E-02	=ldrat13*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr13	9.6E-04						=Xdrat13	
Total dose rate	mSv/d	tdr13	3.9E-02						=SUM(Hletdr13)+Lletdr13	
Equivalent Doses - Lapland Longspur - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr14	5.8E-05	2.2E-03	8.3E-03	8.1E-04	2.7E-02	3.8E-02	=ldrat14*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr14	9.6E-04						=Xdrat14	
Total dose rate	mSv/d	tdr14	3.9E-02						=SUM(Hletdr14)+Lletdr14	
Equivalent Doses - Long-Tailed Duck - Rock Lake										
High LET dose rate	mSv/d	Hletdr15	7.9E-05	4.0E-04	1.5E-02	3.9E-04	4.3E-02	5.8E-02	=ldrat15*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr15	9.6E-04						=Xdrat15	
Total dose rate	mSv/d	tdr15	5.9E-02						=SUM(Hletdr15)+Lletdr15	
Equivalent Doses - Long-Tailed Duck - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr16	7.1E-05	3.8E-04	1.4E-02	3.7E-04	4.1E-02	5.6E-02	=ldrat16*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr16	9.6E-04						=Xdrat16	
Total dose rate	mSv/d	tdr16	5.7E-02						=SUM(Hletdr16)+Lletdr16	
Equivalent Doses - Long-Tailed Duck - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr17	7.2E-05	3.9E-04	1.4E-02	3.7E-04	4.1E-02	5.6E-02	=ldrat17*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr17	9.6E-04						=Xdrat17	
Total dose rate	mSv/d	tdr17	5.7E-02						=SUM(Hletdr17)+Lletdr17	
Equivalent Doses - Merganser - Rock Lake										
High LET dose rate	mSv/d	Hletdr18	1.1E-05	2.1E-04	6.3E-04	1.2E-04	5.2E-03	6.2E-03	=ldrat18*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr18	9.6E-04						=Xdrat18	
Total dose rate	mSv/d	tdr18	7.2E-03						=SUM(Hletdr18)+Lletdr18	
Equivalent Doses - Merganser - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr19	1.1E-05	2.0E-04	5.9E-04	1.2E-04	4.9E-03	5.9E-03	=ldrat19*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr19	9.6E-04						=Xdrat19	
Total dose rate	mSv/d	tdr19	6.8E-03						=SUM(Hletdr19)+Lletdr19	
Equivalent Doses - Merganser - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr20	1.1E-05	2.0E-04	5.9E-04	1.2E-04	4.9E-03	5.9E-03	=ldrat20*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr20	9.6E-04						=Xdrat20	
Total dose rate	mSv/d	tdr20	6.8E-03						=SUM(Hletdr20)+Lletdr20	
Equivalent Doses - Muskox - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr21	1.7E-04	1.2E-04	4.6E-04	4.1E-06	1.5E-02	1.6E-02	=ldrat21*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr21	9.6E-04						=Xdrat21	
Total dose rate	mSv/d	tdr21	1.7E-02						=SUM(Hletdr21)+Lletdr21	
Equivalent Doses - Muskox - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr22	5.8E-05	2.2E-03	8.3E-03	8.1E-04	2.7E-02	3.8E-02	=ldrat22*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr22	9.6E-04						=Xdrat22	
Total dose rate	mSv/d	tdr22	3.9E-02						=SUM(Hletdr22)+Lletdr22	
Equivalent Doses - Northern Pintail - Rock Lake										
High LET dose rate	mSv/d	Hletdr23	3.3E-05	3.0E-03	3.6E-03	1.0E-03	4.5E-02	5.3E-02	=ldrat23*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr23	9.6E-04						=Xdrat23	
Total dose rate	mSv/d	tdr23	5.4E-02						=SUM(Hletdr23)+Lletdr23	
Equivalent Doses - Northern Pintail - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr24	3.0E-05	2.9E-03	3.5E-03	9.8E-04	4.3E-02	5.1E-02	=ldrat24*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr24	9.6E-04						=Xdrat24	
Total dose rate	mSv/d	tdr24	5.2E-02						=SUM(Hletdr24)+Lletdr24	
Equivalent Doses - Northern Pintail - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr25	3.0E-05	2.9E-03	3.5E-03	9.8E-04	4.4E-02	5.1E-02	=ldrat25*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr25	9.6E-04						=Xdrat25	
Total dose rate	mSv/d	tdr25	5.2E-02						=SUM(Hletdr25)+Lletdr25	
Equivalent Doses - Ptarmigan - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr26	6.0E-05	5.9E-04	3.5E-03	2.3E-03	1.1E-01	1.1E-01	=ldrat26*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr26	9.6E-04						=Xdrat26	
Total dose rate	mSv/d	tdr26	1.1E-01						=SUM(Hletdr26)+Lletdr26	
Equivalent Doses - Ptarmigan - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr27	6.1E-05	5.9E-04	3.5E-03	2.3E-03	1.1E-01	1.1E-01	=ldrat27*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr27	9.6E-04						=Xdrat27	
Total dose rate	mSv/d	tdr27	1.1E-01						=SUM(Hletdr27)+Lletdr27	

Table H.2-2
Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

Equivalent Doses - Ptarmigan - Kiggavik Camp									
High LET dose rate	mSv/d	Hletdr28	5.0E-05	6.0E-04	3.3E-03	2.3E-03	1.1E-01	1.1E-01	=ldrat28*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr28	9.6E-04						=Xdrat28
Total dose rate	mSv/d	tdr28	1.1E-01						=SUM(Hletdr28)+Lletdr28
Equivalent Doses - Ptarmigan - JSL @ Sissons Discharge									
High LET dose rate	mSv/d	Hletdr29	6.1E-05	5.9E-04	3.4E-03	2.3E-03	1.1E-01	1.1E-01	=ldrat29*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr29	9.6E-04						=Xdrat29
Total dose rate	mSv/d	tdr29	1.1E-01						=SUM(Hletdr29)+Lletdr29
Equivalent Doses - Sandpiper - Rock Lake									
High LET dose rate	mSv/d	Hletdr30	2.8E-04	1.4E-03	2.4E-02	1.1E-03	8.8E-02	1.2E-01	=ldrat30*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr30	9.6E-04						=Xdrat30
Total dose rate	mSv/d	tdr30	1.2E-01						=SUM(Hletdr30)+Lletdr30
Equivalent Doses - Sandpiper - JSL @ Kiggavik Discharge									
High LET dose rate	mSv/d	Hletdr31	2.6E-04	1.4E-03	2.3E-02	1.1E-03	8.5E-02	1.1E-01	=ldrat31*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr31	9.6E-04						=Xdrat31
Total dose rate	mSv/d	tdr31	1.1E-01						=SUM(Hletdr31)+Lletdr31
Equivalent Doses - Sandpiper - JSL @ Sissons Discharge									
High LET dose rate	mSv/d	Hletdr32	2.6E-04	1.4E-03	2.4E-02	1.1E-03	8.5E-02	1.1E-01	=ldrat32*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr32	9.6E-04						=Xdrat32
Total dose rate	mSv/d	tdr32	1.1E-01						=SUM(Hletdr32)+Lletdr32
Equivalent Doses - Shrew - Rock Lake Watershed									
High LET dose rate	mSv/d	Hletdr33	1.5E-04	4.2E-04	6.4E-03	2.2E-04	4.2E-03	1.1E-02	=ldrat33*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr33	9.6E-04						=Xdrat33
Total dose rate	mSv/d	tdr33	1.2E-02						=SUM(Hletdr33)+Lletdr33
Equivalent Doses - Shrew - JSL @ Kiggavik Discharge									
High LET dose rate	mSv/d	Hletdr34	1.6E-04	4.4E-04	6.9E-03	2.2E-04	4.4E-03	1.2E-02	=ldrat34*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr34	9.6E-04						=Xdrat34
Total dose rate	mSv/d	tdr34	1.3E-02						=SUM(Hletdr34)+Lletdr34
Equivalent Doses - Shrew - Kiggavik Camp									
High LET dose rate	mSv/d	Hletdr35	1.3E-05	4.0E-04	5.9E-03	2.2E-04	4.2E-03	1.1E-02	=ldrat35*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr35	9.6E-04						=Xdrat35
Total dose rate	mSv/d	tdr35	1.2E-02						=SUM(Hletdr35)+Lletdr35
Equivalent Doses - Shrew - JSL @ Sissons Discharge									
High LET dose rate	mSv/d	Hletdr36	1.5E-04	4.2E-04	6.4E-03	2.2E-04	4.2E-03	1.1E-02	=ldrat36*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr36	2.7E-04						=Xdrat36
Total dose rate	mSv/d	tdr36	1.2E-02						=SUM(Hletdr36)+Lletdr36
Equivalent Doses - Squirrel - Rock Lake Watershed									
High LET dose rate	mSv/d	Hletdr37	1.3E-04	2.3E-03	1.0E-02	5.0E-04	7.5E-03	2.1E-02	=ldrat37*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr37	9.6E-04						=Xdrat37
Total dose rate	mSv/d	tdr37	2.2E-02						=SUM(Hletdr37)+Lletdr37
Equivalent Doses - Squirrel - JSL @ Kiggavik Discharge									
High LET dose rate	mSv/d	Hletdr38	1.3E-04	2.3E-03	1.0E-02	5.0E-04	7.5E-03	2.1E-02	=ldrat38*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr38	9.6E-04						=Xdrat38
Total dose rate	mSv/d	tdr38	2.2E-02						=SUM(Hletdr38)+Lletdr38
Equivalent Doses - Squirrel - Kiggavik Camp									
High LET dose rate	mSv/d	Hletdr39	1.3E-04	2.3E-03	1.0E-02	5.0E-04	7.5E-03	2.1E-02	=ldrat39*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr39	9.6E-04						=Xdrat39
Total dose rate	mSv/d	tdr39	2.2E-02						=SUM(Hletdr39)+Lletdr39
Equivalent Doses - Squirrel - JSL @ Sissons Discharge									
High LET dose rate	mSv/d	Hletdr40	1.3E-04	2.3E-03	1.0E-02	5.0E-04	7.5E-03	2.1E-02	=ldrat40*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr40	9.6E-04						=Xdrat40
Total dose rate	mSv/d	tdr40	2.2E-02						=SUM(Hletdr40)+Lletdr40
Equivalent Doses - Wolf - LSA									
High LET dose rate	mSv/d	Hletdr41	5.9E-05	1.9E-05	3.5E-05	8.7E-08	5.7E-03	5.8E-03	=ldrat41*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr41	9.6E-04						=Xdrat41
Total dose rate	mSv/d	tdr41	6.7E-03						=SUM(Hletdr41)+Lletdr41
Equivalent Doses - Wolf - RSA									
High LET dose rate	mSv/d	Hletdr42	5.9E-05	1.9E-05	3.5E-05	8.7E-08	5.7E-03	5.8E-03	=ldrat42*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr42	9.6E-04						=Xdrat42
Total dose rate	mSv/d	tdr42	6.7E-03						=SUM(Hletdr42)+Lletdr42
Equivalent Doses - Wolverine - LSA									
High LET dose rate	mSv/d	Hletdr43	8.3E-05	7.6E-05	3.4E-04	2.8E-06	1.3E-03	1.8E-03	=ldrat43*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr43	9.6E-04						=Xdrat43
Total dose rate	mSv/d	tdr43	2.8E-03						=SUM(Hletdr43)+Lletdr43
Equivalent Doses - Wolverine - RSA									
High LET dose rate	mSv/d	Hletdr44	8.3E-05	7.6E-05	3.4E-04	2.8E-06	1.3E-03	1.8E-03	=ldrat44*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr44	9.6E-04						=Xdrat44
Total dose rate	mSv/d	tdr44	2.8E-03						=SUM(Hletdr44)+Lletdr44

Table H.2-2
Terrestrial Dose Calculations RBE 10 and Dose Limit of 3 mGy/d

SUMMARY

3 Screening Criterion in mGy/d	Total Absorbed Dose mGy/d	Total Equivalent Dose mSv/d	Index (Absorbed Dose)	Index (Equivalent Dose)
Bear - LSA	1.5E-03	6.0E-03	4.9E-04	2.0E-03
Caribou - LSA	6.7E-03	5.8E-02	2.2E-03	1.9E-02
Caribou - RSA	6.7E-03	5.8E-02	2.2E-03	1.9E-02
Falcon - LSA	7.6E-03	4.3E-02	2.5E-03	1.4E-02
Falcon - RSA	7.6E-03	4.3E-02	2.5E-03	1.4E-02
Fox - LSA	1.3E-03	4.0E-03	4.2E-04	1.3E-03
Lemming - Rock Lake Watershed	4.8E-03	3.0E-02	1.6E-03	1.0E-02
Lemming - JSL @ Kiggavik Discharge	4.8E-03	3.0E-02	1.6E-03	1.0E-02
Lemming - Kiggavik Camp	4.8E-03	3.0E-02	1.6E-03	1.0E-02
Lemming - JSL @ Sissons Discharge	4.8E-03	3.0E-02	1.6E-03	1.0E-02
Lapland Longspur - Rock Lake Watershed	5.5E-03	3.9E-02	1.8E-03	1.3E-02
Lapland Longspur - JSL @ Kiggavik Discharge	5.6E-03	4.0E-02	1.9E-03	1.3E-02
Lapland Longspur - Kiggavik Camp	5.4E-03	3.9E-02	1.8E-03	1.3E-02
Lapland Longspur - JSL @ Sissons Discharge	5.5E-03	3.9E-02	1.8E-03	1.3E-02
Long-Tailed Duck - Rock Lake	7.1E-03	5.9E-02	2.4E-03	2.0E-02
Long-Tailed Duck - JSL @ Kiggavik Discharge	6.9E-03	5.7E-02	2.3E-03	1.9E-02
Long-Tailed Duck - JSL @ Sissons Discharge	6.9E-03	5.7E-02	2.3E-03	1.9E-02
Merganser - Rock Lake	1.7E-03	7.2E-03	5.6E-04	2.4E-03
Merganser - JSL @ Kiggavik Discharge	1.7E-03	6.8E-03	5.5E-04	2.3E-03
Merganser - JSL @ Sissons Discharge	1.7E-03	6.8E-03	5.5E-04	2.3E-03
Muskox - JSL @ Kiggavik Discharge	2.6E-03	1.7E-02	8.5E-04	5.6E-03
Muskox - JSL @ Sissons Discharge	5.5E-03	3.9E-02	1.8E-03	1.3E-02
Northern Pintail - Rock Lake	7.2E-03	5.4E-02	2.4E-03	1.8E-02
Northern Pintail - JSL @ Kiggavik Discharge	6.9E-03	5.2E-02	2.3E-03	1.7E-02
Northern Pintail - JSL @ Sissons Discharge	6.9E-03	5.2E-02	2.3E-03	1.7E-02
Ptarmigan - Rock Lake Watershed	1.4E-02	1.1E-01	4.8E-03	3.8E-02
Ptarmigan - JSL @ Kiggavik Discharge	1.4E-02	1.1E-01	4.8E-03	3.8E-02
Ptarmigan - Kiggavik Camp	1.4E-02	1.1E-01	4.8E-03	3.8E-02
Ptarmigan - JSL @ Sissons Discharge	1.4E-02	1.1E-01	4.8E-03	3.8E-02
Sandpiper - Rock Lake	1.3E-02	1.2E-01	4.5E-03	3.9E-02
Sandpiper - JSL @ Kiggavik Discharge	1.3E-02	1.1E-01	4.3E-03	3.7E-02
Sandpiper - JSL @ Sissons Discharge	1.3E-02	1.1E-01	4.4E-03	3.7E-02
Shrew - Rock Lake Watershed	2.3E-03	1.2E-02	7.7E-04	4.1E-03
Shrew - JSL @ Kiggavik Discharge	2.4E-03	1.3E-02	7.9E-04	4.4E-03
Shrew - Kiggavik Camp	2.2E-03	1.2E-02	7.4E-04	3.9E-03
Shrew - JSL @ Sissons Discharge	1.6E-03	1.2E-02	5.3E-04	3.9E-03
Squirrel - Rock Lake Watershed	3.5E-03	2.2E-02	1.2E-03	7.2E-03
Squirrel - JSL @ Kiggavik Discharge	3.5E-03	2.2E-02	1.2E-03	7.2E-03
Squirrel - Kiggavik Camp	3.5E-03	2.2E-02	1.2E-03	7.2E-03
Squirrel - JSL @ Sissons Discharge	3.5E-03	2.2E-02	1.2E-03	7.2E-03
Wolf - LSA	1.5E-03	6.7E-03	5.1E-04	2.2E-03
Wolf - RSA	1.5E-03	6.7E-03	5.1E-04	2.2E-03
Wolverine - LSA	1.1E-03	2.8E-03	3.8E-04	9.3E-04
Wolverine - RSA	1.1E-03	2.8E-03	3.8E-04	9.3E-04

U-238+ Internal U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235
Ra-226+ Internal Ra-226 + 0.3* (Rn-222 + ...Po-214)
Pb-210+ Internal Pb-210 + Bi-210

Table H.2-3

Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

2010

DOSES TO SELECTED VECs - Average Total Dose

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Absorbed Doses - Bear - LSA									
Concentration	Bq/g	Crad	1.26E-05	3.35E-05	2.28E-05	5.30E-05	1.79E-03		
Internal Dose Factor	mGy/d per Bq/g	ldcf	1.4E-01	6.6E-02	1.6E-01	6.0E-03	7.4E-02		
Internal dose rate	mGy/d	ldrat	1.8E-06	2.2E-06	3.6E-06	3.2E-07	1.3E-04	1.4E-04	=Crad*ldcf
External Gamma rate	uGy/h	Xgrat	0.04						
Fraction of time on site	-	fts	1.00						
External dose rate	mGy/d	Xdrat	9.6E-04						=Xgrat*24*fts/1000
Internal plus external	mGy/d	tdrat	1.1E-03						=SUM(ldrat)+Xdrat
Absorbed Doses - Caribou - LSA									
Concentration	Bq/g	Crad2	2.99E-05	4.43E-05	8.68E-05	9.05E-04	2.39E-02		
Internal dose rate	mGy/d	ldrat2	4.3E-06	2.9E-06	1.4E-05	5.5E-06	1.8E-03	1.8E-03	=Crad2*ldcf
Fraction of time on site	-	fts2	1.00						
External dose rate	mGy/d	Xdrat2	9.6E-04						=Xgrat*24*fts2/1000
Internal plus external	mGy/d	tdrat2	2.8E-03						=SUM(ldrat2)+Xdrat2
Absorbed Doses - Caribou - RSA									
Concentration	Bq/g	Crad3	2.99E-05	4.43E-05	8.68E-05	9.05E-04	2.39E-02		
Internal dose rate	mGy/d	ldrat3	4.3E-06	2.9E-06	1.4E-05	5.5E-06	1.8E-03	1.8E-03	=Crad3*ldcf
Fraction of time on site	-	fts3	1.00						
External dose rate	mGy/d	Xdrat3	9.6E-04						=Xgrat*24*fts3/1000
Internal plus external	mGy/d	tdrat3	2.8E-03						=SUM(ldrat3)+Xdrat3
Absorbed Doses - Falcon - LSA									
Concentration	Bq/g	Crad4	3.79E-06	1.20E-04	3.99E-04	1.34E-01	1.46E-02		
Internal dose rate	mGy/d	ldrat4	5.4E-07	7.9E-06	6.3E-05	8.1E-04	1.1E-03	2.0E-03	=Crad4*ldcf
Fraction of time on site	-	fts4	1.00						
External dose rate	mGy/d	Xdrat4	9.6E-04						=Xgrat*24*fts4/1000
Internal plus external	mGy/d	tdrat4	2.9E-03						=SUM(ldrat4)+Xdrat4
Absorbed Doses - Falcon - RSA									
Concentration	Bq/g	Crad5	3.78E-06	1.20E-04	3.98E-04	1.34E-01	1.46E-02		
Internal dose rate	mGy/d	ldrat5	5.4E-07	7.9E-06	6.3E-05	8.1E-04	1.1E-03	2.0E-03	=Crad5*ldcf
Fraction of time on site	-	fts5	1.00						
External dose rate	mGy/d	Xdrat5	9.6E-04						=Xgrat*24*fts5/1000
Internal plus external	mGy/d	tdrat5	2.9E-03						=SUM(ldrat5)+Xdrat5
Absorbed Doses - Fox - LSA									
Concentration	Bq/g	Crad6	8.13E-06	2.47E-05	5.34E-05	1.28E-04	1.08E-03		
Internal dose rate	mGy/d	ldrat6	1.2E-06	1.6E-06	8.5E-06	7.7E-07	8.0E-05	9.2E-05	=Crad6*ldcf
Fraction of time on site	-	fts6	1.00						
External dose rate	mGy/d	Xdrat6	9.6E-04						=Xgrat*24*fts6/1000
Internal plus external	mGy/d	tdrat6	1.1E-03						=SUM(ldrat6)+Xdrat6
Absorbed Doses - Lemming - Rock Lake Watershed									
Concentration	Bq/g	Crad7	3.22E-05	1.14E-03	2.26E-03	4.72E-02	6.00E-03		
Internal dose rate	mGy/d	ldrat7	4.6E-06	7.5E-05	3.6E-04	2.8E-04	4.4E-04	1.2E-03	=Crad7*ldcf
Fraction of time on site	-	fts7	1.00						
External dose rate	mGy/d	Xdrat7	9.6E-04						=Xgrat*24*fts7/1000
Internal plus external	mGy/d	tdrat7	2.1E-03						=SUM(ldrat7)+Xdrat7
Absorbed Doses - Lemming - JSL @ Kiggavik Discharge									
Concentration	Bq/g	Crad8	3.22E-05	1.14E-03	2.26E-03	4.72E-02	6.00E-03		
Internal dose rate	mGy/d	ldrat8	4.6E-06	7.5E-05	3.6E-04	2.8E-04	4.4E-04	1.2E-03	=Crad8*ldcf
Fraction of time on site	-	fts8	1.00						
External dose rate	mGy/d	Xdrat8	9.6E-04						=Xgrat*24*fts8/1000
Internal plus external	mGy/d	tdrat8	2.1E-03						=SUM(ldrat8)+Xdrat8
Absorbed Doses - Lemming - Kiggavik Camp									
Concentration	Bq/g	Crad9	3.22E-05	1.14E-03	2.26E-03	4.72E-02	6.00E-03		
Internal dose rate	mGy/d	ldrat9	4.6E-06	7.5E-05	3.6E-04	2.8E-04	4.4E-04	1.2E-03	=Crad9*ldcf
Fraction of time on site	-	fts9	1.00						
External dose rate	mGy/d	Xdrat9	9.6E-04						=Xgrat*24*fts9/1000
Internal plus external	mGy/d	tdrat9	2.1E-03						=SUM(ldrat9)+Xdrat9
Absorbed Doses - Lemming - JSL @ Sissons Discharge									
Concentration	Bq/g	Crad10	3.22E-05	1.14E-03	2.26E-03	4.72E-02	6.00E-03		
Internal dose rate	mGy/d	ldrat10	4.6E-06	7.5E-05	3.6E-04	2.8E-04	4.4E-04	1.2E-03	=Crad10*ldcf
Fraction of time on site	-	fts10	1.00						
External dose rate	mGy/d	Xdrat10	9.6E-04						=Xgrat*24*fts10/1000
Internal plus external	mGy/d	tdrat10	2.1E-03						=SUM(ldrat10)+Xdrat10
Absorbed Doses - Lapland Longspur - Rock Lake Watershed									
Concentration	Bq/g	Crad11	1.15E-05	7.43E-04	1.58E-03	3.56E-02	1.28E-02		
Internal dose rate	mGy/d	ldrat11	1.6E-06	4.9E-05	2.5E-04	2.1E-04	9.5E-04	1.5E-03	=Crad11*ldcf
Fraction of time on site	-	fts11	1.00						
External dose rate	mGy/d	Xdrat11	9.6E-04						=Xgrat*24*fts11/1000
Internal plus external	mGy/d	tdrat11	2.4E-03						=SUM(ldrat11)+Xdrat11

Table H.2-3

Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

Absorbed Doses - Lapland Longspur - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad12	1.24E-05	7.45E-04	1.62E-03	3.59E-02	1.32E-02			
Internal dose rate	mGy/d	ldrat12	1.8E-06	4.9E-05	2.6E-04	2.2E-04	9.8E-04	1.5E-03	=Crad12*ldcf	
Fraction of time on site	-	fts12	1.00							
External dose rate	mGy/d	Xdrat12	9.6E-04						=Xgrat*24*fts12/1000	
Internal plus external	mGy/d	tdrat12	2.5E-03						=SUM(ldrat12)+Xdrat12	
Absorbed Doses - Lapland Longspur - Kiggavik Camp										
Concentration	Bq/g	Crad13	3.49E-06	7.42E-04	1.55E-03	3.54E-02	1.26E-02			
Internal dose rate	mGy/d	ldrat13	5.0E-07	4.9E-05	2.5E-04	2.1E-04	9.4E-04	1.4E-03	=Crad13*ldcf	
Fraction of time on site	-	fts13	1.00							
External dose rate	mGy/d	Xdrat13	9.6E-04						=Xgrat*24*fts13/1000	
Internal plus external	mGy/d	tdrat13	2.4E-03						=SUM(ldrat13)+Xdrat13	
Absorbed Doses - Lapland Longspur - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad14	1.17E-05	7.43E-04	1.58E-03	3.56E-02	1.29E-02			
Internal dose rate	mGy/d	ldrat14	1.7E-06	4.9E-05	2.5E-04	2.1E-04	9.5E-04	1.5E-03	=Crad14*ldcf	
Fraction of time on site	-	fts14	1.00							
External dose rate	mGy/d	Xdrat14	9.6E-04						=Xgrat*24*fts14/1000	
Internal plus external	mGy/d	tdrat14	2.4E-03						=SUM(ldrat14)+Xdrat14	
Absorbed Doses - Long-Tailed Duck - Rock Lake										
Concentration	Bq/g	Crad15	1.95E-05	2.00E-04	2.29E-03	1.99E-02	1.55E-02			
Internal dose rate	mGy/d	ldrat15	2.8E-06	1.3E-05	3.6E-04	1.2E-04	1.1E-03	1.6E-03	=Crad15*ldcf	
Fraction of time on site	-	fts15	1.00							
External dose rate	mGy/d	Xdrat15	9.6E-04						=Xgrat*24*fts15/1000	
Internal plus external	mGy/d	tdrat15	2.6E-03						=SUM(ldrat15)+Xdrat15	
Absorbed Doses - Long-Tailed Duck - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad16	1.76E-05	1.94E-04	2.21E-03	1.92E-02	1.49E-02			
Internal dose rate	mGy/d	ldrat16	2.5E-06	1.3E-05	3.5E-04	1.2E-04	1.1E-03	1.6E-03	=Crad16*ldcf	
Fraction of time on site	-	fts16	1.00							
External dose rate	mGy/d	Xdrat16	9.6E-04						=Xgrat*24*fts16/1000	
Internal plus external	mGy/d	tdrat16	2.5E-03						=SUM(ldrat16)+Xdrat16	
Absorbed Doses - Long-Tailed Duck - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad17	1.79E-05	1.95E-04	2.22E-03	1.93E-02	1.50E-02			
Internal dose rate	mGy/d	ldrat17	2.5E-06	1.3E-05	3.5E-04	1.2E-04	1.1E-03	1.6E-03	=Crad17*ldcf	
Fraction of time on site	-	fts17	1.00							
External dose rate	mGy/d	Xdrat17	9.6E-04						=Xgrat*24*fts17/1000	
Internal plus external	mGy/d	tdrat17	2.6E-03						=SUM(ldrat17)+Xdrat17	
Absorbed Doses - Merganser - Rock Lake										
Concentration	Bq/g	Crad18	2.29E-06	8.25E-05	1.24E-04	6.28E-03	2.11E-03			
Internal dose rate	mGy/d	ldrat18	3.3E-07	5.4E-06	2.0E-05	3.8E-05	1.6E-04	2.2E-04	=Crad18*ldcf	
Fraction of time on site	-	fts18	1.00							
External dose rate	mGy/d	Xdrat18	9.6E-04						=Xgrat*24*fts18/1000	
Internal plus external	mGy/d	tdrat18	1.2E-03						=SUM(ldrat18)+Xdrat18	
Absorbed Doses - Merganser - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad19	2.29E-06	7.94E-05	1.17E-04	6.08E-03	2.00E-03			
Internal dose rate	mGy/d	ldrat19	3.2E-07	5.2E-06	1.9E-05	3.7E-05	1.5E-04	2.1E-04	=Crad19*ldcf	
Fraction of time on site	-	fts19	1.00							
External dose rate	mGy/d	Xdrat19	9.6E-04						=Xgrat*24*fts19/1000	
Internal plus external	mGy/d	tdrat19	1.2E-03						=SUM(ldrat19)+Xdrat19	
Absorbed Doses - Merganser - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad20	2.29E-06	7.98E-05	1.18E-04	6.10E-03	2.02E-03			
Internal dose rate	mGy/d	ldrat20	3.2E-07	5.3E-06	1.9E-05	3.7E-05	1.5E-04	2.1E-04	=Crad20*ldcf	
Fraction of time on site	-	fts20	1.00							
External dose rate	mGy/d	Xdrat20	9.6E-04						=Xgrat*24*fts20/1000	
Internal plus external	mGy/d	tdrat20	1.2E-03						=SUM(ldrat20)+Xdrat20	
Absorbed Doses - Muskox - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad21	3.12E-05	5.03E-05	7.12E-05	2.22E-04	6.91E-03			
Internal dose rate	mGy/d	ldrat21	4.4E-06	3.3E-06	1.1E-05	1.3E-06	5.1E-04	5.3E-04	=Crad21*ldcf	
Fraction of time on site	-	fts21	1.00							
External dose rate	mGy/d	Xdrat21	9.6E-04						=Xgrat*24*fts21/1000	
Internal plus external	mGy/d	tdrat21	1.5E-03						=SUM(ldrat21)+Xdrat21	
Absorbed Doses - Muskox - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad22	1.17E-05	7.43E-04	1.58E-03	3.56E-02	1.29E-02			
Internal dose rate	mGy/d	ldrat22	1.7E-06	4.9E-05	2.5E-04	2.1E-04	9.5E-04	1.5E-03	=Crad22*ldcf	
Fraction of time on site	-	fts22	1.00							
External dose rate	mGy/d	Xdrat22	9.6E-04						=Xgrat*24*fts22/1000	
Internal plus external	mGy/d	tdrat22	2.4E-03						=SUM(ldrat22)+Xdrat22	
Absorbed Doses - Northern Pintail - Rock Lake										
Concentration	Bq/g	Crad23	7.17E-06	1.15E-03	6.59E-04	5.23E-02	1.76E-02			
Internal dose rate	mGy/d	ldrat23	1.0E-06	7.5E-05	1.0E-04	3.2E-04	1.3E-03	1.8E-03	=Crad23*ldcf	
Fraction of time on site	-	fts23	1.00							
External dose rate	mGy/d	Xdrat23	9.6E-04						=Xgrat*24*fts23/1000	
Internal plus external	mGy/d	tdrat23	2.8E-03						=SUM(ldrat23)+Xdrat23	

Table H.2-3

Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

Absorbed Doses - Northern Pintail - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad24	6.58E-06	1.10E-03	6.35E-04	5.03E-02	1.68E-02			
Internal dose rate	mGy/d	Idrat24	9.3E-07	7.2E-05	1.0E-04	3.0E-04	1.2E-03	1.7E-03	=Crad24*Idcf	
Fraction of time on site	-	fts24	1.00							
External dose rate	mGy/d	Xdrat24	9.6E-04						=Xgrat*24*fts24/1000	
Internal plus external	mGy/d	tdrat24	2.7E-03						=SUM(Idrat24)+Xdrat24	
Absorbed Doses - Northern Pintail - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad25	6.68E-06	1.11E-03	6.38E-04	5.06E-02	1.70E-02			
Internal dose rate	mGy/d	Idrat25	9.5E-07	7.3E-05	1.0E-04	3.1E-04	1.3E-03	1.7E-03	=Crad25*Idcf	
Fraction of time on site	-	fts25	1.00							
External dose rate	mGy/d	Xdrat25	9.6E-04						=Xgrat*24*fts25/1000	
Internal plus external	mGy/d	tdrat25	2.7E-03						=SUM(Idrat25)+Xdrat25	
Absorbed Doses - Ptarmigan - Rock Lake Watershed										
Concentration	Bq/g	Crad26	1.15E-05	2.25E-04	6.65E-04	1.38E-01	4.73E-02			
Internal dose rate	mGy/d	Idrat26	1.6E-06	1.5E-05	1.1E-04	8.3E-04	3.5E-03	4.5E-03	=Crad26*Idcf	
Fraction of time on site	-	fts26	1.00							
External dose rate	mGy/d	Xdrat26	9.6E-04						=Xgrat*24*fts26/1000	
Internal plus external	mGy/d	tdrat26	5.4E-03						=SUM(Idrat26)+Xdrat26	
Absorbed Doses - Ptarmigan - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad27	1.18E-05	2.26E-04	6.77E-04	1.38E-01	4.75E-02			
Internal dose rate	mGy/d	Idrat27	1.7E-06	1.5E-05	1.1E-04	8.3E-04	3.5E-03	4.5E-03	=Crad27*Idcf	
Fraction of time on site	-	fts27	1.00							
External dose rate	mGy/d	Xdrat27	9.6E-04						=Xgrat*24*fts27/1000	
Internal plus external	mGy/d	tdrat27	5.4E-03						=SUM(Idrat27)+Xdrat27	
Absorbed Doses - Ptarmigan - Kiggavik Camp										
Concentration	Bq/g	Crad28	8.86E-06	2.25E-04	6.54E-04	1.37E-01	4.73E-02			
Internal dose rate	mGy/d	Idrat28	1.3E-06	1.5E-05	1.0E-04	8.3E-04	3.5E-03	4.4E-03	=Crad28*Idcf	
Fraction of time on site	-	fts28	1.00							
External dose rate	mGy/d	Xdrat28	9.6E-04						=Xgrat*24*fts28/1000	
Internal plus external	mGy/d	tdrat28	5.4E-03						=SUM(Idrat28)+Xdrat28	
Absorbed Doses - Ptarmigan - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad29	1.15E-05	2.25E-04	6.64E-04	1.38E-01	4.74E-02			
Internal dose rate	mGy/d	Idrat29	1.6E-06	1.5E-05	1.1E-04	8.3E-04	3.5E-03	4.5E-03	=Crad29*Idcf	
Fraction of time on site	-	fts29	1.00							
External dose rate	mGy/d	Xdrat29	9.6E-04						=Xgrat*24*fts29/1000	
Internal plus external	mGy/d	tdrat29	5.4E-03						=SUM(Idrat29)+Xdrat29	
Absorbed Doses - Sandpiper - Rock Lake										
Concentration	Bq/g	Crad30	4.84E-05	7.53E-04	3.86E-03	5.67E-02	3.46E-02			
Internal dose rate	mGy/d	Idrat30	6.9E-06	5.0E-05	6.1E-04	3.4E-04	2.6E-03	3.6E-03	=Crad30*Idcf	
Fraction of time on site	-	fts30	1.00							
External dose rate	mGy/d	Xdrat30	9.6E-04						=Xgrat*24*fts30/1000	
Internal plus external	mGy/d	tdrat30	4.5E-03						=SUM(Idrat30)+Xdrat30	
Absorbed Doses - Sandpiper - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad31	4.49E-05	7.43E-04	3.72E-03	5.54E-02	3.32E-02			
Internal dose rate	mGy/d	Idrat31	6.4E-06	4.9E-05	5.9E-04	3.3E-04	2.5E-03	3.4E-03	=Crad31*Idcf	
Fraction of time on site	-	fts31	1.00							
External dose rate	mGy/d	Xdrat31	9.6E-04						=Xgrat*24*fts31/1000	
Internal plus external	mGy/d	tdrat31	4.4E-03						=SUM(Idrat31)+Xdrat31	
Absorbed Doses - Sandpiper - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad32	4.55E-05	7.43E-04	3.73E-03	5.55E-02	3.34E-02			
Internal dose rate	mGy/d	Idrat32	6.5E-06	4.9E-05	5.9E-04	3.3E-04	2.5E-03	3.5E-03	=Crad32*Idcf	
Fraction of time on site	-	fts32	1.00							
External dose rate	mGy/d	Xdrat32	9.6E-04						=Xgrat*24*fts32/1000	
Internal plus external	mGy/d	tdrat32	4.4E-03						=SUM(Idrat32)+Xdrat32	
Absorbed Doses - Shrew - Rock Lake Watershed										
Concentration	Bq/g	Crad33	3.26E-05	1.90E-04	1.27E-03	1.12E-02	2.07E-03			
Internal dose rate	mGy/d	Idrat33	4.6E-06	1.3E-05	2.0E-04	6.8E-05	1.5E-04	4.4E-04	=Crad33*Idcf	
Fraction of time on site	-	fts33	1.00							
External dose rate	mGy/d	Xdrat33	9.6E-04						=Xgrat*24*fts33/1000	
Internal plus external	mGy/d	tdrat33	1.4E-03						=SUM(Idrat33)+Xdrat33	
Absorbed Doses - Shrew - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad34	3.58E-05	2.00E-04	1.37E-03	1.13E-02	2.12E-03			
Internal dose rate	mGy/d	Idrat34	5.1E-06	1.3E-05	2.2E-04	6.8E-05	1.6E-04	4.6E-04	=Crad34*Idcf	
Fraction of time on site	-	fts34	1.00							
External dose rate	mGy/d	Xdrat34	9.6E-04						=Xgrat*24*fts34/1000	
Internal plus external	mGy/d	tdrat34	1.4E-03						=SUM(Idrat34)+Xdrat34	
Absorbed Doses - Shrew - Kiggavik Camp										
Concentration	Bq/g	Crad35	2.99E-06	1.84E-04	1.18E-03	1.11E-02	2.05E-03			
Internal dose rate	mGy/d	Idrat35	4.2E-07	1.2E-05	1.9E-04	6.7E-05	1.5E-04	4.2E-04	=Crad35*Idcf	
Fraction of time on site	-	fts35	1.00							
External dose rate	mGy/d	Xdrat35	9.6E-04						=Xgrat*24*fts35/1000	
Internal plus external	mGy/d	tdrat35	1.4E-03						=SUM(Idrat35)+Xdrat35	
Absorbed Doses - Shrew - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad36	3.31E-05	1.91E-04	1.26E-03	1.12E-02	2.08E-03			
Internal dose rate	mGy/d	Idrat36	4.7E-06	1.3E-05	2.0E-04	6.8E-05	1.5E-04	4.4E-04	=Crad36*Idcf	
Fraction of time on site	-	fts36	1.00							

Table H.2-3
Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

External dose rate	mGy/d	Xdrat36	2.7E-04							=Xgrat*24*fts36/3600
Internal plus external	mGy/d	tdrat36	7.1E-04							=SUM(ldrat36)+Xdrat36
Absorbed Doses - Squirrel - Rock Lake Watershed										
Concentration	Bq/g	Crad37	2.69E-05	9.87E-04	1.48E-03	1.96E-02	2.33E-03			
Internal dose rate	mGy/d	ldrat37	3.8E-06	6.5E-05	2.4E-04	1.2E-04	1.7E-04	6.0E-04		=Crad37*ldcf
Fraction of time on site	-	fts37	1.00							
External dose rate	mGy/d	Xdrat37	9.6E-04							=Xgrat*24*fts37/1000
Internal plus external	mGy/d	tdrat37	1.6E-03							=SUM(ldrat37)+Xdrat37
Absorbed Doses - Squirrel - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad38	2.69E-05	9.87E-04	1.48E-03	1.96E-02	2.33E-03			
Internal dose rate	mGy/d	ldrat38	3.8E-06	6.5E-05	2.4E-04	1.2E-04	1.7E-04	6.0E-04		=Crad38*ldcf
Fraction of time on site	-	fts38	1.00							
External dose rate	mGy/d	Xdrat38	9.6E-04							=Xgrat*24*fts38/1000
Internal plus external	mGy/d	tdrat38	1.6E-03							=SUM(ldrat38)+Xdrat38
Absorbed Doses - Squirrel - Kiggavik Camp										
Concentration	Bq/g	Crad39	2.69E-05	9.87E-04	1.48E-03	1.96E-02	2.33E-03			
Internal dose rate	mGy/d	ldrat39	3.8E-06	6.5E-05	2.4E-04	1.2E-04	1.7E-04	6.0E-04		=Crad39*ldcf
Fraction of time on site	-	fts39	1.00							
External dose rate	mGy/d	Xdrat39	9.6E-04							=Xgrat*24*fts39/1000
Internal plus external	mGy/d	tdrat39	1.6E-03							=SUM(ldrat39)+Xdrat39

Table H.2-3

Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

Absorbed Doses - Squirrel - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad40	2.69E-05	9.87E-04	1.48E-03	1.96E-02	2.33E-03			
Internal dose rate	mGy/d	ldrat40	3.8E-06	6.5E-05	2.4E-04	1.2E-04	1.7E-04	6.0E-04	=Crad40*ldcf	
Fraction of time on site	-	fts40	1.00							
External dose rate	mGy/d	Xdrat40	9.6E-04						=Xgrat*24*fts40/1000	
Internal plus external	mGy/d	tdrat40	1.6E-03						=SUM(ldrat40)+Xdrat40	
Absorbed Doses - Wolf - LSA										
Concentration	Bq/g	Crad41	1.16E-05	9.61E-06	6.02E-06	3.68E-06	1.90E-03			
Internal dose rate	mGy/d	ldrat41	1.6E-06	6.3E-07	9.6E-07	2.2E-08	1.4E-04	1.4E-04	=Crad41*ldcf	
Fraction of time on site	-	fts41	1.00							
External dose rate	mGy/d	Xdrat41	9.6E-04						=Xgrat*24*fts41/1000	
Internal plus external	mGy/d	tdrat41	1.1E-03						=SUM(ldrat41)+Xdrat41	
Absorbed Doses - Wolf - RSA										
Concentration	Bq/g	Crad42	1.16E-05	9.60E-06	6.02E-06	3.68E-06	1.90E-03			
Internal dose rate	mGy/d	ldrat42	1.6E-06	6.3E-07	9.6E-07	2.2E-08	1.4E-04	1.4E-04	=Crad42*ldcf	
Fraction of time on site	-	fts42	1.00							
External dose rate	mGy/d	Xdrat42	9.6E-04						=Xgrat*24*fts42/1000	
Internal plus external	mGy/d	tdrat42	1.1E-03						=SUM(ldrat42)+Xdrat42	
Absorbed Doses - Wolverine - LSA										
Concentration	Bq/g	Crad43	1.56E-05	3.36E-05	5.34E-05	1.05E-04	4.76E-04			
Internal dose rate	mGy/d	ldrat43	2.2E-06	2.2E-06	8.5E-06	6.3E-07	3.5E-05	4.9E-05	=Crad43*ldcf	
Fraction of time on site	-	fts43	1.00							
External dose rate	mGy/d	Xdrat43	9.6E-04						=Xgrat*24*fts43/1000	
Internal plus external	mGy/d	tdrat43	1.0E-03						=SUM(ldrat43)+Xdrat43	
Absorbed Doses - Wolverine - RSA										
Concentration	Bq/g	Crad44	1.56E-05	3.37E-05	5.34E-05	1.05E-04	4.76E-04			
Internal dose rate	mGy/d	ldrat44	2.2E-06	2.2E-06	8.5E-06	6.3E-07	3.5E-05	4.9E-05	=Crad44*ldcf	
Fraction of time on site	-	fts44	1.00							
External dose rate	mGy/d	Xdrat44	9.6E-04						=Xgrat*24*fts44/1000	
Internal plus external	mGy/d	tdrat44	1.0E-03						=SUM(ldrat44)+Xdrat44	
Equivalent Doses - Bear - LSA										
RBE for alpha	Sv/Gy	RBE	40							
High LET dose rate	mSv/d	Hletdr	7.2E-05	8.8E-05	1.4E-04	3.2E-07	5.3E-03	5.6E-03	=ldrat*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr	9.6E-04						=Xdrat	
Total dose rate	mSv/d	tdr	6.6E-03						=SUM(Hletdr)+Lletdr	
Equivalent Doses - Caribou - LSA										
High LET dose rate	mSv/d	Hletdr2	1.7E-04	1.2E-04	5.5E-04	5.5E-06	7.1E-02	7.2E-02	=ldrat2*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr2	9.6E-04						=Xdrat2	
Total dose rate	mSv/d	tdr2	7.3E-02						=SUM(Hletdr2)+Lletdr2	
Equivalent Doses - Caribou - RSA										
High LET dose rate	mSv/d	Hletdr3	1.7E-04	1.2E-04	5.5E-04	5.5E-06	7.1E-02	7.2E-02	=ldrat3*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr3	9.6E-04						=Xdrat3	
Total dose rate	mSv/d	tdr3	7.3E-02						=SUM(Hletdr3)+Lletdr3	
Equivalent Doses - Falcon - LSA										
High LET dose rate	mSv/d	Hletdr4	2.2E-05	3.2E-04	2.5E-03	8.1E-04	4.3E-02	4.7E-02	=ldrat4*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr4	9.6E-04						=Xdrat4	
Total dose rate	mSv/d	tdr4	4.8E-02						=SUM(Hletdr4)+Lletdr4	
Equivalent Doses - Falcon - RSA										
High LET dose rate	mSv/d	Hletdr5	2.1E-05	3.1E-04	2.5E-03	8.1E-04	4.3E-02	4.7E-02	=ldrat5*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr5	9.6E-04						=Xdrat5	
Total dose rate	mSv/d	tdr5	4.8E-02						=SUM(Hletdr5)+Lletdr5	
Equivalent Doses - Fox - LSA										
High LET dose rate	mSv/d	Hletdr6	4.6E-05	6.5E-05	3.4E-04	7.7E-07	3.2E-03	3.7E-03	=ldrat6*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr6	9.6E-04						=Xdrat6	
Total dose rate	mSv/d	tdr6	4.6E-03						=SUM(Hletdr6)+Lletdr6	
Equivalent Doses - Lemming - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr7	1.8E-04	3.0E-03	1.4E-02	2.8E-04	1.8E-02	3.6E-02	=ldrat7*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr7	9.6E-04						=Xdrat7	
Total dose rate	mSv/d	tdr7	3.7E-02						=SUM(Hletdr7)+Lletdr7	
Equivalent Doses - Lemming - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr8	1.8E-04	3.0E-03	1.4E-02	2.8E-04	1.8E-02	3.6E-02	=ldrat8*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr8	9.6E-04						=Xdrat8	
Total dose rate	mSv/d	tdr8	3.7E-02						=SUM(Hletdr8)+Lletdr8	
Equivalent Doses - Lemming - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr9	1.8E-04	3.0E-03	1.4E-02	2.8E-04	1.8E-02	3.6E-02	=ldrat9*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr9	9.6E-04						=Xdrat9	
Total dose rate	mSv/d	tdr9	3.7E-02						=SUM(Hletdr9)+Lletdr9	
Equivalent Doses - Lemming - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr10	1.8E-04	3.0E-03	1.4E-02	2.8E-04	1.8E-02	3.6E-02	=ldrat10*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr10	9.6E-04						=Xdrat10	
Total dose rate	mSv/d	tdr10	3.7E-02						=SUM(Hletdr10)+Lletdr10	

Table H.2-3

Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

Equivalent Doses - Lapland Longspur - Rock Lake Watershed									
High LET dose rate	mSv/d	Hletdr11	6.5E-05	2.0E-03	1.0E-02	2.1E-04	3.8E-02	5.0E-02	=Idrat11*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr11	9.6E-04						=Xdrat11
Total dose rate	mSv/d	tdr11	5.1E-02						=SUM(Hletdr11)+Lletdr11
Equivalent Doses - Lapland Longspur - JSL @ Kiggavik Discharge									
High LET dose rate	mSv/d	Hletdr12	7.0E-05	2.0E-03	1.0E-02	2.2E-04	3.9E-02	5.2E-02	=Idrat12*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr12	9.6E-04						=Xdrat12
Total dose rate	mSv/d	tdr12	5.3E-02						=SUM(Hletdr12)+Lletdr12
Equivalent Doses - Lapland Longspur - Kiggavik Camp									
High LET dose rate	mSv/d	Hletdr13	2.0E-05	2.0E-03	9.8E-03	2.1E-04	3.7E-02	4.9E-02	=Idrat13*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr13	9.6E-04						=Xdrat13
Total dose rate	mSv/d	tdr13	5.0E-02						=SUM(Hletdr13)+Lletdr13
Equivalent Doses - Lapland Longspur - JSL @ Sissons Discharge									
High LET dose rate	mSv/d	Hletdr14	6.6E-05	2.0E-03	1.0E-02	2.1E-04	3.8E-02	5.0E-02	=Idrat14*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr14	9.6E-04						=Xdrat14
Total dose rate	mSv/d	tdr14	5.1E-02						=SUM(Hletdr14)+Lletdr14
Equivalent Doses - Long-Tailed Duck - Rock Lake									
High LET dose rate	mSv/d	Hletdr15	1.1E-04	5.3E-04	1.5E-02	1.2E-04	4.6E-02	6.1E-02	=Idrat15*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr15	9.6E-04						=Xdrat15
Total dose rate	mSv/d	tdr15	6.2E-02						=SUM(Hletdr15)+Lletdr15
Equivalent Doses - Long-Tailed Duck - JSL @ Kiggavik Discharge									
High LET dose rate	mSv/d	Hletdr16	1.0E-04	5.1E-04	1.4E-02	1.2E-04	4.4E-02	5.9E-02	=Idrat16*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr16	9.6E-04						=Xdrat16
Total dose rate	mSv/d	tdr16	6.0E-02						=SUM(Hletdr16)+Lletdr16
Equivalent Doses - Long-Tailed Duck - JSL @ Sissons Discharge									
High LET dose rate	mSv/d	Hletdr17	1.0E-04	5.1E-04	1.4E-02	1.2E-04	4.4E-02	5.9E-02	=Idrat17*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr17	9.6E-04						=Xdrat17
Total dose rate	mSv/d	tdr17	6.0E-02						=SUM(Hletdr17)+Lletdr17
Equivalent Doses - Merganser - Rock Lake									
High LET dose rate	mSv/d	Hletdr18	1.3E-05	2.2E-04	7.9E-04	3.8E-05	6.3E-03	7.3E-03	=Idrat18*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr18	9.6E-04						=Xdrat18
Total dose rate	mSv/d	tdr18	8.3E-03						=SUM(Hletdr18)+Lletdr18
Equivalent Doses - Merganser - JSL @ Kiggavik Discharge									
High LET dose rate	mSv/d	Hletdr19	1.3E-05	2.1E-04	7.4E-04	3.7E-05	5.9E-03	6.9E-03	=Idrat19*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr19	9.6E-04						=Xdrat19
Total dose rate	mSv/d	tdr19	7.9E-03						=SUM(Hletdr19)+Lletdr19
Equivalent Doses - Merganser - JSL @ Sissons Discharge									
High LET dose rate	mSv/d	Hletdr20	1.3E-05	2.1E-04	7.5E-04	3.7E-05	6.0E-03	7.0E-03	=Idrat20*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr20	9.6E-04						=Xdrat20
Total dose rate	mSv/d	tdr20	8.0E-03						=SUM(Hletdr20)+Lletdr20
Equivalent Doses - Muskox - JSL @ Kiggavik Discharge									
High LET dose rate	mSv/d	Hletdr21	1.8E-04	1.3E-04	4.5E-04	1.3E-06	2.0E-02	2.1E-02	=Idrat21*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr21	9.6E-04						=Xdrat21
Total dose rate	mSv/d	tdr21	2.2E-02						=SUM(Hletdr21)+Lletdr21
Equivalent Doses - Muskox - JSL @ Sissons Discharge									
High LET dose rate	mSv/d	Hletdr22	6.6E-05	2.0E-03	1.0E-02	2.1E-04	3.8E-02	5.0E-02	=Idrat22*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr22	9.6E-04						=Xdrat22
Total dose rate	mSv/d	tdr22	5.1E-02						=SUM(Hletdr22)+Lletdr22
Equivalent Doses - Northern Pintail - Rock Lake									
High LET dose rate	mSv/d	Hletdr23	4.1E-05	3.0E-03	4.2E-03	3.2E-04	5.2E-02	6.0E-02	=Idrat23*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr23	9.6E-04						=Xdrat23
Total dose rate	mSv/d	tdr23	6.1E-02						=SUM(Hletdr23)+Lletdr23
Equivalent Doses - Northern Pintail - JSL @ Kiggavik Discharge									
High LET dose rate	mSv/d	Hletdr24	3.7E-05	2.9E-03	4.0E-03	3.0E-04	5.0E-02	5.7E-02	=Idrat24*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr24	9.6E-04						=Xdrat24
Total dose rate	mSv/d	tdr24	5.8E-02						=SUM(Hletdr24)+Lletdr24
Equivalent Doses - Northern Pintail - JSL @ Sissons Discharge									
High LET dose rate	mSv/d	Hletdr25	3.8E-05	2.9E-03	4.1E-03	3.1E-04	5.0E-02	5.8E-02	=Idrat25*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr25	9.6E-04						=Xdrat25
Total dose rate	mSv/d	tdr25	5.8E-02						=SUM(Hletdr25)+Lletdr25
Equivalent Doses - Ptarmigan - Rock Lake Watershed									
High LET dose rate	mSv/d	Hletdr26	6.5E-05	5.9E-04	4.2E-03	8.3E-04	1.4E-01	1.5E-01	=Idrat26*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr26	9.6E-04						=Xdrat26
Total dose rate	mSv/d	tdr26	1.5E-01						=SUM(Hletdr26)+Lletdr26
Equivalent Doses - Ptarmigan - JSL @ Kiggavik Discharge									
High LET dose rate	mSv/d	Hletdr27	6.7E-05	6.0E-04	4.3E-03	8.3E-04	1.4E-01	1.5E-01	=Idrat27*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr27	9.6E-04						=Xdrat27
Total dose rate	mSv/d	tdr27	1.5E-01						=SUM(Hletdr27)+Lletdr27

Table H.2-3

Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

Equivalent Doses - Ptarmigan - Kiggavik Camp											
High LET dose rate	mSv/d	Hletdr28	5.0E-05	5.9E-04	4.2E-03	8.3E-04	1.4E-01	1.5E-01	=Idrat28*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr28	9.6E-04						=Xdrat28		
Total dose rate	mSv/d	tdr28	1.5E-01						=SUM(Hletdr28)+Lletdr28		
Equivalent Doses - Ptarmigan - JSL @ Sissons Discharge											
High LET dose rate	mSv/d	Hletdr29	6.5E-05	5.9E-04	4.2E-03	8.3E-04	1.4E-01	1.5E-01	=Idrat29*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr29	9.6E-04						=Xdrat29		
Total dose rate	mSv/d	tdr29	1.5E-01						=SUM(Hletdr29)+Lletdr29		
Equivalent Doses - Sandpiper - Rock Lake											
High LET dose rate	mSv/d	Hletdr30	2.8E-04	2.0E-03	2.5E-02	3.4E-04	1.0E-01	1.3E-01	=Idrat30*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr30	9.6E-04						=Xdrat30		
Total dose rate	mSv/d	tdr30	1.3E-01						=SUM(Hletdr30)+Lletdr30		
Equivalent Doses - Sandpiper - JSL @ Kiggavik Discharge											
High LET dose rate	mSv/d	Hletdr31	2.6E-04	2.0E-03	2.4E-02	3.3E-04	9.8E-02	1.2E-01	=Idrat31*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr31	9.6E-04						=Xdrat31		
Total dose rate	mSv/d	tdr31	1.3E-01						=SUM(Hletdr31)+Lletdr31		
Equivalent Doses - Sandpiper - JSL @ Sissons Discharge											
High LET dose rate	mSv/d	Hletdr32	2.6E-04	2.0E-03	2.4E-02	3.3E-04	9.9E-02	1.3E-01	=Idrat32*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr32	9.6E-04						=Xdrat32		
Total dose rate	mSv/d	tdr32	1.3E-01						=SUM(Hletdr32)+Lletdr32		
Equivalent Doses - Shrew - Rock Lake Watershed											
High LET dose rate	mSv/d	Hletdr33	1.9E-04	5.0E-04	8.1E-03	6.8E-05	6.1E-03	1.5E-02	=Idrat33*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr33	9.6E-04						=Xdrat33		
Total dose rate	mSv/d	tdr33	1.6E-02						=SUM(Hletdr33)+Lletdr33		
Equivalent Doses - Shrew - JSL @ Kiggavik Discharge											
High LET dose rate	mSv/d	Hletdr34	2.0E-04	5.3E-04	8.7E-03	6.8E-05	6.3E-03	1.6E-02	=Idrat34*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr34	9.6E-04						=Xdrat34		
Total dose rate	mSv/d	tdr34	1.7E-02						=SUM(Hletdr34)+Lletdr34		
Equivalent Doses - Shrew - Kiggavik Camp											
High LET dose rate	mSv/d	Hletdr35	1.7E-05	4.8E-04	7.5E-03	6.7E-05	6.1E-03	1.4E-02	=Idrat35*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr35	9.6E-04						=Xdrat35		
Total dose rate	mSv/d	tdr35	1.5E-02						=SUM(Hletdr35)+Lletdr35		
Equivalent Doses - Shrew - JSL @ Sissons Discharge											
High LET dose rate	mSv/d	Hletdr36	1.9E-04	5.0E-04	8.0E-03	6.8E-05	6.2E-03	1.5E-02	=Idrat36*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr36	2.7E-04						=Xdrat36		
Total dose rate	mSv/d	tdr36	1.5E-02						=SUM(Hletdr36)+Lletdr36		
Equivalent Doses - Squirrel - Rock Lake Watershed											
High LET dose rate	mSv/d	Hletdr37	1.5E-04	2.6E-03	9.4E-03	1.2E-04	6.9E-03	1.9E-02	=Idrat37*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr37	9.6E-04						=Xdrat37		
Total dose rate	mSv/d	tdr37	2.0E-02						=SUM(Hletdr37)+Lletdr37		
Equivalent Doses - Squirrel - JSL @ Kiggavik Discharge											
High LET dose rate	mSv/d	Hletdr38	1.5E-04	2.6E-03	9.4E-03	1.2E-04	6.9E-03	1.9E-02	=Idrat38*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr38	9.6E-04						=Xdrat38		
Total dose rate	mSv/d	tdr38	2.0E-02						=SUM(Hletdr38)+Lletdr38		
Equivalent Doses - Squirrel - Kiggavik Camp											
High LET dose rate	mSv/d	Hletdr39	1.5E-04	2.6E-03	9.4E-03	1.2E-04	6.9E-03	1.9E-02	=Idrat39*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr39	9.6E-04						=Xdrat39		
Total dose rate	mSv/d	tdr39	2.0E-02						=SUM(Hletdr39)+Lletdr39		
Equivalent Doses - Squirrel - JSL @ Sissons Discharge											
High LET dose rate	mSv/d	Hletdr40	1.5E-04	2.6E-03	9.4E-03	1.2E-04	6.9E-03	1.9E-02	=Idrat40*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr40	9.6E-04						=Xdrat40		
Total dose rate	mSv/d	tdr40	2.0E-02						=SUM(Hletdr40)+Lletdr40		
Equivalent Doses - Wolf - LSA											
High LET dose rate	mSv/d	Hletdr41	6.6E-05	2.5E-05	3.8E-05	2.2E-08	5.6E-03	5.8E-03	=Idrat41*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr41	9.6E-04						=Xdrat41		
Total dose rate	mSv/d	tdr41	6.7E-03						=SUM(Hletdr41)+Lletdr41		
Equivalent Doses - Wolf - RSA											
High LET dose rate	mSv/d	Hletdr42	6.6E-05	2.5E-05	3.8E-05	2.2E-08	5.6E-03	5.8E-03	=Idrat42*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr42	9.6E-04						=Xdrat42		
Total dose rate	mSv/d	tdr42	6.7E-03						=SUM(Hletdr42)+Lletdr42		
Equivalent Doses - Wolverine - LSA											
High LET dose rate	mSv/d	Hletdr43	8.9E-05	8.8E-05	3.4E-04	6.3E-07	1.4E-03	1.9E-03	=Idrat43*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr43	9.6E-04						=Xdrat43		
Total dose rate	mSv/d	tdr43	2.9E-03						=SUM(Hletdr43)+Lletdr43		
Equivalent Doses - Wolverine - RSA											
High LET dose rate	mSv/d	Hletdr44	8.9E-05	8.9E-05	3.4E-04	6.3E-07	1.4E-03	1.9E-03	=Idrat44*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr44	9.6E-04						=Xdrat44		
Total dose rate	mSv/d	tdr44	2.9E-03						=SUM(Hletdr44)+Lletdr44		

Table H.2-3
Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

SUMMARY

1 Screening Criterion in mGy/d	Total Absorbed Dose mGy/d	Total Equivalent Dose mSv/d	Index (Absorbed Dose)	Index (Equivalent Dose)
Bear - LSA	1.1E-03	6.6E-03	1.1E-03	6.6E-03
Caribou - LSA	2.8E-03	7.3E-02	2.8E-03	7.3E-02
Caribou - RSA	2.8E-03	7.3E-02	2.8E-03	7.3E-02
Falcon - LSA	2.9E-03	4.8E-02	2.9E-03	4.8E-02
Falcon - RSA	2.9E-03	4.8E-02	2.9E-03	4.8E-02
Fox - LSA	1.1E-03	4.6E-03	1.1E-03	4.6E-03
Lemming - Rock Lake Watershed	2.1E-03	3.7E-02	2.1E-03	3.7E-02
Lemming - JSL @ Kiggavik Discharge	2.1E-03	3.7E-02	2.1E-03	3.7E-02
Lemming - Kiggavik Camp	2.1E-03	3.7E-02	2.1E-03	3.7E-02
Lemming - JSL @ Sissons Discharge	2.1E-03	3.7E-02	2.1E-03	3.7E-02
Lapland Longspur - Rock Lake Watershed	2.4E-03	5.1E-02	2.4E-03	5.1E-02
Lapland Longspur - JSL @ Kiggavik Discharge	2.5E-03	5.3E-02	2.5E-03	5.3E-02
Lapland Longspur - Kiggavik Camp	2.4E-03	5.0E-02	2.4E-03	5.0E-02
Lapland Longspur - JSL @ Sissons Discharge	2.4E-03	5.1E-02	2.4E-03	5.1E-02
Long-Tailed Duck - Rock Lake	2.6E-03	6.2E-02	2.6E-03	6.2E-02
Long-Tailed Duck - JSL @ Kiggavik Discharge	2.5E-03	6.0E-02	2.5E-03	6.0E-02
Long-Tailed Duck - JSL @ Sissons Discharge	2.6E-03	6.0E-02	2.6E-03	6.0E-02
Merganser - Rock Lake	1.2E-03	8.3E-03	1.2E-03	8.3E-03
Merganser - JSL @ Kiggavik Discharge	1.2E-03	7.9E-03	1.2E-03	7.9E-03
Merganser - JSL @ Sissons Discharge	1.2E-03	8.0E-03	1.2E-03	8.0E-03
Muskox - JSL @ Kiggavik Discharge	1.5E-03	2.2E-02	1.5E-03	2.2E-02
Muskox - JSL @ Sissons Discharge	2.4E-03	5.1E-02	2.4E-03	5.1E-02
Northern Pintail - Rock Lake	2.8E-03	6.1E-02	2.8E-03	6.1E-02
Northern Pintail - JSL @ Kiggavik Discharge	2.7E-03	5.8E-02	2.7E-03	5.8E-02
Northern Pintail - JSL @ Sissons Discharge	2.7E-03	5.8E-02	2.7E-03	5.8E-02
Ptarmigan - Rock Lake Watershed	5.4E-03	1.5E-01	5.4E-03	1.5E-01
Ptarmigan - JSL @ Kiggavik Discharge	5.4E-03	1.5E-01	5.4E-03	1.5E-01
Ptarmigan - Kiggavik Camp	5.4E-03	1.5E-01	5.4E-03	1.5E-01
Ptarmigan - JSL @ Sissons Discharge	5.4E-03	1.5E-01	5.4E-03	1.5E-01
Sandpiper - Rock Lake	4.5E-03	1.3E-01	4.5E-03	1.3E-01
Sandpiper - JSL @ Kiggavik Discharge	4.4E-03	1.3E-01	4.4E-03	1.3E-01
Sandpiper - JSL @ Sissons Discharge	4.4E-03	1.3E-01	4.4E-03	1.3E-01
Shrew - Rock Lake Watershed	1.4E-03	1.6E-02	1.4E-03	1.6E-02
Shrew - JSL @ Kiggavik Discharge	1.4E-03	1.7E-02	1.4E-03	1.7E-02
Shrew - Kiggavik Camp	1.4E-03	1.5E-02	1.4E-03	1.5E-02
Shrew - JSL @ Sissons Discharge	7.1E-04	1.5E-02	7.1E-04	1.5E-02
Squirrel - Rock Lake Watershed	1.6E-03	2.0E-02	1.6E-03	2.0E-02
Squirrel - JSL @ Kiggavik Discharge	1.6E-03	2.0E-02	1.6E-03	2.0E-02
Squirrel - Kiggavik Camp	1.6E-03	2.0E-02	1.6E-03	2.0E-02
Squirrel - JSL @ Sissons Discharge	1.6E-03	2.0E-02	1.6E-03	2.0E-02
Wolf - LSA	1.1E-03	6.7E-03	1.1E-03	6.7E-03
Wolf - RSA	1.1E-03	6.7E-03	1.1E-03	6.7E-03
Wolverine - LSA	1.0E-03	2.9E-03	1.0E-03	2.9E-03
Wolverine - RSA	1.0E-03	2.9E-03	1.0E-03	2.9E-03

U-238+ Internal U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235
Ra-226+ Internal Ra-226 + 0.3* (Rn-222 + ...Po-214)
Pb-210+ Internal Pb-210 + Bi-210

Table H.2-3

Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

2010

DOSES TO SELECTED VECs - 95th Percentile Total Dose

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals		
Absorbed Doses - Bear - LSA										
Concentration	Bq/g	Crad	3.85E-05	1.50E-04	6.99E-05	1.74E-04	6.41E-03			
Internal Dose Factor	mGy/d per Bq/g	ldcf	1.4E-01	6.6E-02	1.6E-01	6.0E-03	7.4E-02			
Internal dose rate	mGy/d	ldrat	5.5E-06	9.9E-06	1.1E-05	1.0E-06	4.7E-04	5.0E-04	=Crad*ldcf	
External Gamma rate	uGy/h	Xgrat	0.04							
Fraction of time on site	-	fts	1.00							
External dose rate	mGy/d	Xdrat	9.6E-04						=Xgrat*24*fts/1000	
Internal plus external	mGy/d	tdrat	1.5E-03						=SUM(ldrat)+Xdrat	
Absorbed Doses - Caribou - LSA										
Concentration	Bq/g	Crad2	8.62E-05	1.33E-04	2.95E-04	2.53E-03	7.65E-02			
Internal dose rate	mGy/d	ldrat2	1.2E-05	8.7E-06	4.7E-05	1.5E-05	5.7E-03	5.7E-03	=Crad2*ldcf	
Fraction of time on site	-	fts2	1.00							
External dose rate	mGy/d	Xdrat2	9.6E-04						=Xgrat*24*fts2/1000	
Internal plus external	mGy/d	tdrat2	6.7E-03						=SUM(ldrat2)+Xdrat2	
Absorbed Doses - Caribou - RSA										
Concentration	Bq/g	Crad3	8.62E-05	1.33E-04	2.95E-04	2.53E-03	7.65E-02			
Internal dose rate	mGy/d	ldrat3	1.2E-05	8.7E-06	4.7E-05	1.5E-05	5.7E-03	5.7E-03	=Crad3*ldcf	
Fraction of time on site	-	fts3	1.00							
External dose rate	mGy/d	Xdrat3	9.6E-04						=Xgrat*24*fts3/1000	
Internal plus external	mGy/d	tdrat3	6.7E-03						=SUM(ldrat3)+Xdrat3	
Absorbed Doses - Falcon - LSA										
Concentration	Bq/g	Crad4	1.14E-05	3.57E-04	1.38E-03	4.40E-01	5.01E-02			
Internal dose rate	mGy/d	ldrat4	1.6E-06	2.3E-05	2.2E-04	2.7E-03	3.7E-03	6.6E-03	=Crad4*ldcf	
Fraction of time on site	-	fts4	1.00							
External dose rate	mGy/d	Xdrat4	9.6E-04						=Xgrat*24*fts4/1000	
Internal plus external	mGy/d	tdrat4	7.6E-03						=SUM(ldrat4)+Xdrat4	
Absorbed Doses - Falcon - RSA										
Concentration	Bq/g	Crad5	1.14E-05	3.56E-04	1.38E-03	4.40E-01	5.00E-02			
Internal dose rate	mGy/d	ldrat5	1.6E-06	2.3E-05	2.2E-04	2.7E-03	3.7E-03	6.6E-03	=Crad5*ldcf	
Fraction of time on site	-	fts5	1.00							
External dose rate	mGy/d	Xdrat5	9.6E-04						=Xgrat*24*fts5/1000	
Internal plus external	mGy/d	tdrat5	7.6E-03						=SUM(ldrat5)+Xdrat5	
Absorbed Doses - Fox - LSA										
Concentration	Bq/g	Crad6	2.00E-05	7.94E-05	1.30E-04	5.15E-04	3.65E-03			
Internal dose rate	mGy/d	ldrat6	2.8E-06	5.2E-06	2.1E-05	3.1E-06	2.7E-04	3.0E-04	=Crad6*ldcf	
Fraction of time on site	-	fts6	1.00							
External dose rate	mGy/d	Xdrat6	9.6E-04						=Xgrat*24*fts6/1000	
Internal plus external	mGy/d	tdrat6	1.3E-03						=SUM(ldrat6)+Xdrat6	
Absorbed Doses - Lemming - Rock Lake Watershed										
Concentration	Bq/g	Crad7	1.49E-04	3.56E-03	6.36E-03	1.69E-01	2.09E-02			
Internal dose rate	mGy/d	ldrat7	2.1E-05	2.3E-04	1.0E-03	1.0E-03	1.5E-03	3.8E-03	=Crad7*ldcf	
Fraction of time on site	-	fts7	1.00							
External dose rate	mGy/d	Xdrat7	9.6E-04						=Xgrat*24*fts7/1000	
Internal plus external	mGy/d	tdrat7	4.8E-03						=SUM(ldrat7)+Xdrat7	
Absorbed Doses - Lemming - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad8	1.49E-04	3.56E-03	6.36E-03	1.69E-01	2.09E-02			
Internal dose rate	mGy/d	ldrat8	2.1E-05	2.3E-04	1.0E-03	1.0E-03	1.5E-03	3.8E-03	=Crad8*ldcf	
Fraction of time on site	-	fts8	1.00							
External dose rate	mGy/d	Xdrat8	9.6E-04						=Xgrat*24*fts8/1000	
Internal plus external	mGy/d	tdrat8	4.8E-03						=SUM(ldrat8)+Xdrat8	
Absorbed Doses - Lemming - Kiggavik Camp										
Concentration	Bq/g	Crad9	1.49E-04	3.56E-03	6.36E-03	1.69E-01	2.09E-02			
Internal dose rate	mGy/d	ldrat9	2.1E-05	2.3E-04	1.0E-03	1.0E-03	1.5E-03	3.8E-03	=Crad9*ldcf	
Fraction of time on site	-	fts9	1.00							
External dose rate	mGy/d	Xdrat9	9.6E-04						=Xgrat*24*fts9/1000	
Internal plus external	mGy/d	tdrat9	4.8E-03						=SUM(ldrat9)+Xdrat9	
Absorbed Doses - Lemming - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad10	1.49E-04	3.56E-03	6.36E-03	1.69E-01	2.09E-02			
Internal dose rate	mGy/d	ldrat10	2.1E-05	2.3E-04	1.0E-03	1.0E-03	1.5E-03	3.8E-03	=Crad10*ldcf	
Fraction of time on site	-	fts10	1.00							
External dose rate	mGy/d	Xdrat10	9.6E-04						=Xgrat*24*fts10/1000	
Internal plus external	mGy/d	tdrat10	4.8E-03						=SUM(ldrat10)+Xdrat10	
Absorbed Doses - Lapland Longspur - Rock Lake Watershed										
Concentration	Bq/g	Crad11	4.06E-05	3.37E-03	5.23E-03	1.35E-01	3.62E-02			
Internal dose rate	mGy/d	ldrat11	5.8E-06	2.2E-04	8.3E-04	8.1E-04	2.7E-03	4.6E-03	=Crad11*ldcf	
Fraction of time on site	-	fts11	1.00							
External dose rate	mGy/d	Xdrat11	9.6E-04						=Xgrat*24*fts11/1000	
Internal plus external	mGy/d	tdrat11	5.5E-03						=SUM(ldrat11)+Xdrat11	

Table H.2-3

Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

Absorbed Doses - Lapland Longspur - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad12	4.32E-05	3.38E-03	5.39E-03	1.36E-01	3.72E-02			
Internal dose rate	mGy/d	ldrat12	6.1E-06	2.2E-04	8.6E-04	8.2E-04	2.8E-03	4.7E-03	=Crad12*ldcf	
Fraction of time on site	-	fts12	1.00							
External dose rate	mGy/d	Xdrat12	9.6E-04						=Xgrat*24*fts12/1000	
Internal plus external	mGy/d	tdrat12	5.6E-03						=SUM(ldrat12)+Xdrat12	
Absorbed Doses - Lapland Longspur - Kiggavik Camp										
Concentration	Bq/g	Crad13	1.27E-05	3.37E-03	5.10E-03	1.34E-01	3.57E-02			
Internal dose rate	mGy/d	ldrat13	1.8E-06	2.2E-04	8.1E-04	8.1E-04	2.6E-03	4.5E-03	=Crad13*ldcf	
Fraction of time on site	-	fts13	1.00							
External dose rate	mGy/d	Xdrat13	9.6E-04						=Xgrat*24*fts13/1000	
Internal plus external	mGy/d	tdrat13	5.4E-03						=SUM(ldrat13)+Xdrat13	
Absorbed Doses - Lapland Longspur - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad14	4.06E-05	3.37E-03	5.22E-03	1.35E-01	3.64E-02			
Internal dose rate	mGy/d	ldrat14	5.8E-06	2.2E-04	8.3E-04	8.1E-04	2.7E-03	4.6E-03	=Crad14*ldcf	
Fraction of time on site	-	fts14	1.00							
External dose rate	mGy/d	Xdrat14	9.6E-04						=Xgrat*24*fts14/1000	
Internal plus external	mGy/d	tdrat14	5.5E-03						=SUM(ldrat14)+Xdrat14	
Absorbed Doses - Long-Tailed Duck - Rock Lake										
Concentration	Bq/g	Crad15	5.55E-05	6.02E-04	9.25E-03	6.39E-02	5.78E-02			
Internal dose rate	mGy/d	ldrat15	7.9E-06	4.0E-05	1.5E-03	3.9E-04	4.3E-03	6.2E-03	=Crad15*ldcf	
Fraction of time on site	-	fts15	1.00							
External dose rate	mGy/d	Xdrat15	9.6E-04						=Xgrat*24*fts15/1000	
Internal plus external	mGy/d	tdrat15	7.1E-03						=SUM(ldrat15)+Xdrat15	
Absorbed Doses - Long-Tailed Duck - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad16	4.99E-05	5.82E-04	8.89E-03	6.14E-02	5.54E-02			
Internal dose rate	mGy/d	ldrat16	7.1E-06	3.8E-05	1.4E-03	3.7E-04	4.1E-03	5.9E-03	=Crad16*ldcf	
Fraction of time on site	-	fts16	1.00							
External dose rate	mGy/d	Xdrat16	9.6E-04						=Xgrat*24*fts16/1000	
Internal plus external	mGy/d	tdrat16	6.9E-03						=SUM(ldrat16)+Xdrat16	
Absorbed Doses - Long-Tailed Duck - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad17	5.11E-05	5.85E-04	8.94E-03	6.18E-02	5.58E-02			
Internal dose rate	mGy/d	ldrat17	7.2E-06	3.9E-05	1.4E-03	3.7E-04	4.1E-03	6.0E-03	=Crad17*ldcf	
Fraction of time on site	-	fts17	1.00							
External dose rate	mGy/d	Xdrat17	9.6E-04						=Xgrat*24*fts17/1000	
Internal plus external	mGy/d	tdrat17	6.9E-03						=SUM(ldrat17)+Xdrat17	
Absorbed Doses - Merganser - Rock Lake										
Concentration	Bq/g	Crad18	7.67E-06	3.15E-04	3.98E-04	1.98E-02	7.05E-03			
Internal dose rate	mGy/d	ldrat18	1.1E-06	2.1E-05	6.3E-05	1.2E-04	5.2E-04	7.3E-04	=Crad18*ldcf	
Fraction of time on site	-	fts18	1.00							
External dose rate	mGy/d	Xdrat18	9.6E-04						=Xgrat*24*fts18/1000	
Internal plus external	mGy/d	tdrat18	1.7E-03						=SUM(ldrat18)+Xdrat18	
Absorbed Doses - Merganser - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad19	7.65E-06	3.07E-04	3.70E-04	1.97E-02	6.67E-03			
Internal dose rate	mGy/d	ldrat19	1.1E-06	2.0E-05	5.9E-05	1.2E-04	4.9E-04	6.9E-04	=Crad19*ldcf	
Fraction of time on site	-	fts19	1.00							
External dose rate	mGy/d	Xdrat19	9.6E-04						=Xgrat*24*fts19/1000	
Internal plus external	mGy/d	tdrat19	1.7E-03						=SUM(ldrat19)+Xdrat19	
Absorbed Doses - Merganser - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad20	7.64E-06	3.09E-04	3.73E-04	1.97E-02	6.68E-03			
Internal dose rate	mGy/d	ldrat20	1.1E-06	2.0E-05	5.9E-05	1.2E-04	4.9E-04	6.9E-04	=Crad20*ldcf	
Fraction of time on site	-	fts20	1.00							
External dose rate	mGy/d	Xdrat20	9.6E-04						=Xgrat*24*fts20/1000	
Internal plus external	mGy/d	tdrat20	1.7E-03						=SUM(ldrat20)+Xdrat20	
Absorbed Doses - Muskox - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad21	1.18E-04	1.86E-04	2.87E-04	6.76E-04	2.04E-02			
Internal dose rate	mGy/d	ldrat21	1.7E-05	1.2E-05	4.6E-05	4.1E-06	1.5E-03	1.6E-03	=Crad21*ldcf	
Fraction of time on site	-	fts21	1.00							
External dose rate	mGy/d	Xdrat21	9.6E-04						=Xgrat*24*fts21/1000	
Internal plus external	mGy/d	tdrat21	2.6E-03						=SUM(ldrat21)+Xdrat21	
Absorbed Doses - Muskox - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad22	4.06E-05	3.37E-03	5.22E-03	1.35E-01	3.64E-02			
Internal dose rate	mGy/d	ldrat22	5.8E-06	2.2E-04	8.3E-04	8.1E-04	2.7E-03	4.6E-03	=Crad22*ldcf	
Fraction of time on site	-	fts22	1.00							
External dose rate	mGy/d	Xdrat22	9.6E-04						=Xgrat*24*fts22/1000	
Internal plus external	mGy/d	tdrat22	5.5E-03						=SUM(ldrat22)+Xdrat22	
Absorbed Doses - Northern Pintail - Rock Lake										
Concentration	Bq/g	Crad23	2.33E-05	4.59E-03	2.26E-03	1.68E-01	6.11E-02			
Internal dose rate	mGy/d	ldrat23	3.3E-06	3.0E-04	3.6E-04	1.0E-03	4.5E-03	6.2E-03	=Crad23*ldcf	
Fraction of time on site	-	fts23	1.00							
External dose rate	mGy/d	Xdrat23	9.6E-04						=Xgrat*24*fts23/1000	
Internal plus external	mGy/d	tdrat23	7.2E-03						=SUM(ldrat23)+Xdrat23	

Table H.2-3

Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

Absorbed Doses - Northern Pintail - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad24	2.11E-05	4.42E-03	2.17E-03	1.62E-01	5.85E-02			
Internal dose rate	mGy/d	Idrat24	3.0E-06	2.9E-04	3.5E-04	9.8E-04	4.3E-03	5.9E-03	=Crad24*Idcf	
Fraction of time on site	-	fts24	1.00							
External dose rate	mGy/d	Xdrat24	9.6E-04						=Xgrat*24*fts24/1000	
Internal plus external	mGy/d	tdrat24	6.9E-03						=SUM(Idrat24)+Xdrat24	
Absorbed Doses - Northern Pintail - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad25	2.14E-05	4.45E-03	2.18E-03	1.63E-01	5.90E-02			
Internal dose rate	mGy/d	Idrat25	3.0E-06	2.9E-04	3.5E-04	9.8E-04	4.4E-03	6.0E-03	=Crad25*Idcf	
Fraction of time on site	-	fts25	1.00							
External dose rate	mGy/d	Xdrat25	9.6E-04						=Xgrat*24*fts25/1000	
Internal plus external	mGy/d	tdrat25	6.9E-03						=SUM(Idrat25)+Xdrat25	
Absorbed Doses - Ptarmigan - Rock Lake Watershed										
Concentration	Bq/g	Crad26	4.26E-05	9.01E-04	2.17E-03	3.88E-01	1.42E-01			
Internal dose rate	mGy/d	Idrat26	6.0E-06	5.9E-05	3.5E-04	2.3E-03	1.1E-02	1.3E-02	=Crad26*Idcf	
Fraction of time on site	-	fts26	1.00							
External dose rate	mGy/d	Xdrat26	9.6E-04						=Xgrat*24*fts26/1000	
Internal plus external	mGy/d	tdrat26	1.4E-02						=SUM(Idrat26)+Xdrat26	
Absorbed Doses - Ptarmigan - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad27	4.32E-05	9.03E-04	2.21E-03	3.88E-01	1.42E-01			
Internal dose rate	mGy/d	Idrat27	6.1E-06	5.9E-05	3.5E-04	2.3E-03	1.1E-02	1.3E-02	=Crad27*Idcf	
Fraction of time on site	-	fts27	1.00							
External dose rate	mGy/d	Xdrat27	9.6E-04						=Xgrat*24*fts27/1000	
Internal plus external	mGy/d	tdrat27	1.4E-02						=SUM(Idrat27)+Xdrat27	
Absorbed Doses - Ptarmigan - Kiggavik Camp										
Concentration	Bq/g	Crad28	3.38E-05	9.00E-04	2.10E-03	3.88E-01	1.42E-01			
Internal dose rate	mGy/d	Idrat28	4.8E-06	5.9E-05	3.3E-04	2.3E-03	1.1E-02	1.3E-02	=Crad28*Idcf	
Fraction of time on site	-	fts28	1.00							
External dose rate	mGy/d	Xdrat28	9.6E-04						=Xgrat*24*fts28/1000	
Internal plus external	mGy/d	tdrat28	1.4E-02						=SUM(Idrat28)+Xdrat28	
Absorbed Doses - Ptarmigan - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad29	4.27E-05	9.01E-04	2.16E-03	3.88E-01	1.42E-01			
Internal dose rate	mGy/d	Idrat29	6.1E-06	5.9E-05	3.4E-04	2.3E-03	1.1E-02	1.3E-02	=Crad29*Idcf	
Fraction of time on site	-	fts29	1.00							
External dose rate	mGy/d	Xdrat29	9.6E-04						=Xgrat*24*fts29/1000	
Internal plus external	mGy/d	tdrat29	1.4E-02						=SUM(Idrat29)+Xdrat29	
Absorbed Doses - Sandpiper - Rock Lake										
Concentration	Bq/g	Crad30	1.96E-04	2.12E-03	1.52E-02	1.82E-01	1.19E-01			
Internal dose rate	mGy/d	Idrat30	2.8E-05	1.4E-04	2.4E-03	1.1E-03	8.8E-03	1.3E-02	=Crad30*Idcf	
Fraction of time on site	-	fts30	1.00							
External dose rate	mGy/d	Xdrat30	9.6E-04						=Xgrat*24*fts30/1000	
Internal plus external	mGy/d	tdrat30	1.3E-02						=SUM(Idrat30)+Xdrat30	
Absorbed Doses - Sandpiper - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad31	1.81E-04	2.10E-03	1.47E-02	1.78E-01	1.14E-01			
Internal dose rate	mGy/d	Idrat31	2.6E-05	1.4E-04	2.3E-03	1.1E-03	8.5E-03	1.2E-02	=Crad31*Idcf	
Fraction of time on site	-	fts31	1.00							
External dose rate	mGy/d	Xdrat31	9.6E-04						=Xgrat*24*fts31/1000	
Internal plus external	mGy/d	tdrat31	1.3E-02						=SUM(Idrat31)+Xdrat31	
Absorbed Doses - Sandpiper - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad32	1.84E-04	2.10E-03	1.48E-02	1.78E-01	1.15E-01			
Internal dose rate	mGy/d	Idrat32	2.6E-05	1.4E-04	2.4E-03	1.1E-03	8.5E-03	1.2E-02	=Crad32*Idcf	
Fraction of time on site	-	fts32	1.00							
External dose rate	mGy/d	Xdrat32	9.6E-04						=Xgrat*24*fts32/1000	
Internal plus external	mGy/d	tdrat32	1.3E-02						=SUM(Idrat32)+Xdrat32	
Absorbed Doses - Shrew - Rock Lake Watershed										
Concentration	Bq/g	Crad33	1.03E-04	6.30E-04	4.01E-03	3.64E-02	5.70E-03			
Internal dose rate	mGy/d	Idrat33	1.5E-05	4.1E-05	6.4E-04	2.2E-04	4.2E-04	1.3E-03	=Crad33*Idcf	
Fraction of time on site	-	fts33	1.00							
External dose rate	mGy/d	Xdrat33	9.6E-04						=Xgrat*24*fts33/1000	
Internal plus external	mGy/d	tdrat33	2.3E-03						=SUM(Idrat33)+Xdrat33	
Absorbed Doses - Shrew - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad34	1.13E-04	6.72E-04	4.37E-03	3.68E-02	5.88E-03			
Internal dose rate	mGy/d	Idrat34	1.6E-05	4.4E-05	6.9E-04	2.2E-04	4.4E-04	1.4E-03	=Crad34*Idcf	
Fraction of time on site	-	fts34	1.00							
External dose rate	mGy/d	Xdrat34	9.6E-04						=Xgrat*24*fts34/1000	
Internal plus external	mGy/d	tdrat34	2.4E-03						=SUM(Idrat34)+Xdrat34	
Absorbed Doses - Shrew - Kiggavik Camp										
Concentration	Bq/g	Crad35	9.18E-06	5.99E-04	3.72E-03	3.61E-02	5.69E-03			
Internal dose rate	mGy/d	Idrat35	1.3E-06	3.9E-05	5.9E-04	2.2E-04	4.2E-04	1.3E-03	=Crad35*Idcf	
Fraction of time on site	-	fts35	1.00							
External dose rate	mGy/d	Xdrat35	9.6E-04						=Xgrat*24*fts35/1000	
Internal plus external	mGy/d	tdrat35	2.2E-03						=SUM(Idrat35)+Xdrat35	
Absorbed Doses - Shrew - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad36	1.04E-04	6.31E-04	4.01E-03	3.64E-02	5.72E-03			
Internal dose rate	mGy/d	Idrat36	1.5E-05	4.2E-05	6.4E-04	2.2E-04	4.2E-04	1.3E-03	=Crad36*Idcf	
Fraction of time on site	-	fts36	1.00							

Table H.2-3

Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

External dose rate	mGy/d	Xdrat36	2.7E-04							=Xgrat*24*fts36/3600
Internal plus external	mGy/d	tdrat36	1.6E-03							=SUM(ldrat36)+Xdrat36
Absorbed Doses - Squirrel - Rock Lake Watershed										
Concentration	Bq/g	Crad37	8.95E-05	3.42E-03	6.40E-03	8.30E-02	1.01E-02			
Internal dose rate	mGy/d	ldrat37	1.3E-05	2.2E-04	1.0E-03	5.0E-04	7.5E-04	2.5E-03		=Crad37*ldcf
Fraction of time on site	-	fts37	1.00							
External dose rate	mGy/d	Xdrat37	9.6E-04							=Xgrat*24*fts37/1000
Internal plus external	mGy/d	tdrat37	3.5E-03							=SUM(ldrat37)+Xdrat37
Absorbed Doses - Squirrel - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad38	8.95E-05	3.42E-03	6.40E-03	8.30E-02	1.01E-02			
Internal dose rate	mGy/d	ldrat38	1.3E-05	2.2E-04	1.0E-03	5.0E-04	7.5E-04	2.5E-03		=Crad38*ldcf
Fraction of time on site	-	fts38	1.00							
External dose rate	mGy/d	Xdrat38	9.6E-04							=Xgrat*24*fts38/1000
Internal plus external	mGy/d	tdrat38	3.5E-03							=SUM(ldrat38)+Xdrat38
Absorbed Doses - Squirrel - Kiggavik Camp										
Concentration	Bq/g	Crad39	8.94E-05	3.42E-03	6.40E-03	8.30E-02	1.01E-02			
Internal dose rate	mGy/d	ldrat39	1.3E-05	2.2E-04	1.0E-03	5.0E-04	7.5E-04	2.5E-03		=Crad39*ldcf
Fraction of time on site	-	fts39	1.00							
External dose rate	mGy/d	Xdrat39	9.6E-04							=Xgrat*24*fts39/1000
Internal plus external	mGy/d	tdrat39	3.5E-03							=SUM(ldrat39)+Xdrat39

Table H.2-3

Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

Absorbed Doses - Squirrel - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad40	8.95E-05	3.42E-03	6.40E-03	8.30E-02	1.01E-02			
Internal dose rate	mGy/d	ldrat40	1.3E-05	2.2E-04	1.0E-03	5.0E-04	7.5E-04	2.5E-03	=Crad40*ldcf	
Fraction of time on site	-	fts40	1.00							
External dose rate	mGy/d	Xdrat40	9.6E-04						=Xgrat*24*fts40/1000	
Internal plus external	mGy/d	tdrat40	3.5E-03						=SUM(ldrat40)+Xdrat40	
Absorbed Doses - Wolf - LSA										
Concentration	Bq/g	Crad41	4.14E-05	2.94E-05	2.20E-05	1.44E-05	7.66E-03			
Internal dose rate	mGy/d	ldrat41	5.9E-06	1.9E-06	3.5E-06	8.7E-08	5.7E-04	5.8E-04	=Crad41*ldcf	
Fraction of time on site	-	fts41	1.00							
External dose rate	mGy/d	Xdrat41	9.6E-04						=Xgrat*24*fts41/1000	
Internal plus external	mGy/d	tdrat41	1.5E-03						=SUM(ldrat41)+Xdrat41	
Absorbed Doses - Wolf - RSA										
Concentration	Bq/g	Crad42	4.15E-05	2.93E-05	2.20E-05	1.44E-05	7.66E-03			
Internal dose rate	mGy/d	ldrat42	5.9E-06	1.9E-06	3.5E-06	8.7E-08	5.7E-04	5.8E-04	=Crad42*ldcf	
Fraction of time on site	-	fts42	1.00							
External dose rate	mGy/d	Xdrat42	9.6E-04						=Xgrat*24*fts42/1000	
Internal plus external	mGy/d	tdrat42	1.5E-03						=SUM(ldrat42)+Xdrat42	
Absorbed Doses - Wolverine - LSA										
Concentration	Bq/g	Crad43	5.79E-05	1.16E-04	2.13E-04	4.70E-04	1.79E-03			
Internal dose rate	mGy/d	ldrat43	8.2E-06	7.6E-06	3.4E-05	2.8E-06	1.3E-04	1.9E-04	=Crad43*ldcf	
Fraction of time on site	-	fts43	1.00							
External dose rate	mGy/d	Xdrat43	9.6E-04						=Xgrat*24*fts43/1000	
Internal plus external	mGy/d	tdrat43	1.1E-03						=SUM(ldrat43)+Xdrat43	
Absorbed Doses - Wolverine - RSA										
Concentration	Bq/g	Crad44	5.81E-05	1.16E-04	2.13E-04	4.70E-04	1.79E-03			
Internal dose rate	mGy/d	ldrat44	8.2E-06	7.6E-06	3.4E-05	2.8E-06	1.3E-04	1.9E-04	=Crad44*ldcf	
Fraction of time on site	-	fts44	1.00							
External dose rate	mGy/d	Xdrat44	9.6E-04						=Xgrat*24*fts44/1000	
Internal plus external	mGy/d	tdrat44	1.1E-03						=SUM(ldrat44)+Xdrat44	
Equivalent Doses - Bear - LSA										
RBE for alpha	Sv/Gy	RBE	40							
High LET dose rate	mSv/d	Hletdr	2.2E-04	4.0E-04	4.4E-04	1.0E-06	1.9E-02	2.0E-02	=ldrat*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr	9.6E-04						=Xdrat	
Total dose rate	mSv/d	tdr	2.1E-02						=SUM(Hletdr)+Lletdr	
Equivalent Doses - Caribou - LSA										
High LET dose rate	mSv/d	Hletdr2	4.9E-04	3.5E-04	1.9E-03	1.5E-05	2.3E-01	2.3E-01	=ldrat2*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr2	9.6E-04						=Xdrat2	
Total dose rate	mSv/d	tdr2	2.3E-01						=SUM(Hletdr2)+Lletdr2	
Equivalent Doses - Caribou - RSA										
High LET dose rate	mSv/d	Hletdr3	4.9E-04	3.5E-04	1.9E-03	1.5E-05	2.3E-01	2.3E-01	=ldrat3*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr3	9.6E-04						=Xdrat3	
Total dose rate	mSv/d	tdr3	2.3E-01						=SUM(Hletdr3)+Lletdr3	
Equivalent Doses - Falcon - LSA										
High LET dose rate	mSv/d	Hletdr4	6.5E-05	9.4E-04	8.8E-03	2.7E-03	1.5E-01	1.6E-01	=ldrat4*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr4	9.6E-04						=Xdrat4	
Total dose rate	mSv/d	tdr4	1.6E-01						=SUM(Hletdr4)+Lletdr4	
Equivalent Doses - Falcon - RSA										
High LET dose rate	mSv/d	Hletdr5	6.5E-05	9.4E-04	8.8E-03	2.7E-03	1.5E-01	1.6E-01	=ldrat5*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr5	9.6E-04						=Xdrat5	
Total dose rate	mSv/d	tdr5	1.6E-01						=SUM(Hletdr5)+Lletdr5	
Equivalent Doses - Fox - LSA										
High LET dose rate	mSv/d	Hletdr6	1.1E-04	2.1E-04	8.3E-04	3.1E-06	1.1E-02	1.2E-02	=ldrat6*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr6	9.6E-04						=Xdrat6	
Total dose rate	mSv/d	tdr6	1.3E-02						=SUM(Hletdr6)+Lletdr6	
Equivalent Doses - Lemming - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr7	8.5E-04	9.4E-03	4.0E-02	1.0E-03	6.2E-02	1.1E-01	=ldrat7*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr7	9.6E-04						=Xdrat7	
Total dose rate	mSv/d	tdr7	1.1E-01						=SUM(Hletdr7)+Lletdr7	
Equivalent Doses - Lemming - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr8	8.5E-04	9.4E-03	4.0E-02	1.0E-03	6.2E-02	1.1E-01	=ldrat8*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr8	9.6E-04						=Xdrat8	
Total dose rate	mSv/d	tdr8	1.1E-01						=SUM(Hletdr8)+Lletdr8	
Equivalent Doses - Lemming - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr9	8.5E-04	9.4E-03	4.0E-02	1.0E-03	6.2E-02	1.1E-01	=ldrat9*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr9	9.6E-04						=Xdrat9	
Total dose rate	mSv/d	tdr9	1.1E-01						=SUM(Hletdr9)+Lletdr9	
Equivalent Doses - Lemming - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr10	8.5E-04	9.4E-03	4.0E-02	1.0E-03	6.2E-02	1.1E-01	=ldrat10*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr10	9.6E-04						=Xdrat10	
Total dose rate	mSv/d	tdr10	1.1E-01						=SUM(Hletdr10)+Lletdr10	

Table H.2-3

Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

Equivalent Doses - Lapland Longspur - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr11	2.3E-04	8.9E-03	3.3E-02	8.1E-04	1.1E-01	1.5E-01	=Idrat11*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr11	9.6E-04						=Xdrat11	
Total dose rate	mSv/d	tdr11	1.5E-01						=SUM(Hletdr11)+Lletdr11	
Equivalent Doses - Lapland Longspur - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr12	2.5E-04	8.9E-03	3.4E-02	8.2E-04	1.1E-01	1.5E-01	=Idrat12*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr12	9.6E-04						=Xdrat12	
Total dose rate	mSv/d	tdr12	1.6E-01						=SUM(Hletdr12)+Lletdr12	
Equivalent Doses - Lapland Longspur - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr13	7.2E-05	8.9E-03	3.2E-02	8.1E-04	1.1E-01	1.5E-01	=Idrat13*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr13	9.6E-04						=Xdrat13	
Total dose rate	mSv/d	tdr13	1.5E-01						=SUM(Hletdr13)+Lletdr13	
Equivalent Doses - Lapland Longspur - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr14	2.3E-04	8.9E-03	3.3E-02	8.1E-04	1.1E-01	1.5E-01	=Idrat14*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr14	9.6E-04						=Xdrat14	
Total dose rate	mSv/d	tdr14	1.5E-01						=SUM(Hletdr14)+Lletdr14	
Equivalent Doses - Long-Tailed Duck - Rock Lake										
High LET dose rate	mSv/d	Hletdr15	3.2E-04	1.6E-03	5.9E-02	3.9E-04	1.7E-01	2.3E-01	=Idrat15*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr15	9.6E-04						=Xdrat15	
Total dose rate	mSv/d	tdr15	2.3E-01						=SUM(Hletdr15)+Lletdr15	
Equivalent Doses - Long-Tailed Duck - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr16	2.8E-04	1.5E-03	5.7E-02	3.7E-04	1.6E-01	2.2E-01	=Idrat16*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr16	9.6E-04						=Xdrat16	
Total dose rate	mSv/d	tdr16	2.2E-01						=SUM(Hletdr16)+Lletdr16	
Equivalent Doses - Long-Tailed Duck - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr17	2.9E-04	1.5E-03	5.7E-02	3.7E-04	1.7E-01	2.2E-01	=Idrat17*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr17	9.6E-04						=Xdrat17	
Total dose rate	mSv/d	tdr17	2.3E-01						=SUM(Hletdr17)+Lletdr17	
Equivalent Doses - Merganser - Rock Lake										
High LET dose rate	mSv/d	Hletdr18	4.4E-05	8.3E-04	2.5E-03	1.2E-04	2.1E-02	2.4E-02	=Idrat18*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr18	9.6E-04						=Xdrat18	
Total dose rate	mSv/d	tdr18	2.5E-02						=SUM(Hletdr18)+Lletdr18	
Equivalent Doses - Merganser - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr19	4.3E-05	8.1E-04	2.4E-03	1.2E-04	2.0E-02	2.3E-02	=Idrat19*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr19	9.6E-04						=Xdrat19	
Total dose rate	mSv/d	tdr19	2.4E-02						=SUM(Hletdr19)+Lletdr19	
Equivalent Doses - Merganser - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr20	4.3E-05	8.1E-04	2.4E-03	1.2E-04	2.0E-02	2.3E-02	=Idrat20*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr20	9.6E-04						=Xdrat20	
Total dose rate	mSv/d	tdr20	2.4E-02						=SUM(Hletdr20)+Lletdr20	
Equivalent Doses - Muskox - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr21	6.7E-04	4.9E-04	1.8E-03	4.1E-06	6.0E-02	6.3E-02	=Idrat21*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr21	9.6E-04						=Xdrat21	
Total dose rate	mSv/d	tdr21	6.4E-02						=SUM(Hletdr21)+Lletdr21	
Equivalent Doses - Muskox - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr22	2.3E-04	8.9E-03	3.3E-02	8.1E-04	1.1E-01	1.5E-01	=Idrat22*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr22	9.6E-04						=Xdrat22	
Total dose rate	mSv/d	tdr22	1.5E-01						=SUM(Hletdr22)+Lletdr22	
Equivalent Doses - Northern Pintail - Rock Lake										
High LET dose rate	mSv/d	Hletdr23	1.3E-04	1.2E-02	1.4E-02	1.0E-03	1.8E-01	2.1E-01	=Idrat23*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr23	9.6E-04						=Xdrat23	
Total dose rate	mSv/d	tdr23	2.1E-01						=SUM(Hletdr23)+Lletdr23	
Equivalent Doses - Northern Pintail - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr24	1.2E-04	1.2E-02	1.4E-02	9.8E-04	1.7E-01	2.0E-01	=Idrat24*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr24	9.6E-04						=Xdrat24	
Total dose rate	mSv/d	tdr24	2.0E-01						=SUM(Hletdr24)+Lletdr24	
Equivalent Doses - Northern Pintail - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr25	1.2E-04	1.2E-02	1.4E-02	9.8E-04	1.7E-01	2.0E-01	=Idrat25*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr25	9.6E-04						=Xdrat25	
Total dose rate	mSv/d	tdr25	2.0E-01						=SUM(Hletdr25)+Lletdr25	
Equivalent Doses - Ptarmigan - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr26	2.4E-04	2.4E-03	1.4E-02	2.3E-03	4.2E-01	4.4E-01	=Idrat26*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr26	9.6E-04						=Xdrat26	
Total dose rate	mSv/d	tdr26	4.4E-01						=SUM(Hletdr26)+Lletdr26	
Equivalent Doses - Ptarmigan - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr27	2.5E-04	2.4E-03	1.4E-02	2.3E-03	4.2E-01	4.4E-01	=Idrat27*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr27	9.6E-04						=Xdrat27	
Total dose rate	mSv/d	tdr27	4.4E-01						=SUM(Hletdr27)+Lletdr27	

Table H.2-3

Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

Equivalent Doses - Ptarmigan - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr28	1.9E-04	2.4E-03	1.3E-02	2.3E-03	4.2E-01	4.4E-01	=Idrat28*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr28	9.6E-04						=Xdrat28	
Total dose rate	mSv/d	tdr28	4.4E-01						=SUM(Hletdr28)+Lletdr28	
Equivalent Doses - Ptarmigan - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr29	2.4E-04	2.4E-03	1.4E-02	2.3E-03	4.2E-01	4.4E-01	=Idrat29*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr29	9.6E-04						=Xdrat29	
Total dose rate	mSv/d	tdr29	4.4E-01						=SUM(Hletdr29)+Lletdr29	
Equivalent Doses - Sandpiper - Rock Lake										
High LET dose rate	mSv/d	Hletdr30	1.1E-03	5.6E-03	9.7E-02	1.1E-03	3.5E-01	4.6E-01	=Idrat30*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr30	9.6E-04						=Xdrat30	
Total dose rate	mSv/d	tdr30	4.6E-01						=SUM(Hletdr30)+Lletdr30	
Equivalent Doses - Sandpiper - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr31	1.0E-03	5.5E-03	9.4E-02	1.1E-03	3.4E-01	4.4E-01	=Idrat31*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr31	9.6E-04						=Xdrat31	
Total dose rate	mSv/d	tdr31	4.4E-01						=SUM(Hletdr31)+Lletdr31	
Equivalent Doses - Sandpiper - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr32	1.0E-03	5.5E-03	9.4E-02	1.1E-03	3.4E-01	4.4E-01	=Idrat32*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr32	9.6E-04						=Xdrat32	
Total dose rate	mSv/d	tdr32	4.4E-01						=SUM(Hletdr32)+Lletdr32	
Equivalent Doses - Shrew - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr33	5.8E-04	1.7E-03	2.5E-02	2.2E-04	1.7E-02	4.5E-02	=Idrat33*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr33	9.6E-04						=Xdrat33	
Total dose rate	mSv/d	tdr33	4.6E-02						=SUM(Hletdr33)+Lletdr33	
Equivalent Doses - Shrew - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr34	6.4E-04	1.8E-03	2.8E-02	2.2E-04	1.7E-02	4.8E-02	=Idrat34*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr34	9.6E-04						=Xdrat34	
Total dose rate	mSv/d	tdr34	4.9E-02						=SUM(Hletdr34)+Lletdr34	
Equivalent Doses - Shrew - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr35	5.2E-05	1.6E-03	2.4E-02	2.2E-04	1.7E-02	4.2E-02	=Idrat35*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr35	9.6E-04						=Xdrat35	
Total dose rate	mSv/d	tdr35	4.3E-02						=SUM(Hletdr35)+Lletdr35	
Equivalent Doses - Shrew - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr36	5.9E-04	1.7E-03	2.5E-02	2.2E-04	1.7E-02	4.5E-02	=Idrat36*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr36	2.7E-04						=Xdrat36	
Total dose rate	mSv/d	tdr36	4.5E-02						=SUM(Hletdr36)+Lletdr36	
Equivalent Doses - Squirrel - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr37	5.1E-04	9.0E-03	4.1E-02	5.0E-04	3.0E-02	8.1E-02	=Idrat37*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr37	9.6E-04						=Xdrat37	
Total dose rate	mSv/d	tdr37	8.2E-02						=SUM(Hletdr37)+Lletdr37	
Equivalent Doses - Squirrel - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr38	5.1E-04	9.0E-03	4.1E-02	5.0E-04	3.0E-02	8.1E-02	=Idrat38*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr38	9.6E-04						=Xdrat38	
Total dose rate	mSv/d	tdr38	8.2E-02						=SUM(Hletdr38)+Lletdr38	
Equivalent Doses - Squirrel - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr39	5.1E-04	9.0E-03	4.1E-02	5.0E-04	3.0E-02	8.1E-02	=Idrat39*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr39	9.6E-04						=Xdrat39	
Total dose rate	mSv/d	tdr39	8.2E-02						=SUM(Hletdr39)+Lletdr39	
Equivalent Doses - Squirrel - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr40	5.1E-04	9.0E-03	4.1E-02	5.0E-04	3.0E-02	8.1E-02	=Idrat40*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr40	9.6E-04						=Xdrat40	
Total dose rate	mSv/d	tdr40	8.2E-02						=SUM(Hletdr40)+Lletdr40	
Equivalent Doses - Wolf - LSA										
High LET dose rate	mSv/d	Hletdr41	2.4E-04	7.7E-05	1.4E-04	8.7E-08	2.3E-02	2.3E-02	=Idrat41*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr41	9.6E-04						=Xdrat41	
Total dose rate	mSv/d	tdr41	2.4E-02						=SUM(Hletdr41)+Lletdr41	
Equivalent Doses - Wolf - RSA										
High LET dose rate	mSv/d	Hletdr42	2.4E-04	7.7E-05	1.4E-04	8.7E-08	2.3E-02	2.3E-02	=Idrat42*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr42	9.6E-04						=Xdrat42	
Total dose rate	mSv/d	tdr42	2.4E-02						=SUM(Hletdr42)+Lletdr42	
Equivalent Doses - Wolverine - LSA										
High LET dose rate	mSv/d	Hletdr43	3.3E-04	3.0E-04	1.4E-03	2.8E-06	5.3E-03	7.3E-03	=Idrat43*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr43	9.6E-04						=Xdrat43	
Total dose rate	mSv/d	tdr43	8.3E-03						=SUM(Hletdr43)+Lletdr43	
Equivalent Doses - Wolverine - RSA										
High LET dose rate	mSv/d	Hletdr44	3.3E-04	3.0E-04	1.4E-03	2.8E-06	5.3E-03	7.3E-03	=Idrat44*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr44	9.6E-04						=Xdrat44	
Total dose rate	mSv/d	tdr44	8.3E-03						=SUM(Hletdr44)+Lletdr44	

Table H.2-3
Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

SUMMARY

1 Screening Criterion in mGy/d	Total Absorbed Dose mGy/d	Total Equivalent Dose mSv/d	Index (Absorbed Dose)	Index (Equivalent Dose)
Bear - LSA	1.5E-03	2.1E-02	1.5E-03	2.1E-02
Caribou - LSA	6.7E-03	2.3E-01	6.7E-03	2.3E-01
Caribou - RSA	6.7E-03	2.3E-01	6.7E-03	2.3E-01
Falcon - LSA	7.6E-03	1.6E-01	7.6E-03	1.6E-01
Falcon - RSA	7.6E-03	1.6E-01	7.6E-03	1.6E-01
Fox - LSA	1.3E-03	1.3E-02	1.3E-03	1.3E-02
Lemming - Rock Lake Watershed	4.8E-03	1.1E-01	4.8E-03	1.1E-01
Lemming - JSL @ Kiggavik Discharge	4.8E-03	1.1E-01	4.8E-03	1.1E-01
Lemming - Kiggavik Camp	4.8E-03	1.1E-01	4.8E-03	1.1E-01
Lemming - JSL @ Sissons Discharge	4.8E-03	1.1E-01	4.8E-03	1.1E-01
Lapland Longspur - Rock Lake Watershed	5.5E-03	1.5E-01	5.5E-03	1.5E-01
Lapland Longspur - JSL @ Kiggavik Discharge	5.6E-03	1.6E-01	5.6E-03	1.6E-01
Lapland Longspur - Kiggavik Camp	5.4E-03	1.5E-01	5.4E-03	1.5E-01
Lapland Longspur - JSL @ Sissons Discharge	5.5E-03	1.5E-01	5.5E-03	1.5E-01
Long-Tailed Duck - Rock Lake	7.1E-03	2.3E-01	7.1E-03	2.3E-01
Long-Tailed Duck - JSL @ Kiggavik Discharge	6.9E-03	2.2E-01	6.9E-03	2.2E-01
Long-Tailed Duck - JSL @ Sissons Discharge	6.9E-03	2.3E-01	6.9E-03	2.3E-01
Merganser - Rock Lake	1.7E-03	2.5E-02	1.7E-03	2.5E-02
Merganser - JSL @ Kiggavik Discharge	1.7E-03	2.4E-02	1.7E-03	2.4E-02
Merganser - JSL @ Sissons Discharge	1.7E-03	2.4E-02	1.7E-03	2.4E-02
Muskox - JSL @ Kiggavik Discharge	2.6E-03	6.4E-02	2.6E-03	6.4E-02
Muskox - JSL @ Sissons Discharge	5.5E-03	1.5E-01	5.5E-03	1.5E-01
Northern Pintail - Rock Lake	7.2E-03	2.1E-01	7.2E-03	2.1E-01
Northern Pintail - JSL @ Kiggavik Discharge	6.9E-03	2.0E-01	6.9E-03	2.0E-01
Northern Pintail - JSL @ Sissons Discharge	6.9E-03	2.0E-01	6.9E-03	2.0E-01
Ptarmigan - Rock Lake Watershed	1.4E-02	4.4E-01	1.4E-02	4.4E-01
Ptarmigan - JSL @ Kiggavik Discharge	1.4E-02	4.4E-01	1.4E-02	4.4E-01
Ptarmigan - Kiggavik Camp	1.4E-02	4.4E-01	1.4E-02	4.4E-01
Ptarmigan - JSL @ Sissons Discharge	1.4E-02	4.4E-01	1.4E-02	4.4E-01
Sandpiper - Rock Lake	1.3E-02	4.6E-01	1.3E-02	4.6E-01
Sandpiper - JSL @ Kiggavik Discharge	1.3E-02	4.4E-01	1.3E-02	4.4E-01
Sandpiper - JSL @ Sissons Discharge	1.3E-02	4.4E-01	1.3E-02	4.4E-01
Shrew - Rock Lake Watershed	2.3E-03	4.6E-02	2.3E-03	4.6E-02
Shrew - JSL @ Kiggavik Discharge	2.4E-03	4.9E-02	2.4E-03	4.9E-02
Shrew - Kiggavik Camp	2.2E-03	4.3E-02	2.2E-03	4.3E-02
Shrew - JSL @ Sissons Discharge	1.6E-03	4.5E-02	1.6E-03	4.5E-02
Squirrel - Rock Lake Watershed	3.5E-03	8.2E-02	3.5E-03	8.2E-02
Squirrel - JSL @ Kiggavik Discharge	3.5E-03	8.2E-02	3.5E-03	8.2E-02
Squirrel - Kiggavik Camp	3.5E-03	8.2E-02	3.5E-03	8.2E-02
Squirrel - JSL @ Sissons Discharge	3.5E-03	8.2E-02	3.5E-03	8.2E-02
Wolf - LSA	1.5E-03	2.4E-02	1.5E-03	2.4E-02
Wolf - RSA	1.5E-03	2.4E-02	1.5E-03	2.4E-02
Wolverine - LSA	1.1E-03	8.3E-03	1.1E-03	8.3E-03
Wolverine - RSA	1.1E-03	8.3E-03	1.1E-03	8.3E-03

U-238+ Internal U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235
Ra-226+ Internal Ra-226 + 0.3* (Rn-222 + ...Po-214)
Pb-210+ Internal Pb-210 + Bi-210

Table H.2-3

Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

2023

DOSES TO SELECTED VECs - Average Total Dose

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals		
Absorbed Doses - Bear - LSA										
Concentration	Bq/g	Crad	1.72E-05	3.49E-05	2.39E-05	5.32E-05	1.80E-03			
Internal Dose Factor	mGy/d per Bq/g	ldcf	1.4E-01	6.6E-02	1.6E-01	6.0E-03	7.4E-02			
Internal dose rate	mGy/d	ldrat	2.4E-06	2.3E-06	3.8E-06	3.2E-07	1.3E-04	1.4E-04	=Crad*ldcf	
External Gamma rate	uGy/h	Xgrat	0.04							
Fraction of time on site	-	fts	1.00							
External dose rate	mGy/d	Xdrat	9.6E-04						=Xgrat*24*fts/1000	
Internal plus external	mGy/d	tdrat	1.1E-03						=SUM(ldrat)+Xdrat	
Absorbed Doses - Caribou - LSA										
Concentration	Bq/g	Crad2	7.26E-05	4.61E-05	9.33E-05	9.07E-04	2.41E-02			
Internal dose rate	mGy/d	ldrat2	1.0E-05	3.0E-06	1.5E-05	5.5E-06	1.8E-03	1.8E-03	=Crad2*ldcf	
Fraction of time on site	-	fts2	1.00							
External dose rate	mGy/d	Xdrat2	9.6E-04						=Xgrat*24*fts2/1000	
Internal plus external	mGy/d	tdrat2	2.8E-03						=SUM(ldrat2)+Xdrat2	
Absorbed Doses - Caribou - RSA										
Concentration	Bq/g	Crad3	4.76E-05	4.51E-05	8.95E-05	9.06E-04	2.40E-02			
Internal dose rate	mGy/d	ldrat3	6.8E-06	3.0E-06	1.4E-05	5.5E-06	1.8E-03	1.8E-03	=Crad3*ldcf	
Fraction of time on site	-	fts3	1.00							
External dose rate	mGy/d	Xdrat3	9.6E-04						=Xgrat*24*fts3/1000	
Internal plus external	mGy/d	tdrat3	2.8E-03						=SUM(ldrat3)+Xdrat3	
Absorbed Doses - Falcon - LSA										
Concentration	Bq/g	Crad4	4.03E-06	1.21E-04	4.04E-04	1.34E-01	1.47E-02			
Internal dose rate	mGy/d	ldrat4	5.7E-07	8.0E-06	6.4E-05	8.1E-04	1.1E-03	2.0E-03	=Crad4*ldcf	
Fraction of time on site	-	fts4	1.00							
External dose rate	mGy/d	Xdrat4	9.6E-04						=Xgrat*24*fts4/1000	
Internal plus external	mGy/d	tdrat4	2.9E-03						=SUM(ldrat4)+Xdrat4	
Absorbed Doses - Falcon - RSA										
Concentration	Bq/g	Crad5	3.90E-06	1.20E-04	3.99E-04	1.34E-01	1.47E-02			
Internal dose rate	mGy/d	ldrat5	5.5E-07	7.9E-06	6.3E-05	8.1E-04	1.1E-03	2.0E-03	=Crad5*ldcf	
Fraction of time on site	-	fts5	1.00							
External dose rate	mGy/d	Xdrat5	9.6E-04						=Xgrat*24*fts5/1000	
Internal plus external	mGy/d	tdrat5	2.9E-03						=SUM(ldrat5)+Xdrat5	
Absorbed Doses - Fox - LSA										
Concentration	Bq/g	Crad6	1.81E-05	2.80E-05	6.26E-05	1.31E-04	1.16E-03			
Internal dose rate	mGy/d	ldrat6	2.6E-06	1.8E-06	9.9E-06	7.9E-07	8.5E-05	1.0E-04	=Crad6*ldcf	
Fraction of time on site	-	fts6	1.00							
External dose rate	mGy/d	Xdrat6	9.6E-04						=Xgrat*24*fts6/1000	
Internal plus external	mGy/d	tdrat6	1.1E-03						=SUM(ldrat6)+Xdrat6	
Absorbed Doses - Lemming - Rock Lake Watershed										
Concentration	Bq/g	Crad7	1.41E-04	1.26E-03	2.61E-03	4.81E-02	6.66E-03			
Internal dose rate	mGy/d	ldrat7	2.0E-05	8.3E-05	4.2E-04	2.9E-04	4.9E-04	1.3E-03	=Crad7*ldcf	
Fraction of time on site	-	fts7	1.00							
External dose rate	mGy/d	Xdrat7	9.6E-04						=Xgrat*24*fts7/1000	
Internal plus external	mGy/d	tdrat7	2.3E-03						=SUM(ldrat7)+Xdrat7	
Absorbed Doses - Lemming - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad8	1.22E-04	1.24E-03	2.55E-03	4.80E-02	6.55E-03			
Internal dose rate	mGy/d	ldrat8	1.7E-05	8.2E-05	4.1E-04	2.9E-04	4.8E-04	1.3E-03	=Crad8*ldcf	
Fraction of time on site	-	fts8	1.00							
External dose rate	mGy/d	Xdrat8	9.6E-04						=Xgrat*24*fts8/1000	
Internal plus external	mGy/d	tdrat8	2.2E-03						=SUM(ldrat8)+Xdrat8	
Absorbed Doses - Lemming - Kiggavik Camp										
Concentration	Bq/g	Crad9	2.05E-03	3.47E-03	8.82E-03	6.52E-02	1.82E-02			
Internal dose rate	mGy/d	ldrat9	2.9E-04	2.3E-04	1.4E-03	3.9E-04	1.3E-03	3.7E-03	=Crad9*ldcf	
Fraction of time on site	-	fts9	1.00							
External dose rate	mGy/d	Xdrat9	9.6E-04						=Xgrat*24*fts9/1000	
Internal plus external	mGy/d	tdrat9	4.6E-03						=SUM(ldrat9)+Xdrat9	
Absorbed Doses - Lemming - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad10	2.45E-04	1.38E-03	2.95E-03	4.91E-02	7.29E-03			
Internal dose rate	mGy/d	ldrat10	3.5E-05	9.1E-05	4.7E-04	3.0E-04	5.4E-04	1.4E-03	=Crad10*ldcf	
Fraction of time on site	-	fts10	1.00							
External dose rate	mGy/d	Xdrat10	9.6E-04						=Xgrat*24*fts10/1000	
Internal plus external	mGy/d	tdrat10	2.4E-03						=SUM(ldrat10)+Xdrat10	
Absorbed Doses - Lapland Longspur - Rock Lake Watershed										
Concentration	Bq/g	Crad11	1.42E-05	7.56E-04	1.61E-03	3.59E-02	1.29E-02			
Internal dose rate	mGy/d	ldrat11	2.0E-06	5.0E-05	2.6E-04	2.2E-04	9.6E-04	1.5E-03	=Crad11*ldcf	
Fraction of time on site	-	fts11	1.00							
External dose rate	mGy/d	Xdrat11	9.6E-04						=Xgrat*24*fts11/1000	
Internal plus external	mGy/d	tdrat11	2.4E-03						=SUM(ldrat11)+Xdrat11	

Table H.2-3

Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

Absorbed Doses - Lapland Longspur - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad12	1.97E-05	7.55E-04	1.65E-03	3.61E-02	1.34E-02			
Internal dose rate	mGy/d	ldrat12	2.8E-06	5.0E-05	2.6E-04	2.2E-04	9.9E-04	1.5E-03	=Crad12*ldcf	
Fraction of time on site	-	fts12	1.00							
External dose rate	mGy/d	Xdrat12	9.6E-04						=Xgrat*24*fts12/1000	
Internal plus external	mGy/d	tdrat12	2.5E-03						=SUM(ldrat12)+Xdrat12	
Absorbed Doses - Lapland Longspur - Kiggavik Camp										
Concentration	Bq/g	Crad13	4.69E-05	9.46E-04	2.03E-03	3.97E-02	1.41E-02			
Internal dose rate	mGy/d	ldrat13	6.7E-06	6.2E-05	3.2E-04	2.4E-04	1.0E-03	1.7E-03	=Crad13*ldcf	
Fraction of time on site	-	fts13	1.00							
External dose rate	mGy/d	Xdrat13	9.6E-04						=Xgrat*24*fts13/1000	
Internal plus external	mGy/d	tdrat13	2.6E-03						=SUM(ldrat13)+Xdrat13	
Absorbed Doses - Lapland Longspur - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad14	3.23E-05	7.65E-04	1.64E-03	3.62E-02	1.32E-02			
Internal dose rate	mGy/d	ldrat14	4.6E-06	5.0E-05	2.6E-04	2.2E-04	9.8E-04	1.5E-03	=Crad14*ldcf	
Fraction of time on site	-	fts14	1.00							
External dose rate	mGy/d	Xdrat14	9.6E-04						=Xgrat*24*fts14/1000	
Internal plus external	mGy/d	tdrat14	2.5E-03						=SUM(ldrat14)+Xdrat14	
Absorbed Doses - Long-Tailed Duck - Rock Lake										
Concentration	Bq/g	Crad15	1.95E-05	2.01E-04	2.30E-03	1.99E-02	1.55E-02			
Internal dose rate	mGy/d	ldrat15	2.8E-06	1.3E-05	3.6E-04	1.2E-04	1.1E-03	1.6E-03	=Crad15*ldcf	
Fraction of time on site	-	fts15	1.00							
External dose rate	mGy/d	Xdrat15	9.6E-04						=Xgrat*24*fts15/1000	
Internal plus external	mGy/d	tdrat15	2.6E-03						=SUM(ldrat15)+Xdrat15	
Absorbed Doses - Long-Tailed Duck - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad16	3.14E-05	1.96E-04	2.21E-03	1.93E-02	1.52E-02			
Internal dose rate	mGy/d	ldrat16	4.5E-06	1.3E-05	3.5E-04	1.2E-04	1.1E-03	1.6E-03	=Crad16*ldcf	
Fraction of time on site	-	fts16	1.00							
External dose rate	mGy/d	Xdrat16	9.6E-04						=Xgrat*24*fts16/1000	
Internal plus external	mGy/d	tdrat16	2.6E-03						=SUM(ldrat16)+Xdrat16	
Absorbed Doses - Long-Tailed Duck - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad17	4.73E-05	1.97E-04	2.24E-03	1.95E-02	1.52E-02			
Internal dose rate	mGy/d	ldrat17	6.7E-06	1.3E-05	3.6E-04	1.2E-04	1.1E-03	1.6E-03	=Crad17*ldcf	
Fraction of time on site	-	fts17	1.00							
External dose rate	mGy/d	Xdrat17	9.6E-04						=Xgrat*24*fts17/1000	
Internal plus external	mGy/d	tdrat17	2.6E-03						=SUM(ldrat17)+Xdrat17	
Absorbed Doses - Merganser - Rock Lake										
Concentration	Bq/g	Crad18	2.29E-06	8.27E-05	1.25E-04	6.29E-03	2.11E-03			
Internal dose rate	mGy/d	ldrat18	3.3E-07	5.4E-06	2.0E-05	3.8E-05	1.6E-04	2.2E-04	=Crad18*ldcf	
Fraction of time on site	-	fts18	1.00							
External dose rate	mGy/d	Xdrat18	9.6E-04						=Xgrat*24*fts18/1000	
Internal plus external	mGy/d	tdrat18	1.2E-03						=SUM(ldrat18)+Xdrat18	
Absorbed Doses - Merganser - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad19	2.31E-06	8.03E-05	1.18E-04	6.13E-03	2.04E-03			
Internal dose rate	mGy/d	ldrat19	3.3E-07	5.3E-06	1.9E-05	3.7E-05	1.5E-04	2.1E-04	=Crad19*ldcf	
Fraction of time on site	-	fts19	1.00							
External dose rate	mGy/d	Xdrat19	9.6E-04						=Xgrat*24*fts19/1000	
Internal plus external	mGy/d	tdrat19	1.2E-03						=SUM(ldrat19)+Xdrat19	
Absorbed Doses - Merganser - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad20	2.33E-06	8.08E-05	1.20E-04	6.18E-03	2.06E-03			
Internal dose rate	mGy/d	ldrat20	3.3E-07	5.3E-06	1.9E-05	3.7E-05	1.5E-04	2.1E-04	=Crad20*ldcf	
Fraction of time on site	-	fts20	1.00							
External dose rate	mGy/d	Xdrat20	9.6E-04						=Xgrat*24*fts20/1000	
Internal plus external	mGy/d	tdrat20	1.2E-03						=SUM(ldrat20)+Xdrat20	
Absorbed Doses - Muskox - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad21	3.13E-05	5.03E-05	7.12E-05	2.22E-04	6.91E-03			
Internal dose rate	mGy/d	ldrat21	4.4E-06	3.3E-06	1.1E-05	1.3E-06	5.1E-04	5.3E-04	=Crad21*ldcf	
Fraction of time on site	-	fts21	1.00							
External dose rate	mGy/d	Xdrat21	9.6E-04						=Xgrat*24*fts21/1000	
Internal plus external	mGy/d	tdrat21	1.5E-03						=SUM(ldrat21)+Xdrat21	
Absorbed Doses - Muskox - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad22	3.23E-05	7.65E-04	1.64E-03	3.62E-02	1.32E-02			
Internal dose rate	mGy/d	ldrat22	4.6E-06	5.0E-05	2.6E-04	2.2E-04	9.8E-04	1.5E-03	=Crad22*ldcf	
Fraction of time on site	-	fts22	1.00							
External dose rate	mGy/d	Xdrat22	9.6E-04						=Xgrat*24*fts22/1000	
Internal plus external	mGy/d	tdrat22	2.5E-03						=SUM(ldrat22)+Xdrat22	
Absorbed Doses - Northern Pintail - Rock Lake										
Concentration	Bq/g	Crad23	7.17E-06	1.15E-03	6.60E-04	5.23E-02	1.76E-02			
Internal dose rate	mGy/d	ldrat23	1.0E-06	7.5E-05	1.0E-04	3.2E-04	1.3E-03	1.8E-03	=Crad23*ldcf	
Fraction of time on site	-	fts23	1.00							
External dose rate	mGy/d	Xdrat23	9.6E-04						=Xgrat*24*fts23/1000	
Internal plus external	mGy/d	tdrat23	2.8E-03						=SUM(ldrat23)+Xdrat23	

Table H.2-3

Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

Absorbed Doses - Northern Pintail - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad24	1.07E-05	1.11E-03	6.38E-04	5.08E-02	1.71E-02			
Internal dose rate	mGy/d	Idrat24	1.5E-06	7.3E-05	1.0E-04	3.1E-04	1.3E-03	1.7E-03	=Crad24*Idcf	
Fraction of time on site	-	fts24	1.00							
External dose rate	mGy/d	Xdrat24	9.6E-04						=Xgrat*24*fts24/1000	
Internal plus external	mGy/d	tdrat24	2.7E-03						=SUM(Idrat24)+Xdrat24	
Absorbed Doses - Northern Pintail - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad25	1.56E-05	1.12E-03	6.43E-04	5.13E-02	1.72E-02			
Internal dose rate	mGy/d	Idrat25	2.2E-06	7.4E-05	1.0E-04	3.1E-04	1.3E-03	1.8E-03	=Crad25*Idcf	
Fraction of time on site	-	fts25	1.00							
External dose rate	mGy/d	Xdrat25	9.6E-04						=Xgrat*24*fts25/1000	
Internal plus external	mGy/d	tdrat25	2.7E-03						=SUM(Idrat25)+Xdrat25	
Absorbed Doses - Ptarmigan - Rock Lake Watershed										
Concentration	Bq/g	Crad26	1.21E-05	2.28E-04	6.70E-04	1.38E-01	4.74E-02			
Internal dose rate	mGy/d	Idrat26	1.7E-06	1.5E-05	1.1E-04	8.3E-04	3.5E-03	4.5E-03	=Crad26*Idcf	
Fraction of time on site	-	fts26	1.00							
External dose rate	mGy/d	Xdrat26	9.6E-04						=Xgrat*24*fts26/1000	
Internal plus external	mGy/d	tdrat26	5.4E-03						=SUM(Idrat26)+Xdrat26	
Absorbed Doses - Ptarmigan - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad27	1.40E-05	2.28E-04	6.81E-04	1.38E-01	4.76E-02			
Internal dose rate	mGy/d	Idrat27	2.0E-06	1.5E-05	1.1E-04	8.3E-04	3.5E-03	4.5E-03	=Crad27*Idcf	
Fraction of time on site	-	fts27	1.00							
External dose rate	mGy/d	Xdrat27	9.6E-04						=Xgrat*24*fts27/1000	
Internal plus external	mGy/d	tdrat27	5.4E-03						=SUM(Idrat27)+Xdrat27	
Absorbed Doses - Ptarmigan - Kiggavik Camp										
Concentration	Bq/g	Crad28	1.84E-05	2.62E-04	7.35E-04	1.39E-01	4.77E-02			
Internal dose rate	mGy/d	Idrat28	2.6E-06	1.7E-05	1.2E-04	8.4E-04	3.5E-03	4.5E-03	=Crad28*Idcf	
Fraction of time on site	-	fts28	1.00							
External dose rate	mGy/d	Xdrat28	9.6E-04						=Xgrat*24*fts28/1000	
Internal plus external	mGy/d	tdrat28	5.5E-03						=SUM(Idrat28)+Xdrat28	
Absorbed Doses - Ptarmigan - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad29	1.79E-05	2.30E-04	6.75E-04	1.38E-01	4.75E-02			
Internal dose rate	mGy/d	Idrat29	2.5E-06	1.5E-05	1.1E-04	8.3E-04	3.5E-03	4.5E-03	=Crad29*Idcf	
Fraction of time on site	-	fts29	1.00							
External dose rate	mGy/d	Xdrat29	9.6E-04						=Xgrat*24*fts29/1000	
Internal plus external	mGy/d	tdrat29	5.4E-03						=SUM(Idrat29)+Xdrat29	
Absorbed Doses - Sandpiper - Rock Lake										
Concentration	Bq/g	Crad30	4.85E-05	7.57E-04	3.86E-03	5.69E-02	3.46E-02			
Internal dose rate	mGy/d	Idrat30	6.9E-06	5.0E-05	6.1E-04	3.4E-04	2.6E-03	3.6E-03	=Crad30*Idcf	
Fraction of time on site	-	fts30	1.00							
External dose rate	mGy/d	Xdrat30	9.6E-04						=Xgrat*24*fts30/1000	
Internal plus external	mGy/d	tdrat30	4.5E-03						=SUM(Idrat30)+Xdrat30	
Absorbed Doses - Sandpiper - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad31	7.06E-05	7.48E-04	3.74E-03	5.58E-02	3.42E-02			
Internal dose rate	mGy/d	Idrat31	1.0E-05	4.9E-05	5.9E-04	3.4E-04	2.5E-03	3.5E-03	=Crad31*Idcf	
Fraction of time on site	-	fts31	1.00							
External dose rate	mGy/d	Xdrat31	9.6E-04						=Xgrat*24*fts31/1000	
Internal plus external	mGy/d	tdrat31	4.5E-03						=SUM(Idrat31)+Xdrat31	
Absorbed Doses - Sandpiper - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad32	1.07E-04	7.48E-04	3.77E-03	5.60E-02	3.41E-02			
Internal dose rate	mGy/d	Idrat32	1.5E-05	4.9E-05	6.0E-04	3.4E-04	2.5E-03	3.5E-03	=Crad32*Idcf	
Fraction of time on site	-	fts32	1.00							
External dose rate	mGy/d	Xdrat32	9.6E-04						=Xgrat*24*fts32/1000	
Internal plus external	mGy/d	tdrat32	4.5E-03						=SUM(Idrat32)+Xdrat32	
Absorbed Doses - Shrew - Rock Lake Watershed										
Concentration	Bq/g	Crad33	1.01E-04	2.60E-04	1.45E-03	1.17E-02	2.43E-03			
Internal dose rate	mGy/d	Idrat33	1.4E-05	1.7E-05	2.3E-04	7.0E-05	1.8E-04	5.1E-04	=Crad33*Idcf	
Fraction of time on site	-	fts33	1.00							
External dose rate	mGy/d	Xdrat33	9.6E-04						=Xgrat*24*fts33/1000	
Internal plus external	mGy/d	tdrat33	1.5E-03						=SUM(Idrat33)+Xdrat33	
Absorbed Doses - Shrew - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad34	1.12E-04	2.60E-04	1.52E-03	1.17E-02	2.43E-03			
Internal dose rate	mGy/d	Idrat34	1.6E-05	1.7E-05	2.4E-04	7.0E-05	1.8E-04	5.3E-04	=Crad34*Idcf	
Fraction of time on site	-	fts34	1.00							
External dose rate	mGy/d	Xdrat34	9.6E-04						=Xgrat*24*fts34/1000	
Internal plus external	mGy/d	tdrat34	1.5E-03						=SUM(Idrat34)+Xdrat34	
Absorbed Doses - Shrew - Kiggavik Camp										
Concentration	Bq/g	Crad35	1.27E-03	1.48E-03	4.44E-03	2.01E-02	8.75E-03			
Internal dose rate	mGy/d	Idrat35	1.8E-04	9.7E-05	7.1E-04	1.2E-04	6.5E-04	1.8E-03	=Crad35*Idcf	
Fraction of time on site	-	fts35	1.00							
External dose rate	mGy/d	Xdrat35	9.6E-04						=Xgrat*24*fts35/1000	
Internal plus external	mGy/d	tdrat35	2.7E-03						=SUM(Idrat35)+Xdrat35	
Absorbed Doses - Shrew - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad36	2.24E-04	3.32E-04	1.63E-03	1.22E-02	2.80E-03			
Internal dose rate	mGy/d	Idrat36	3.2E-05	2.2E-05	2.6E-04	7.3E-05	2.1E-04	5.9E-04	=Crad36*Idcf	
Fraction of time on site	-	fts36	1.00							

Table H.2-3

Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

External dose rate	mGy/d	Xdrat36	2.7E-04							=Xgrat*24*fts36/3600
Internal plus external	mGy/d	tdrat36	8.6E-04							=SUM(ldrat36)+Xdrat36
Absorbed Doses - Squirrel - Rock Lake Watershed										
Concentration	Bq/g	Crad37	2.87E-05	9.96E-04	1.50E-03	1.97E-02	2.34E-03			
Internal dose rate	mGy/d	ldrat37	4.1E-06	6.6E-05	2.4E-04	1.2E-04	1.7E-04	6.0E-04		=Crad37*ldcf
Fraction of time on site	-	fts37	1.00							
External dose rate	mGy/d	Xdrat37	9.6E-04							=Xgrat*24*fts37/1000
Internal plus external	mGy/d	tdrat37	1.6E-03							=SUM(ldrat37)+Xdrat37
Absorbed Doses - Squirrel - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad38	2.83E-05	9.94E-04	1.49E-03	1.97E-02	2.34E-03			
Internal dose rate	mGy/d	ldrat38	4.0E-06	6.5E-05	2.4E-04	1.2E-04	1.7E-04	6.0E-04		=Crad38*ldcf
Fraction of time on site	-	fts38	1.00							
External dose rate	mGy/d	Xdrat38	9.6E-04							=Xgrat*24*fts38/1000
Internal plus external	mGy/d	tdrat38	1.6E-03							=SUM(ldrat38)+Xdrat38
Absorbed Doses - Squirrel - Kiggavik Camp										
Concentration	Bq/g	Crad39	5.59E-05	1.14E-03	1.73E-03	1.99E-02	2.37E-03			
Internal dose rate	mGy/d	ldrat39	7.9E-06	7.5E-05	2.7E-04	1.2E-04	1.8E-04	6.5E-04		=Crad39*ldcf
Fraction of time on site	-	fts39	1.00							
External dose rate	mGy/d	Xdrat39	9.6E-04							=Xgrat*24*fts39/1000
Internal plus external	mGy/d	tdrat39	1.6E-03							=SUM(ldrat39)+Xdrat39

Table H.2-3
Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

Absorbed Doses - Squirrel - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad40	2.99E-05	1.00E-03	1.51E-03	1.97E-02	2.34E-03			
Internal dose rate	mGy/d	Idrat40	4.2E-06	6.6E-05	2.4E-04	1.2E-04	1.7E-04	6.0E-04	=Crad40*Idcf	
Fraction of time on site	-	fts40	1.00							
External dose rate	mGy/d	Xdrat40	9.6E-04						=Xgrat*24*fts40/1000	
Internal plus external	mGy/d	tdrat40	1.6E-03						=SUM(Idrat40)+Xdrat40	
Absorbed Doses - Wolf - LSA										
Concentration	Bq/g	Crad41	1.29E-05	9.62E-06	6.08E-06	3.68E-06	1.91E-03			
Internal dose rate	mGy/d	Idrat41	1.8E-06	6.3E-07	9.7E-07	2.2E-08	1.4E-04	1.4E-04	=Crad41*Idcf	
Fraction of time on site	-	fts41	1.00							
External dose rate	mGy/d	Xdrat41	9.6E-04						=Xgrat*24*fts41/1000	
Internal plus external	mGy/d	tdrat41	1.1E-03						=SUM(Idrat41)+Xdrat41	
Absorbed Doses - Wolf - RSA										
Concentration	Bq/g	Crad42	1.28E-05	9.62E-06	6.07E-06	3.68E-06	1.91E-03			
Internal dose rate	mGy/d	Idrat42	1.8E-06	6.3E-07	9.6E-07	2.2E-08	1.4E-04	1.4E-04	=Crad42*Idcf	
Fraction of time on site	-	fts42	1.00							
External dose rate	mGy/d	Xdrat42	9.6E-04						=Xgrat*24*fts42/1000	
Internal plus external	mGy/d	tdrat42	1.1E-03						=SUM(Idrat42)+Xdrat42	
Absorbed Doses - Wolverine - LSA										
Concentration	Bq/g	Crad43	2.15E-05	3.52E-05	5.82E-05	1.07E-04	5.04E-04			
Internal dose rate	mGy/d	Idrat43	3.1E-06	2.3E-06	9.3E-06	6.4E-07	3.7E-05	5.3E-05	=Crad43*Idcf	
Fraction of time on site	-	fts43	1.00							
External dose rate	mGy/d	Xdrat43	9.6E-04						=Xgrat*24*fts43/1000	
Internal plus external	mGy/d	tdrat43	1.0E-03						=SUM(Idrat43)+Xdrat43	
Absorbed Doses - Wolverine - RSA										
Concentration	Bq/g	Crad44	1.82E-05	3.43E-05	5.54E-05	1.06E-04	4.89E-04			
Internal dose rate	mGy/d	Idrat44	2.6E-06	2.3E-06	8.8E-06	6.4E-07	3.6E-05	5.0E-05	=Crad44*Idcf	
Fraction of time on site	-	fts44	1.00							
External dose rate	mGy/d	Xdrat44	9.6E-04						=Xgrat*24*fts44/1000	
Internal plus external	mGy/d	tdrat44	1.0E-03						=SUM(Idrat44)+Xdrat44	
Equivalent Doses - Bear - LSA										
RBE for alpha	Sv/Gy	RBE	40							
High LET dose rate	mSv/d	Hletdr	9.8E-05	9.2E-05	1.5E-04	3.2E-07	5.3E-03	5.7E-03	=Idrat*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr	9.6E-04						=Xdrat	
Total dose rate	mSv/d	tdr	6.6E-03						=SUM(Hletdr)+Lletdr	
Equivalent Doses - Caribou - LSA										
High LET dose rate	mSv/d	Hletdr2	4.1E-04	1.2E-04	5.9E-04	5.5E-06	7.1E-02	7.3E-02	=Idrat2*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr2	9.6E-04						=Xdrat2	
Total dose rate	mSv/d	tdr2	7.4E-02						=SUM(Hletdr2)+Lletdr2	
Equivalent Doses - Caribou - RSA										
High LET dose rate	mSv/d	Hletdr3	2.7E-04	1.2E-04	5.7E-04	5.5E-06	7.1E-02	7.2E-02	=Idrat3*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr3	9.6E-04						=Xdrat3	
Total dose rate	mSv/d	tdr3	7.3E-02						=SUM(Hletdr3)+Lletdr3	
Equivalent Doses - Falcon - LSA										
High LET dose rate	mSv/d	Hletdr4	2.3E-05	3.2E-04	2.6E-03	8.1E-04	4.4E-02	4.7E-02	=Idrat4*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr4	9.6E-04						=Xdrat4	
Total dose rate	mSv/d	tdr4	4.8E-02						=SUM(Hletdr4)+Lletdr4	
Equivalent Doses - Falcon - RSA										
High LET dose rate	mSv/d	Hletdr5	2.2E-05	3.2E-04	2.5E-03	8.1E-04	4.3E-02	4.7E-02	=Idrat5*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr5	9.6E-04						=Xdrat5	
Total dose rate	mSv/d	tdr5	4.8E-02						=SUM(Hletdr5)+Lletdr5	
Equivalent Doses - Fox - LSA										
High LET dose rate	mSv/d	Hletdr6	1.0E-04	7.4E-05	4.0E-04	7.9E-07	3.4E-03	4.0E-03	=Idrat6*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr6	9.6E-04						=Xdrat6	
Total dose rate	mSv/d	tdr6	5.0E-03						=SUM(Hletdr6)+Lletdr6	
Equivalent Doses - Lemming - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr7	8.0E-04	3.3E-03	1.7E-02	2.9E-04	2.0E-02	4.1E-02	=Idrat7*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr7	9.6E-04						=Xdrat7	
Total dose rate	mSv/d	tdr7	4.2E-02						=SUM(Hletdr7)+Lletdr7	
Equivalent Doses - Lemming - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr8	6.9E-04	3.3E-03	1.6E-02	2.9E-04	1.9E-02	4.0E-02	=Idrat8*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr8	9.6E-04						=Xdrat8	
Total dose rate	mSv/d	tdr8	4.1E-02						=SUM(Hletdr8)+Lletdr8	
Equivalent Doses - Lemming - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr9	1.2E-02	9.1E-03	5.6E-02	3.9E-04	5.4E-02	1.3E-01	=Idrat9*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr9	9.6E-04						=Xdrat9	
Total dose rate	mSv/d	tdr9	1.3E-01						=SUM(Hletdr9)+Lletdr9	
Equivalent Doses - Lemming - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr10	1.4E-03	3.6E-03	1.9E-02	3.0E-04	2.2E-02	4.6E-02	=Idrat10*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr10	9.6E-04						=Xdrat10	
Total dose rate	mSv/d	tdr10	4.7E-02						=SUM(Hletdr10)+Lletdr10	

Table H.2-3

Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

Equivalent Doses - Lapland Longspur - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr11	8.1E-05	2.0E-03	1.0E-02	2.2E-04	3.8E-02	5.1E-02	=Idrat11*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr11	9.6E-04						=Xdrat11	
Total dose rate	mSv/d	tdr11	5.2E-02						=SUM(Hletdr11)+Lletdr11	
Equivalent Doses - Lapland Longspur - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr12	1.1E-04	2.0E-03	1.0E-02	2.2E-04	4.0E-02	5.2E-02	=Idrat12*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr12	9.6E-04						=Xdrat12	
Total dose rate	mSv/d	tdr12	5.3E-02						=SUM(Hletdr12)+Lletdr12	
Equivalent Doses - Lapland Longspur - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr13	2.7E-04	2.5E-03	1.3E-02	2.4E-04	4.2E-02	5.8E-02	=Idrat13*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr13	9.6E-04						=Xdrat13	
Total dose rate	mSv/d	tdr13	5.9E-02						=SUM(Hletdr13)+Lletdr13	
Equivalent Doses - Lapland Longspur - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr14	1.8E-04	2.0E-03	1.0E-02	2.2E-04	3.9E-02	5.2E-02	=Idrat14*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr14	9.6E-04						=Xdrat14	
Total dose rate	mSv/d	tdr14	5.3E-02						=SUM(Hletdr14)+Lletdr14	
Equivalent Doses - Long-Tailed Duck - Rock Lake										
High LET dose rate	mSv/d	Hletdr15	1.1E-04	5.3E-04	1.5E-02	1.2E-04	4.6E-02	6.1E-02	=Idrat15*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr15	9.6E-04						=Xdrat15	
Total dose rate	mSv/d	tdr15	6.2E-02						=SUM(Hletdr15)+Lletdr15	
Equivalent Doses - Long-Tailed Duck - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr16	1.8E-04	5.2E-04	1.4E-02	1.2E-04	4.5E-02	6.0E-02	=Idrat16*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr16	9.6E-04						=Xdrat16	
Total dose rate	mSv/d	tdr16	6.1E-02						=SUM(Hletdr16)+Lletdr16	
Equivalent Doses - Long-Tailed Duck - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr17	2.7E-04	5.2E-04	1.4E-02	1.2E-04	4.5E-02	6.0E-02	=Idrat17*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr17	9.6E-04						=Xdrat17	
Total dose rate	mSv/d	tdr17	6.1E-02						=SUM(Hletdr17)+Lletdr17	
Equivalent Doses - Merganser - Rock Lake										
High LET dose rate	mSv/d	Hletdr18	1.3E-05	2.2E-04	7.9E-04	3.8E-05	6.3E-03	7.3E-03	=Idrat18*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr18	9.6E-04						=Xdrat18	
Total dose rate	mSv/d	tdr18	8.3E-03						=SUM(Hletdr18)+Lletdr18	
Equivalent Doses - Merganser - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr19	1.3E-05	2.1E-04	7.5E-04	3.7E-05	6.0E-03	7.1E-03	=Idrat19*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr19	9.6E-04						=Xdrat19	
Total dose rate	mSv/d	tdr19	8.0E-03						=SUM(Hletdr19)+Lletdr19	
Equivalent Doses - Merganser - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr20	1.3E-05	2.1E-04	7.6E-04	3.7E-05	6.1E-03	7.1E-03	=Idrat20*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr20	9.6E-04						=Xdrat20	
Total dose rate	mSv/d	tdr20	8.1E-03						=SUM(Hletdr20)+Lletdr20	
Equivalent Doses - Muskox - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr21	1.8E-04	1.3E-04	4.5E-04	1.3E-06	2.0E-02	2.1E-02	=Idrat21*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr21	9.6E-04						=Xdrat21	
Total dose rate	mSv/d	tdr21	2.2E-02						=SUM(Hletdr21)+Lletdr21	
Equivalent Doses - Muskox - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr22	1.8E-04	2.0E-03	1.0E-02	2.2E-04	3.9E-02	5.2E-02	=Idrat22*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr22	9.6E-04						=Xdrat22	
Total dose rate	mSv/d	tdr22	5.3E-02						=SUM(Hletdr22)+Lletdr22	
Equivalent Doses - Northern Pintail - Rock Lake										
High LET dose rate	mSv/d	Hletdr23	4.1E-05	3.0E-03	4.2E-03	3.2E-04	5.2E-02	6.0E-02	=Idrat23*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr23	9.6E-04						=Xdrat23	
Total dose rate	mSv/d	tdr23	6.1E-02						=SUM(Hletdr23)+Lletdr23	
Equivalent Doses - Northern Pintail - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr24	6.1E-05	2.9E-03	4.1E-03	3.1E-04	5.1E-02	5.8E-02	=Idrat24*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr24	9.6E-04						=Xdrat24	
Total dose rate	mSv/d	tdr24	5.9E-02						=SUM(Hletdr24)+Lletdr24	
Equivalent Doses - Northern Pintail - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr25	8.9E-05	3.0E-03	4.1E-03	3.1E-04	5.1E-02	5.8E-02	=Idrat25*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr25	9.6E-04						=Xdrat25	
Total dose rate	mSv/d	tdr25	5.9E-02						=SUM(Hletdr25)+Lletdr25	
Equivalent Doses - Ptarmigan - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr26	6.8E-05	6.0E-04	4.3E-03	8.3E-04	1.4E-01	1.5E-01	=Idrat26*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr26	9.6E-04						=Xdrat26	
Total dose rate	mSv/d	tdr26	1.5E-01						=SUM(Hletdr26)+Lletdr26	
Equivalent Doses - Ptarmigan - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr27	8.0E-05	6.0E-04	4.3E-03	8.3E-04	1.4E-01	1.5E-01	=Idrat27*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr27	9.6E-04						=Xdrat27	
Total dose rate	mSv/d	tdr27	1.5E-01						=SUM(Hletdr27)+Lletdr27	

Table H.2-3

Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

Equivalent Doses - Ptarmigan - Kiggavik Camp											
High LET dose rate	mSv/d	Hletdr28	1.0E-04	6.9E-04	4.7E-03	8.4E-04	1.4E-01	1.5E-01	=Idrat28*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr28	9.6E-04						=Xdrat28		
Total dose rate	mSv/d	tdr28	1.5E-01						=SUM(Hletdr28)+Lletdr28		
Equivalent Doses - Ptarmigan - JSL @ Sissons Discharge											
High LET dose rate	mSv/d	Hletdr29	1.0E-04	6.0E-04	4.3E-03	8.3E-04	1.4E-01	1.5E-01	=Idrat29*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr29	9.6E-04						=Xdrat29		
Total dose rate	mSv/d	tdr29	1.5E-01						=SUM(Hletdr29)+Lletdr29		
Equivalent Doses - Sandpiper - Rock Lake											
High LET dose rate	mSv/d	Hletdr30	2.8E-04	2.0E-03	2.5E-02	3.4E-04	1.0E-01	1.3E-01	=Idrat30*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr30	9.6E-04						=Xdrat30		
Total dose rate	mSv/d	tdr30	1.3E-01						=SUM(Hletdr30)+Lletdr30		
Equivalent Doses - Sandpiper - JSL @ Kiggavik Discharge											
High LET dose rate	mSv/d	Hletdr31	4.0E-04	2.0E-03	2.4E-02	3.4E-04	1.0E-01	1.3E-01	=Idrat31*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr31	9.6E-04						=Xdrat31		
Total dose rate	mSv/d	tdr31	1.3E-01						=SUM(Hletdr31)+Lletdr31		
Equivalent Doses - Sandpiper - JSL @ Sissons Discharge											
High LET dose rate	mSv/d	Hletdr32	6.1E-04	2.0E-03	2.4E-02	3.4E-04	1.0E-01	1.3E-01	=Idrat32*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr32	9.6E-04						=Xdrat32		
Total dose rate	mSv/d	tdr32	1.3E-01						=SUM(Hletdr32)+Lletdr32		
Equivalent Doses - Shrew - Rock Lake Watershed											
High LET dose rate	mSv/d	Hletdr33	5.7E-04	6.8E-04	9.2E-03	7.0E-05	7.2E-03	1.8E-02	=Idrat33*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr33	9.6E-04						=Xdrat33		
Total dose rate	mSv/d	tdr33	1.9E-02						=SUM(Hletdr33)+Lletdr33		
Equivalent Doses - Shrew - JSL @ Kiggavik Discharge											
High LET dose rate	mSv/d	Hletdr34	6.4E-04	6.8E-04	9.7E-03	7.0E-05	7.2E-03	1.8E-02	=Idrat34*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr34	9.6E-04						=Xdrat34		
Total dose rate	mSv/d	tdr34	1.9E-02						=SUM(Hletdr34)+Lletdr34		
Equivalent Doses - Shrew - Kiggavik Camp											
High LET dose rate	mSv/d	Hletdr35	7.2E-03	3.9E-03	2.8E-02	1.2E-04	2.6E-02	6.5E-02	=Idrat35*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr35	9.6E-04						=Xdrat35		
Total dose rate	mSv/d	tdr35	6.6E-02						=SUM(Hletdr35)+Lletdr35		
Equivalent Doses - Shrew - JSL @ Sissons Discharge											
High LET dose rate	mSv/d	Hletdr36	1.3E-03	8.7E-04	1.0E-02	7.3E-05	8.3E-03	2.1E-02	=Idrat36*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr36	2.7E-04						=Xdrat36		
Total dose rate	mSv/d	tdr36	2.1E-02						=SUM(Hletdr36)+Lletdr36		
Equivalent Doses - Squirrel - Rock Lake Watershed											
High LET dose rate	mSv/d	Hletdr37	1.6E-04	2.6E-03	9.5E-03	1.2E-04	6.9E-03	1.9E-02	=Idrat37*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr37	9.6E-04						=Xdrat37		
Total dose rate	mSv/d	tdr37	2.0E-02						=SUM(Hletdr37)+Lletdr37		
Equivalent Doses - Squirrel - JSL @ Kiggavik Discharge											
High LET dose rate	mSv/d	Hletdr38	1.6E-04	2.6E-03	9.5E-03	1.2E-04	6.9E-03	1.9E-02	=Idrat38*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr38	9.6E-04						=Xdrat38		
Total dose rate	mSv/d	tdr38	2.0E-02						=SUM(Hletdr38)+Lletdr38		
Equivalent Doses - Squirrel - Kiggavik Camp											
High LET dose rate	mSv/d	Hletdr39	3.2E-04	3.0E-03	1.1E-02	1.2E-04	7.0E-03	2.1E-02	=Idrat39*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr39	9.6E-04						=Xdrat39		
Total dose rate	mSv/d	tdr39	2.2E-02						=SUM(Hletdr39)+Lletdr39		
Equivalent Doses - Squirrel - JSL @ Sissons Discharge											
High LET dose rate	mSv/d	Hletdr40	1.7E-04	2.6E-03	9.6E-03	1.2E-04	6.9E-03	1.9E-02	=Idrat40*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr40	9.6E-04						=Xdrat40		
Total dose rate	mSv/d	tdr40	2.0E-02						=SUM(Hletdr40)+Lletdr40		
Equivalent Doses - Wolf - LSA											
High LET dose rate	mSv/d	Hletdr41	7.3E-05	2.5E-05	3.9E-05	2.2E-08	5.7E-03	5.8E-03	=Idrat41*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr41	9.6E-04						=Xdrat41		
Total dose rate	mSv/d	tdr41	6.8E-03						=SUM(Hletdr41)+Lletdr41		
Equivalent Doses - Wolf - RSA											
High LET dose rate	mSv/d	Hletdr42	7.2E-05	2.5E-05	3.9E-05	2.2E-08	5.7E-03	5.8E-03	=Idrat42*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr42	9.6E-04						=Xdrat42		
Total dose rate	mSv/d	tdr42	6.8E-03						=SUM(Hletdr42)+Lletdr42		
Equivalent Doses - Wolverine - LSA											
High LET dose rate	mSv/d	Hletdr43	1.2E-04	9.3E-05	3.7E-04	6.4E-07	1.5E-03	2.1E-03	=Idrat43*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr43	9.6E-04						=Xdrat43		
Total dose rate	mSv/d	tdr43	3.0E-03						=SUM(Hletdr43)+Lletdr43		
Equivalent Doses - Wolverine - RSA											
High LET dose rate	mSv/d	Hletdr44	1.0E-04	9.0E-05	3.5E-04	6.4E-07	1.4E-03	2.0E-03	=Idrat44*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr44	9.6E-04						=Xdrat44		
Total dose rate	mSv/d	tdr44	3.0E-03						=SUM(Hletdr44)+Lletdr44		

Table H.2-3
Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

SUMMARY

1 Screening Criterion in mGy/d	Total Absorbed Dose mGy/d	Total Equivalent Dose mSv/d	Index (Absorbed Dose)	Index (Equivalent Dose)
Bear - LSA	1.1E-03	6.6E-03	1.1E-03	6.6E-03
Caribou - LSA	2.8E-03	7.4E-02	2.8E-03	7.4E-02
Caribou - RSA	2.8E-03	7.3E-02	2.8E-03	7.3E-02
Falcon - LSA	2.9E-03	4.8E-02	2.9E-03	4.8E-02
Falcon - RSA	2.9E-03	4.8E-02	2.9E-03	4.8E-02
Fox - LSA	1.1E-03	5.0E-03	1.1E-03	5.0E-03
Lemming - Rock Lake Watershed	2.3E-03	4.2E-02	2.3E-03	4.2E-02
Lemming - JSL @ Kiggavik Discharge	2.2E-03	4.1E-02	2.2E-03	4.1E-02
Lemming - Kiggavik Camp	4.6E-03	1.3E-01	4.6E-03	1.3E-01
Lemming - JSL @ Sissons Discharge	2.4E-03	4.7E-02	2.4E-03	4.7E-02
Lapland Longspur - Rock Lake Watershed	2.4E-03	5.2E-02	2.4E-03	5.2E-02
Lapland Longspur - JSL @ Kiggavik Discharge	2.5E-03	5.3E-02	2.5E-03	5.3E-02
Lapland Longspur - Kiggavik Camp	2.6E-03	5.9E-02	2.6E-03	5.9E-02
Lapland Longspur - JSL @ Sissons Discharge	2.5E-03	5.3E-02	2.5E-03	5.3E-02
Long-Tailed Duck - Rock Lake	2.6E-03	6.2E-02	2.6E-03	6.2E-02
Long-Tailed Duck - JSL @ Kiggavik Discharge	2.6E-03	6.1E-02	2.6E-03	6.1E-02
Long-Tailed Duck - JSL @ Sissons Discharge	2.6E-03	6.1E-02	2.6E-03	6.1E-02
Merganser - Rock Lake	1.2E-03	8.3E-03	1.2E-03	8.3E-03
Merganser - JSL @ Kiggavik Discharge	1.2E-03	8.0E-03	1.2E-03	8.0E-03
Merganser - JSL @ Sissons Discharge	1.2E-03	8.1E-03	1.2E-03	8.1E-03
Muskox - JSL @ Kiggavik Discharge	1.5E-03	2.2E-02	1.5E-03	2.2E-02
Muskox - JSL @ Sissons Discharge	2.5E-03	5.3E-02	2.5E-03	5.3E-02
Northern Pintail - Rock Lake	2.8E-03	6.1E-02	2.8E-03	6.1E-02
Northern Pintail - JSL @ Kiggavik Discharge	2.7E-03	5.9E-02	2.7E-03	5.9E-02
Northern Pintail - JSL @ Sissons Discharge	2.7E-03	5.9E-02	2.7E-03	5.9E-02
Ptarmigan - Rock Lake Watershed	5.4E-03	1.5E-01	5.4E-03	1.5E-01
Ptarmigan - JSL @ Kiggavik Discharge	5.4E-03	1.5E-01	5.4E-03	1.5E-01
Ptarmigan - Kiggavik Camp	5.5E-03	1.5E-01	5.5E-03	1.5E-01
Ptarmigan - JSL @ Sissons Discharge	5.4E-03	1.5E-01	5.4E-03	1.5E-01
Sandpiper - Rock Lake	4.5E-03	1.3E-01	4.5E-03	1.3E-01
Sandpiper - JSL @ Kiggavik Discharge	4.5E-03	1.3E-01	4.5E-03	1.3E-01
Sandpiper - JSL @ Sissons Discharge	4.5E-03	1.3E-01	4.5E-03	1.3E-01
Shrew - Rock Lake Watershed	1.5E-03	1.9E-02	1.5E-03	1.9E-02
Shrew - JSL @ Kiggavik Discharge	1.5E-03	1.9E-02	1.5E-03	1.9E-02
Shrew - Kiggavik Camp	2.7E-03	6.6E-02	2.7E-03	6.6E-02
Shrew - JSL @ Sissons Discharge	8.6E-04	2.1E-02	8.6E-04	2.1E-02
Squirrel - Rock Lake Watershed	1.6E-03	2.0E-02	1.6E-03	2.0E-02
Squirrel - JSL @ Kiggavik Discharge	1.6E-03	2.0E-02	1.6E-03	2.0E-02
Squirrel - Kiggavik Camp	1.6E-03	2.2E-02	1.6E-03	2.2E-02
Squirrel - JSL @ Sissons Discharge	1.6E-03	2.0E-02	1.6E-03	2.0E-02
Wolf - LSA	1.1E-03	6.8E-03	1.1E-03	6.8E-03
Wolf - RSA	1.1E-03	6.8E-03	1.1E-03	6.8E-03
Wolverine - LSA	1.0E-03	3.0E-03	1.0E-03	3.0E-03
Wolverine - RSA	1.0E-03	3.0E-03	1.0E-03	3.0E-03

U-238+ Internal U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235
Ra-226+ Internal Ra-226 + 0.3* (Rn-222 + ...Po-214)
Pb-210+ Internal Pb-210 + Bi-210

Table H.2-3

Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

2023

DOSES TO SELECTED VECs - 95th Percentile Total Dose

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Absorbed Doses - Bear - LSA									
Concentration	Bq/g	Crad	5.86E-05	1.53E-04	7.24E-05	1.74E-04	6.46E-03		
Internal Dose Factor	mGy/d per Bq/g	ldcf	1.4E-01	6.6E-02	1.6E-01	6.0E-03	7.4E-02	5.1E-04	=Crad*ldcf
Internal dose rate	mGy/d	ldrat	8.3E-06	1.0E-05	1.2E-05	1.0E-06	4.8E-04		
External Gamma rate	uGy/h	Xgrat	0.04						
Fraction of time on site	-	fts	1.00						
External dose rate	mGy/d	Xdrat	9.6E-04						=Xgrat*24*fts/1000
Internal plus external	mGy/d	tdrat	1.5E-03						=SUM(ldrat)+Xdrat
Absorbed Doses - Caribou - LSA									
Concentration	Bq/g	Crad2	2.17E-04	1.43E-04	3.21E-04	2.53E-03	7.70E-02		
Internal dose rate	mGy/d	ldrat2	3.1E-05	9.4E-06	5.1E-05	1.5E-05	5.7E-03	5.8E-03	=Crad2*ldcf
Fraction of time on site	-	fts2	1.00						
External dose rate	mGy/d	Xdrat2	9.6E-04						=Xgrat*24*fts2/1000
Internal plus external	mGy/d	tdrat2	6.8E-03						=SUM(ldrat2)+Xdrat2
Absorbed Doses - Caribou - RSA									
Concentration	Bq/g	Crad3	1.43E-04	1.35E-04	3.10E-04	2.53E-03	7.68E-02		
Internal dose rate	mGy/d	ldrat3	2.0E-05	8.9E-06	4.9E-05	1.5E-05	5.7E-03	5.8E-03	=Crad3*ldcf
Fraction of time on site	-	fts3	1.00						
External dose rate	mGy/d	Xdrat3	9.6E-04						=Xgrat*24*fts3/1000
Internal plus external	mGy/d	tdrat3	6.7E-03						=SUM(ldrat3)+Xdrat3
Absorbed Doses - Falcon - LSA									
Concentration	Bq/g	Crad4	1.31E-05	3.60E-04	1.40E-03	4.43E-01	5.03E-02		
Internal dose rate	mGy/d	ldrat4	1.9E-06	2.4E-05	2.2E-04	2.7E-03	3.7E-03	6.6E-03	=Crad4*ldcf
Fraction of time on site	-	fts4	1.00						
External dose rate	mGy/d	Xdrat4	9.6E-04						=Xgrat*24*fts4/1000
Internal plus external	mGy/d	tdrat4	7.6E-03						=SUM(ldrat4)+Xdrat4
Absorbed Doses - Falcon - RSA									
Concentration	Bq/g	Crad5	1.15E-05	3.57E-04	1.39E-03	4.41E-01	5.02E-02		
Internal dose rate	mGy/d	ldrat5	1.6E-06	2.3E-05	2.2E-04	2.7E-03	3.7E-03	6.6E-03	=Crad5*ldcf
Fraction of time on site	-	fts5	1.00						
External dose rate	mGy/d	Xdrat5	9.6E-04						=Xgrat*24*fts5/1000
Internal plus external	mGy/d	tdrat5	7.6E-03						=SUM(ldrat5)+Xdrat5
Absorbed Doses - Fox - LSA									
Concentration	Bq/g	Crad6	6.08E-05	1.01E-04	1.40E-04	5.33E-04	3.76E-03		
Internal dose rate	mGy/d	ldrat6	8.6E-06	6.6E-06	2.2E-05	3.2E-06	2.8E-04	3.2E-04	=Crad6*ldcf
Fraction of time on site	-	fts6	1.00						
External dose rate	mGy/d	Xdrat6	9.6E-04						=Xgrat*24*fts6/1000
Internal plus external	mGy/d	tdrat6	1.3E-03						=SUM(ldrat6)+Xdrat6
Absorbed Doses - Lemming - Rock Lake Watershed									
Concentration	Bq/g	Crad7	4.49E-04	3.99E-03	6.83E-03	1.75E-01	2.37E-02		
Internal dose rate	mGy/d	ldrat7	6.4E-05	2.6E-04	1.1E-03	1.1E-03	1.8E-03	4.2E-03	=Crad7*ldcf
Fraction of time on site	-	fts7	1.00						
External dose rate	mGy/d	Xdrat7	9.6E-04						=Xgrat*24*fts7/1000
Internal plus external	mGy/d	tdrat7	5.2E-03						=SUM(ldrat7)+Xdrat7
Absorbed Doses - Lemming - JSL @ Kiggavik Discharge									
Concentration	Bq/g	Crad8	3.96E-04	3.88E-03	6.70E-03	1.74E-01	2.32E-02		
Internal dose rate	mGy/d	ldrat8	5.6E-05	2.6E-04	1.1E-03	1.0E-03	1.7E-03	4.1E-03	=Crad8*ldcf
Fraction of time on site	-	fts8	1.00						
External dose rate	mGy/d	Xdrat8	9.6E-04						=Xgrat*24*fts8/1000
Internal plus external	mGy/d	tdrat8	5.1E-03						=SUM(ldrat8)+Xdrat8
Absorbed Doses - Lemming - Kiggavik Camp									
Concentration	Bq/g	Crad9	6.85E-03	1.54E-02	3.19E-02	2.79E-01	6.09E-02		
Internal dose rate	mGy/d	ldrat9	9.7E-04	1.0E-03	5.1E-03	1.7E-03	4.5E-03	1.3E-02	=Crad9*ldcf
Fraction of time on site	-	fts9	1.00						
External dose rate	mGy/d	Xdrat9	9.6E-04						=Xgrat*24*fts9/1000
Internal plus external	mGy/d	tdrat9	1.4E-02						=SUM(ldrat9)+Xdrat9
Absorbed Doses - Lemming - JSL @ Sissons Discharge									
Concentration	Bq/g	Crad10	7.64E-04	4.47E-03	7.73E-03	1.80E-01	2.64E-02		
Internal dose rate	mGy/d	ldrat10	1.1E-04	2.9E-04	1.2E-03	1.1E-03	2.0E-03	4.7E-03	=Crad10*ldcf
Fraction of time on site	-	fts10	1.00						
External dose rate	mGy/d	Xdrat10	9.6E-04						=Xgrat*24*fts10/1000
Internal plus external	mGy/d	tdrat10	5.6E-03						=SUM(ldrat10)+Xdrat10
Absorbed Doses - Lapland Longspur - Rock Lake Watershed									
Concentration	Bq/g	Crad11	4.55E-05	3.38E-03	5.35E-03	1.36E-01	3.64E-02		
Internal dose rate	mGy/d	ldrat11	6.5E-06	2.2E-04	8.5E-04	8.2E-04	2.7E-03	4.6E-03	=Crad11*ldcf
Fraction of time on site	-	fts11	1.00						
External dose rate	mGy/d	Xdrat11	9.6E-04						=Xgrat*24*fts11/1000
Internal plus external	mGy/d	tdrat11	5.6E-03						=SUM(ldrat11)+Xdrat11

Table H.2-3

Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

Absorbed Doses - Lapland Longspur - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad12	6.59E-05	3.38E-03	5.51E-03	1.37E-01	3.75E-02			
Internal dose rate	mGy/d	ldrat12	9.4E-06	2.2E-04	8.8E-04	8.3E-04	2.8E-03	4.7E-03	=Crad12*ldcf	
Fraction of time on site	-	fts12	1.00							
External dose rate	mGy/d	Xdrat12	9.6E-04						=Xgrat*24*fts12/1000	
Internal plus external	mGy/d	tdrat12	5.7E-03						=SUM(ldrat12)+Xdrat12	
Absorbed Doses - Lapland Longspur - Kiggavik Camp										
Concentration	Bq/g	Crad13	1.41E-04	3.79E-03	7.11E-03	1.61E-01	3.86E-02			
Internal dose rate	mGy/d	ldrat13	2.0E-05	2.5E-04	1.1E-03	9.7E-04	2.9E-03	5.2E-03	=Crad13*ldcf	
Fraction of time on site	-	fts13	1.00							
External dose rate	mGy/d	Xdrat13	9.6E-04						=Xgrat*24*fts13/1000	
Internal plus external	mGy/d	tdrat13	6.2E-03						=SUM(ldrat13)+Xdrat13	
Absorbed Doses - Lapland Longspur - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad14	1.08E-04	3.39E-03	5.61E-03	1.37E-01	3.66E-02			
Internal dose rate	mGy/d	ldrat14	1.5E-05	2.2E-04	8.9E-04	8.3E-04	2.7E-03	4.7E-03	=Crad14*ldcf	
Fraction of time on site	-	fts14	1.00							
External dose rate	mGy/d	Xdrat14	9.6E-04						=Xgrat*24*fts14/1000	
Internal plus external	mGy/d	tdrat14	5.6E-03						=SUM(ldrat14)+Xdrat14	
Absorbed Doses - Long-Tailed Duck - Rock Lake										
Concentration	Bq/g	Crad15	5.55E-05	6.03E-04	9.25E-03	6.39E-02	5.78E-02			
Internal dose rate	mGy/d	ldrat15	7.9E-06	4.0E-05	1.5E-03	3.9E-04	4.3E-03	6.2E-03	=Crad15*ldcf	
Fraction of time on site	-	fts15	1.00							
External dose rate	mGy/d	Xdrat15	9.6E-04						=Xgrat*24*fts15/1000	
Internal plus external	mGy/d	tdrat15	7.1E-03						=SUM(ldrat15)+Xdrat15	
Absorbed Doses - Long-Tailed Duck - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad16	1.05E-04	5.88E-04	8.96E-03	6.24E-02	5.61E-02			
Internal dose rate	mGy/d	ldrat16	1.5E-05	3.9E-05	1.4E-03	3.8E-04	4.2E-03	6.0E-03	=Crad16*ldcf	
Fraction of time on site	-	fts16	1.00							
External dose rate	mGy/d	Xdrat16	9.6E-04						=Xgrat*24*fts16/1000	
Internal plus external	mGy/d	tdrat16	7.0E-03						=SUM(ldrat16)+Xdrat16	
Absorbed Doses - Long-Tailed Duck - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad17	1.80E-04	5.95E-04	9.11E-03	6.35E-02	5.62E-02			
Internal dose rate	mGy/d	ldrat17	2.6E-05	3.9E-05	1.4E-03	3.8E-04	4.2E-03	6.1E-03	=Crad17*ldcf	
Fraction of time on site	-	fts17	1.00							
External dose rate	mGy/d	Xdrat17	9.6E-04						=Xgrat*24*fts17/1000	
Internal plus external	mGy/d	tdrat17	7.0E-03						=SUM(ldrat17)+Xdrat17	
Absorbed Doses - Merganser - Rock Lake										
Concentration	Bq/g	Crad18	7.69E-06	3.15E-04	3.98E-04	1.98E-02	7.05E-03			
Internal dose rate	mGy/d	ldrat18	1.1E-06	2.1E-05	6.3E-05	1.2E-04	5.2E-04	7.3E-04	=Crad18*ldcf	
Fraction of time on site	-	fts18	1.00							
External dose rate	mGy/d	Xdrat18	9.6E-04						=Xgrat*24*fts18/1000	
Internal plus external	mGy/d	tdrat18	1.7E-03						=SUM(ldrat18)+Xdrat18	
Absorbed Doses - Merganser - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad19	7.79E-06	3.09E-04	3.71E-04	1.98E-02	6.68E-03			
Internal dose rate	mGy/d	ldrat19	1.1E-06	2.0E-05	5.9E-05	1.2E-04	4.9E-04	6.9E-04	=Crad19*ldcf	
Fraction of time on site	-	fts19	1.00							
External dose rate	mGy/d	Xdrat19	9.6E-04						=Xgrat*24*fts19/1000	
Internal plus external	mGy/d	tdrat19	1.7E-03						=SUM(ldrat19)+Xdrat19	
Absorbed Doses - Merganser - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad20	7.95E-06	3.12E-04	3.74E-04	1.98E-02	6.73E-03			
Internal dose rate	mGy/d	ldrat20	1.1E-06	2.1E-05	5.9E-05	1.2E-04	5.0E-04	7.0E-04	=Crad20*ldcf	
Fraction of time on site	-	fts20	1.00							
External dose rate	mGy/d	Xdrat20	9.6E-04						=Xgrat*24*fts20/1000	
Internal plus external	mGy/d	tdrat20	1.7E-03						=SUM(ldrat20)+Xdrat20	
Absorbed Doses - Muskox - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad21	1.18E-04	1.86E-04	2.87E-04	6.76E-04	2.04E-02			
Internal dose rate	mGy/d	ldrat21	1.7E-05	1.2E-05	4.6E-05	4.1E-06	1.5E-03	1.6E-03	=Crad21*ldcf	
Fraction of time on site	-	fts21	1.00							
External dose rate	mGy/d	Xdrat21	9.6E-04						=Xgrat*24*fts21/1000	
Internal plus external	mGy/d	tdrat21	2.6E-03						=SUM(ldrat21)+Xdrat21	
Absorbed Doses - Muskox - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad22	1.08E-04	3.39E-03	5.61E-03	1.37E-01	3.66E-02			
Internal dose rate	mGy/d	ldrat22	1.5E-05	2.2E-04	8.9E-04	8.3E-04	2.7E-03	4.7E-03	=Crad22*ldcf	
Fraction of time on site	-	fts22	1.00							
External dose rate	mGy/d	Xdrat22	9.6E-04						=Xgrat*24*fts22/1000	
Internal plus external	mGy/d	tdrat22	5.6E-03						=SUM(ldrat22)+Xdrat22	
Absorbed Doses - Northern Pintail - Rock Lake										
Concentration	Bq/g	Crad23	2.34E-05	4.59E-03	2.26E-03	1.68E-01	6.11E-02			
Internal dose rate	mGy/d	ldrat23	3.3E-06	3.0E-04	3.6E-04	1.0E-03	4.5E-03	6.2E-03	=Crad23*ldcf	
Fraction of time on site	-	fts23	1.00							
External dose rate	mGy/d	Xdrat23	9.6E-04						=Xgrat*24*fts23/1000	
Internal plus external	mGy/d	tdrat23	7.2E-03						=SUM(ldrat23)+Xdrat23	

Table H.2-3

Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

Absorbed Doses - Northern Pintail - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad24	3.49E-05	4.46E-03	2.18E-03	1.63E-01	5.87E-02			
Internal dose rate	mGy/d	Idrat24	5.0E-06	2.9E-04	3.5E-04	9.8E-04	4.3E-03	6.0E-03	=Crad24*Idcf	
Fraction of time on site	-	fts24	1.00							
External dose rate	mGy/d	Xdrat24	9.6E-04						=Xgrat*24*fts24/1000	
Internal plus external	mGy/d	tdrat24	6.9E-03						=SUM(Idrat24)+Xdrat24	
Absorbed Doses - Northern Pintail - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad25	5.40E-05	4.51E-03	2.22E-03	1.66E-01	5.90E-02			
Internal dose rate	mGy/d	Idrat25	7.7E-06	3.0E-04	3.5E-04	1.0E-03	4.4E-03	6.0E-03	=Crad25*Idcf	
Fraction of time on site	-	fts25	1.00							
External dose rate	mGy/d	Xdrat25	9.6E-04						=Xgrat*24*fts25/1000	
Internal plus external	mGy/d	tdrat25	7.0E-03						=SUM(Idrat25)+Xdrat25	
Absorbed Doses - Ptarmigan - Rock Lake Watershed										
Concentration	Bq/g	Crad26	4.30E-05	9.05E-04	2.19E-03	3.88E-01	1.43E-01			
Internal dose rate	mGy/d	Idrat26	6.1E-06	6.0E-05	3.5E-04	2.3E-03	1.1E-02	1.3E-02	=Crad26*Idcf	
Fraction of time on site	-	fts26	1.00							
External dose rate	mGy/d	Xdrat26	9.6E-04						=Xgrat*24*fts26/1000	
Internal plus external	mGy/d	tdrat26	1.4E-02						=SUM(Idrat26)+Xdrat26	
Absorbed Doses - Ptarmigan - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad27	4.92E-05	9.06E-04	2.22E-03	3.89E-01	1.43E-01			
Internal dose rate	mGy/d	Idrat27	7.0E-06	6.0E-05	3.5E-04	2.3E-03	1.1E-02	1.3E-02	=Crad27*Idcf	
Fraction of time on site	-	fts27	1.00							
External dose rate	mGy/d	Xdrat27	9.6E-04						=Xgrat*24*fts27/1000	
Internal plus external	mGy/d	tdrat27	1.4E-02						=SUM(Idrat27)+Xdrat27	
Absorbed Doses - Ptarmigan - Kiggavik Camp										
Concentration	Bq/g	Crad28	6.42E-05	1.02E-03	2.39E-03	3.90E-01	1.44E-01			
Internal dose rate	mGy/d	Idrat28	9.1E-06	6.7E-05	3.8E-04	2.4E-03	1.1E-02	1.3E-02	=Crad28*Idcf	
Fraction of time on site	-	fts28	1.00							
External dose rate	mGy/d	Xdrat28	9.6E-04						=Xgrat*24*fts28/1000	
Internal plus external	mGy/d	tdrat28	1.4E-02						=SUM(Idrat28)+Xdrat28	
Absorbed Doses - Ptarmigan - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad29	6.35E-05	9.08E-04	2.21E-03	3.89E-01	1.43E-01			
Internal dose rate	mGy/d	Idrat29	9.0E-06	6.0E-05	3.5E-04	2.3E-03	1.1E-02	1.3E-02	=Crad29*Idcf	
Fraction of time on site	-	fts29	1.00							
External dose rate	mGy/d	Xdrat29	9.6E-04						=Xgrat*24*fts29/1000	
Internal plus external	mGy/d	tdrat29	1.4E-02						=SUM(Idrat29)+Xdrat29	
Absorbed Doses - Sandpiper - Rock Lake										
Concentration	Bq/g	Crad30	1.96E-04	2.14E-03	1.53E-02	1.83E-01	1.19E-01			
Internal dose rate	mGy/d	Idrat30	2.8E-05	1.4E-04	2.4E-03	1.1E-03	8.8E-03	1.3E-02	=Crad30*Idcf	
Fraction of time on site	-	fts30	1.00							
External dose rate	mGy/d	Xdrat30	9.6E-04						=Xgrat*24*fts30/1000	
Internal plus external	mGy/d	tdrat30	1.3E-02						=SUM(Idrat30)+Xdrat30	
Absorbed Doses - Sandpiper - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad31	2.92E-04	2.11E-03	1.48E-02	1.79E-01	1.17E-01			
Internal dose rate	mGy/d	Idrat31	4.1E-05	1.4E-04	2.3E-03	1.1E-03	8.6E-03	1.2E-02	=Crad31*Idcf	
Fraction of time on site	-	fts31	1.00							
External dose rate	mGy/d	Xdrat31	9.6E-04						=Xgrat*24*fts31/1000	
Internal plus external	mGy/d	tdrat31	1.3E-02						=SUM(Idrat31)+Xdrat31	
Absorbed Doses - Sandpiper - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad32	4.14E-04	2.11E-03	1.48E-02	1.79E-01	1.19E-01			
Internal dose rate	mGy/d	Idrat32	5.9E-05	1.4E-04	2.4E-03	1.1E-03	8.8E-03	1.2E-02	=Crad32*Idcf	
Fraction of time on site	-	fts32	1.00							
External dose rate	mGy/d	Xdrat32	9.6E-04						=Xgrat*24*fts32/1000	
Internal plus external	mGy/d	tdrat32	1.3E-02						=SUM(Idrat32)+Xdrat32	
Absorbed Doses - Shrew - Rock Lake Watershed										
Concentration	Bq/g	Crad33	3.38E-04	8.11E-04	4.38E-03	3.80E-02	6.81E-03			
Internal dose rate	mGy/d	Idrat33	4.8E-05	5.3E-05	7.0E-04	2.3E-04	5.0E-04	1.5E-03	=Crad33*Idcf	
Fraction of time on site	-	fts33	1.00							
External dose rate	mGy/d	Xdrat33	9.6E-04						=Xgrat*24*fts33/1000	
Internal plus external	mGy/d	tdrat33	2.5E-03						=SUM(Idrat33)+Xdrat33	
Absorbed Doses - Shrew - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad34	3.59E-04	8.26E-04	4.64E-03	3.82E-02	6.87E-03			
Internal dose rate	mGy/d	Idrat34	5.1E-05	5.4E-05	7.4E-04	2.3E-04	5.1E-04	1.6E-03	=Crad34*Idcf	
Fraction of time on site	-	fts34	1.00							
External dose rate	mGy/d	Xdrat34	9.6E-04						=Xgrat*24*fts34/1000	
Internal plus external	mGy/d	tdrat34	2.5E-03						=SUM(Idrat34)+Xdrat34	
Absorbed Doses - Shrew - Kiggavik Camp										
Concentration	Bq/g	Crad35	4.58E-03	5.90E-03	1.78E-02	6.87E-02	2.64E-02			
Internal dose rate	mGy/d	Idrat35	6.5E-04	3.9E-04	2.8E-03	4.1E-04	2.0E-03	6.2E-03	=Crad35*Idcf	
Fraction of time on site	-	fts35	1.00							
External dose rate	mGy/d	Xdrat35	9.6E-04						=Xgrat*24*fts35/1000	
Internal plus external	mGy/d	tdrat35	7.2E-03						=SUM(Idrat35)+Xdrat35	
Absorbed Doses - Shrew - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad36	7.03E-04	1.19E-03	5.13E-03	3.97E-02	8.00E-03			
Internal dose rate	mGy/d	Idrat36	1.0E-04	7.8E-05	8.2E-04	2.4E-04	5.9E-04	1.8E-03	=Crad36*Idcf	
Fraction of time on site	-	fts36	1.00							

Table H.2-3

Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

External dose rate	mGy/d	Xdrat36	2.7E-04							=Xgrat*24*fts36/3600
Internal plus external	mGy/d	tdrat36	2.1E-03							=SUM(ldrat36)+Xdrat36
Absorbed Doses - Squirrel - Rock Lake Watershed										
Concentration	Bq/g	Crad37	9.06E-05	3.42E-03	6.41E-03	8.31E-02	1.01E-02			
Internal dose rate	mGy/d	ldrat37	1.3E-05	2.3E-04	1.0E-03	5.0E-04	7.5E-04	2.5E-03		=Crad37*ldcf
Fraction of time on site	-	fts37	1.00							
External dose rate	mGy/d	Xdrat37	9.6E-04							=Xgrat*24*fts37/1000
Internal plus external	mGy/d	tdrat37	3.5E-03							=SUM(ldrat37)+Xdrat37
Absorbed Doses - Squirrel - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad38	9.03E-05	3.42E-03	6.41E-03	8.31E-02	1.01E-02			
Internal dose rate	mGy/d	ldrat38	1.3E-05	2.3E-04	1.0E-03	5.0E-04	7.5E-04	2.5E-03		=Crad38*ldcf
Fraction of time on site	-	fts38	1.00							
External dose rate	mGy/d	Xdrat38	9.6E-04							=Xgrat*24*fts38/1000
Internal plus external	mGy/d	tdrat38	3.5E-03							=SUM(ldrat38)+Xdrat38
Absorbed Doses - Squirrel - Kiggavik Camp										
Concentration	Bq/g	Crad39	1.71E-04	3.45E-03	6.61E-03	8.33E-02	1.01E-02			
Internal dose rate	mGy/d	ldrat39	2.4E-05	2.3E-04	1.1E-03	5.0E-04	7.5E-04	2.6E-03		=Crad39*ldcf
Fraction of time on site	-	fts39	1.00							
External dose rate	mGy/d	Xdrat39	9.6E-04							=Xgrat*24*fts39/1000
Internal plus external	mGy/d	tdrat39	3.5E-03							=SUM(ldrat39)+Xdrat39

Table H.2-3

Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

Absorbed Doses - Squirrel - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad40	9.27E-05	3.42E-03	6.42E-03	8.31E-02	1.01E-02			
Internal dose rate	mGy/d	Idrat40	1.3E-05	2.3E-04	1.0E-03	5.0E-04	7.5E-04	2.5E-03	=Crad40*Idcf	
Fraction of time on site	-	fts40	1.00							
External dose rate	mGy/d	Xdrat40	9.6E-04						=Xgrat*24*fts40/1000	
Internal plus external	mGy/d	tdrat40	3.5E-03						=SUM(Idrat40)+Xdrat40	
Absorbed Doses - Wolf - LSA										
Concentration	Bq/g	Crad41	4.47E-05	2.94E-05	2.20E-05	1.44E-05	7.66E-03			
Internal dose rate	mGy/d	Idrat41	6.3E-06	1.9E-06	3.5E-06	8.7E-08	5.7E-04	5.8E-04	=Crad41*Idcf	
Fraction of time on site	-	fts41	1.00							
External dose rate	mGy/d	Xdrat41	9.6E-04						=Xgrat*24*fts41/1000	
Internal plus external	mGy/d	tdrat41	1.5E-03						=SUM(Idrat41)+Xdrat41	
Absorbed Doses - Wolf - RSA										
Concentration	Bq/g	Crad42	4.48E-05	2.94E-05	2.20E-05	1.44E-05	7.68E-03			
Internal dose rate	mGy/d	Idrat42	6.4E-06	1.9E-06	3.5E-06	8.7E-08	5.7E-04	5.8E-04	=Crad42*Idcf	
Fraction of time on site	-	fts42	1.00							
External dose rate	mGy/d	Xdrat42	9.6E-04						=Xgrat*24*fts42/1000	
Internal plus external	mGy/d	tdrat42	1.5E-03						=SUM(Idrat42)+Xdrat42	
Absorbed Doses - Wolverine - LSA										
Concentration	Bq/g	Crad43	7.28E-05	1.17E-04	2.17E-04	4.90E-04	1.83E-03			
Internal dose rate	mGy/d	Idrat43	1.0E-05	7.7E-06	3.5E-05	3.0E-06	1.4E-04	1.9E-04	=Crad43*Idcf	
Fraction of time on site	-	fts43	1.00							
External dose rate	mGy/d	Xdrat43	9.6E-04						=Xgrat*24*fts43/1000	
Internal plus external	mGy/d	tdrat43	1.2E-03						=SUM(Idrat43)+Xdrat43	
Absorbed Doses - Wolverine - RSA										
Concentration	Bq/g	Crad44	6.64E-05	1.16E-04	2.15E-04	4.78E-04	1.81E-03			
Internal dose rate	mGy/d	Idrat44	9.4E-06	7.6E-06	3.4E-05	2.9E-06	1.3E-04	1.9E-04	=Crad44*Idcf	
Fraction of time on site	-	fts44	1.00							
External dose rate	mGy/d	Xdrat44	9.6E-04						=Xgrat*24*fts44/1000	
Internal plus external	mGy/d	tdrat44	1.1E-03						=SUM(Idrat44)+Xdrat44	
Equivalent Doses - Bear - LSA										
RBE for alpha	Sv/Gy	RBE	40							
High LET dose rate	mSv/d	Hletdr	3.3E-04	4.0E-04	4.6E-04	1.0E-06	1.9E-02	2.0E-02	=Idrat*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr	9.6E-04						=Xdrat	
Total dose rate	mSv/d	tdr	2.1E-02						=SUM(Hletdr)+Lletdr	
Equivalent Doses - Caribou - LSA										
High LET dose rate	mSv/d	Hletdr2	1.2E-03	3.8E-04	2.0E-03	1.5E-05	2.3E-01	2.3E-01	=Idrat2*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr2	9.6E-04						=Xdrat2	
Total dose rate	mSv/d	tdr2	2.3E-01						=SUM(Hletdr2)+Lletdr2	
Equivalent Doses - Caribou - RSA										
High LET dose rate	mSv/d	Hletdr3	8.1E-04	3.5E-04	2.0E-03	1.5E-05	2.3E-01	2.3E-01	=Idrat3*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr3	9.6E-04						=Xdrat3	
Total dose rate	mSv/d	tdr3	2.3E-01						=SUM(Hletdr3)+Lletdr3	
Equivalent Doses - Falcon - LSA										
High LET dose rate	mSv/d	Hletdr4	7.4E-05	9.5E-04	8.9E-03	2.7E-03	1.5E-01	1.6E-01	=Idrat4*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr4	9.6E-04						=Xdrat4	
Total dose rate	mSv/d	tdr4	1.6E-01						=SUM(Hletdr4)+Lletdr4	
Equivalent Doses - Falcon - RSA										
High LET dose rate	mSv/d	Hletdr5	6.5E-05	9.4E-04	8.8E-03	2.7E-03	1.5E-01	1.6E-01	=Idrat5*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr5	9.6E-04						=Xdrat5	
Total dose rate	mSv/d	tdr5	1.6E-01						=SUM(Hletdr5)+Lletdr5	
Equivalent Doses - Fox - LSA										
High LET dose rate	mSv/d	Hletdr6	3.5E-04	2.7E-04	8.9E-04	3.2E-06	1.1E-02	1.3E-02	=Idrat6*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr6	9.6E-04						=Xdrat6	
Total dose rate	mSv/d	tdr6	1.4E-02						=SUM(Hletdr6)+Lletdr6	
Equivalent Doses - Lemming - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr7	2.6E-03	1.1E-02	4.3E-02	1.1E-03	7.0E-02	1.3E-01	=Idrat7*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr7	9.6E-04						=Xdrat7	
Total dose rate	mSv/d	tdr7	1.3E-01						=SUM(Hletdr7)+Lletdr7	
Equivalent Doses - Lemming - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr8	2.2E-03	1.0E-02	4.3E-02	1.0E-03	6.9E-02	1.2E-01	=Idrat8*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr8	9.6E-04						=Xdrat8	
Total dose rate	mSv/d	tdr8	1.3E-01						=SUM(Hletdr8)+Lletdr8	
Equivalent Doses - Lemming - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr9	3.9E-02	4.1E-02	2.0E-01	1.7E-03	1.8E-01	4.6E-01	=Idrat9*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr9	9.6E-04						=Xdrat9	
Total dose rate	mSv/d	tdr9	4.6E-01						=SUM(Hletdr9)+Lletdr9	
Equivalent Doses - Lemming - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr10	4.3E-03	1.2E-02	4.9E-02	1.1E-03	7.8E-02	1.4E-01	=Idrat10*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr10	9.6E-04						=Xdrat10	
Total dose rate	mSv/d	tdr10	1.5E-01						=SUM(Hletdr10)+Lletdr10	

Table H.2-3

Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

Equivalent Doses - Lapland Longspur - Rock Lake Watershed									
High LET dose rate	mSv/d	Hletdr11	2.6E-04	8.9E-03	3.4E-02	8.2E-04	1.1E-01	1.5E-01	=Idrat11*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr11	9.6E-04						=Xdrat11
Total dose rate	mSv/d	tdr11	1.5E-01						=SUM(Hletdr11)+Lletdr11
Equivalent Doses - Lapland Longspur - JSL @ Kiggavik Discharge									
High LET dose rate	mSv/d	Hletdr12	3.7E-04	8.9E-03	3.5E-02	8.3E-04	1.1E-01	1.6E-01	=Idrat12*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr12	9.6E-04						=Xdrat12
Total dose rate	mSv/d	tdr12	1.6E-01						=SUM(Hletdr12)+Lletdr12
Equivalent Doses - Lapland Longspur - Kiggavik Camp									
High LET dose rate	mSv/d	Hletdr13	8.0E-04	1.0E-02	4.5E-02	9.7E-04	1.1E-01	1.7E-01	=Idrat13*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr13	9.6E-04						=Xdrat13
Total dose rate	mSv/d	tdr13	1.7E-01						=SUM(Hletdr13)+Lletdr13
Equivalent Doses - Lapland Longspur - JSL @ Sissons Discharge									
High LET dose rate	mSv/d	Hletdr14	6.1E-04	8.9E-03	3.6E-02	8.3E-04	1.1E-01	1.5E-01	=Idrat14*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr14	9.6E-04						=Xdrat14
Total dose rate	mSv/d	tdr14	1.6E-01						=SUM(Hletdr14)+Lletdr14
Equivalent Doses - Long-Tailed Duck - Rock Lake									
High LET dose rate	mSv/d	Hletdr15	3.2E-04	1.6E-03	5.9E-02	3.9E-04	1.7E-01	2.3E-01	=Idrat15*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr15	9.6E-04						=Xdrat15
Total dose rate	mSv/d	tdr15	2.3E-01						=SUM(Hletdr15)+Lletdr15
Equivalent Doses - Long-Tailed Duck - JSL @ Kiggavik Discharge									
High LET dose rate	mSv/d	Hletdr16	5.9E-04	1.5E-03	5.7E-02	3.8E-04	1.7E-01	2.3E-01	=Idrat16*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr16	9.6E-04						=Xdrat16
Total dose rate	mSv/d	tdr16	2.3E-01						=SUM(Hletdr16)+Lletdr16
Equivalent Doses - Long-Tailed Duck - JSL @ Sissons Discharge									
High LET dose rate	mSv/d	Hletdr17	1.0E-03	1.6E-03	5.8E-02	3.8E-04	1.7E-01	2.3E-01	=Idrat17*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr17	9.6E-04						=Xdrat17
Total dose rate	mSv/d	tdr17	2.3E-01						=SUM(Hletdr17)+Lletdr17
Equivalent Doses - Merganser - Rock Lake									
High LET dose rate	mSv/d	Hletdr18	4.4E-05	8.3E-04	2.5E-03	1.2E-04	2.1E-02	2.4E-02	=Idrat18*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr18	9.6E-04						=Xdrat18
Total dose rate	mSv/d	tdr18	2.5E-02						=SUM(Hletdr18)+Lletdr18
Equivalent Doses - Merganser - JSL @ Kiggavik Discharge									
High LET dose rate	mSv/d	Hletdr19	4.4E-05	8.1E-04	2.4E-03	1.2E-04	2.0E-02	2.3E-02	=Idrat19*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr19	9.6E-04						=Xdrat19
Total dose rate	mSv/d	tdr19	2.4E-02						=SUM(Hletdr19)+Lletdr19
Equivalent Doses - Merganser - JSL @ Sissons Discharge									
High LET dose rate	mSv/d	Hletdr20	4.5E-05	8.2E-04	2.4E-03	1.2E-04	2.0E-02	2.3E-02	=Idrat20*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr20	9.6E-04						=Xdrat20
Total dose rate	mSv/d	tdr20	2.4E-02						=SUM(Hletdr20)+Lletdr20
Equivalent Doses - Muskox - JSL @ Kiggavik Discharge									
High LET dose rate	mSv/d	Hletdr21	6.7E-04	4.9E-04	1.8E-03	4.1E-06	6.0E-02	6.3E-02	=Idrat21*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr21	9.6E-04						=Xdrat21
Total dose rate	mSv/d	tdr21	6.4E-02						=SUM(Hletdr21)+Lletdr21
Equivalent Doses - Muskox - JSL @ Sissons Discharge									
High LET dose rate	mSv/d	Hletdr22	6.1E-04	8.9E-03	3.6E-02	8.3E-04	1.1E-01	1.5E-01	=Idrat22*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr22	9.6E-04						=Xdrat22
Total dose rate	mSv/d	tdr22	1.6E-01						=SUM(Hletdr22)+Lletdr22
Equivalent Doses - Northern Pintail - Rock Lake									
High LET dose rate	mSv/d	Hletdr23	1.3E-04	1.2E-02	1.4E-02	1.0E-03	1.8E-01	2.1E-01	=Idrat23*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr23	9.6E-04						=Xdrat23
Total dose rate	mSv/d	tdr23	2.1E-01						=SUM(Hletdr23)+Lletdr23
Equivalent Doses - Northern Pintail - JSL @ Kiggavik Discharge									
High LET dose rate	mSv/d	Hletdr24	2.0E-04	1.2E-02	1.4E-02	9.8E-04	1.7E-01	2.0E-01	=Idrat24*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr24	9.6E-04						=Xdrat24
Total dose rate	mSv/d	tdr24	2.0E-01						=SUM(Hletdr24)+Lletdr24
Equivalent Doses - Northern Pintail - JSL @ Sissons Discharge									
High LET dose rate	mSv/d	Hletdr25	3.1E-04	1.2E-02	1.4E-02	1.0E-03	1.7E-01	2.0E-01	=Idrat25*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr25	9.6E-04						=Xdrat25
Total dose rate	mSv/d	tdr25	2.0E-01						=SUM(Hletdr25)+Lletdr25
Equivalent Doses - Ptarmigan - Rock Lake Watershed									
High LET dose rate	mSv/d	Hletdr26	2.4E-04	2.4E-03	1.4E-02	2.3E-03	4.2E-01	4.4E-01	=Idrat26*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr26	9.6E-04						=Xdrat26
Total dose rate	mSv/d	tdr26	4.4E-01						=SUM(Hletdr26)+Lletdr26
Equivalent Doses - Ptarmigan - JSL @ Kiggavik Discharge									
High LET dose rate	mSv/d	Hletdr27	2.8E-04	2.4E-03	1.4E-02	2.3E-03	4.2E-01	4.4E-01	=Idrat27*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr27	9.6E-04						=Xdrat27
Total dose rate	mSv/d	tdr27	4.4E-01						=SUM(Hletdr27)+Lletdr27

Table H.2-3

Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

Equivalent Doses - Ptarmigan - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr28	3.6E-04	2.7E-03	1.5E-02	2.4E-03	4.3E-01	4.5E-01	=Idrat28*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr28	9.6E-04						=Xdrat28	
Total dose rate	mSv/d	tdr28	4.5E-01						=SUM(Hletdr28)+Lletdr28	
Equivalent Doses - Ptarmigan - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr29	3.6E-04	2.4E-03	1.4E-02	2.3E-03	4.2E-01	4.4E-01	=Idrat29*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr29	9.6E-04						=Xdrat29	
Total dose rate	mSv/d	tdr29	4.4E-01						=SUM(Hletdr29)+Lletdr29	
Equivalent Doses - Sandpiper - Rock Lake										
High LET dose rate	mSv/d	Hletdr30	1.1E-03	5.6E-03	9.7E-02	1.1E-03	3.5E-01	4.6E-01	=Idrat30*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr30	9.6E-04						=Xdrat30	
Total dose rate	mSv/d	tdr30	4.6E-01						=SUM(Hletdr30)+Lletdr30	
Equivalent Doses - Sandpiper - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr31	1.7E-03	5.6E-03	9.4E-02	1.1E-03	3.5E-01	4.5E-01	=Idrat31*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr31	9.6E-04						=Xdrat31	
Total dose rate	mSv/d	tdr31	4.5E-01						=SUM(Hletdr31)+Lletdr31	
Equivalent Doses - Sandpiper - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr32	2.4E-03	5.5E-03	9.4E-02	1.1E-03	3.5E-01	4.6E-01	=Idrat32*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr32	9.6E-04						=Xdrat32	
Total dose rate	mSv/d	tdr32	4.6E-01						=SUM(Hletdr32)+Lletdr32	
Equivalent Doses - Shrew - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr33	1.9E-03	2.1E-03	2.8E-02	2.3E-04	2.0E-02	5.2E-02	=Idrat33*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr33	9.6E-04						=Xdrat33	
Total dose rate	mSv/d	tdr33	5.3E-02						=SUM(Hletdr33)+Lletdr33	
Equivalent Doses - Shrew - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr34	2.0E-03	2.2E-03	3.0E-02	2.3E-04	2.0E-02	5.4E-02	=Idrat34*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr34	9.6E-04						=Xdrat34	
Total dose rate	mSv/d	tdr34	5.5E-02						=SUM(Hletdr34)+Lletdr34	
Equivalent Doses - Shrew - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr35	2.6E-02	1.6E-02	1.1E-01	4.1E-04	7.8E-02	2.3E-01	=Idrat35*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr35	9.6E-04						=Xdrat35	
Total dose rate	mSv/d	tdr35	2.3E-01						=SUM(Hletdr35)+Lletdr35	
Equivalent Doses - Shrew - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr36	4.0E-03	3.1E-03	3.3E-02	2.4E-04	2.4E-02	6.4E-02	=Idrat36*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr36	2.7E-04						=Xdrat36	
Total dose rate	mSv/d	tdr36	6.4E-02						=SUM(Hletdr36)+Lletdr36	
Equivalent Doses - Squirrel - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr37	5.1E-04	9.0E-03	4.1E-02	5.0E-04	3.0E-02	8.1E-02	=Idrat37*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr37	9.6E-04						=Xdrat37	
Total dose rate	mSv/d	tdr37	8.2E-02						=SUM(Hletdr37)+Lletdr37	
Equivalent Doses - Squirrel - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr38	5.1E-04	9.0E-03	4.1E-02	5.0E-04	3.0E-02	8.1E-02	=Idrat38*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr38	9.6E-04						=Xdrat38	
Total dose rate	mSv/d	tdr38	8.2E-02						=SUM(Hletdr38)+Lletdr38	
Equivalent Doses - Squirrel - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr39	9.7E-04	9.1E-03	4.2E-02	5.0E-04	3.0E-02	8.3E-02	=Idrat39*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr39	9.6E-04						=Xdrat39	
Total dose rate	mSv/d	tdr39	8.4E-02						=SUM(Hletdr39)+Lletdr39	
Equivalent Doses - Squirrel - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr40	5.3E-04	9.0E-03	4.1E-02	5.0E-04	3.0E-02	8.1E-02	=Idrat40*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr40	9.6E-04						=Xdrat40	
Total dose rate	mSv/d	tdr40	8.2E-02						=SUM(Hletdr40)+Lletdr40	
Equivalent Doses - Wolf - LSA										
High LET dose rate	mSv/d	Hletdr41	2.5E-04	7.7E-05	1.4E-04	8.7E-08	2.3E-02	2.3E-02	=Idrat41*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr41	9.6E-04						=Xdrat41	
Total dose rate	mSv/d	tdr41	2.4E-02						=SUM(Hletdr41)+Lletdr41	
Equivalent Doses - Wolf - RSA										
High LET dose rate	mSv/d	Hletdr42	2.5E-04	7.7E-05	1.4E-04	8.7E-08	2.3E-02	2.3E-02	=Idrat42*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr42	9.6E-04						=Xdrat42	
Total dose rate	mSv/d	tdr42	2.4E-02						=SUM(Hletdr42)+Lletdr42	
Equivalent Doses - Wolverine - LSA										
High LET dose rate	mSv/d	Hletdr43	4.1E-04	3.1E-04	1.4E-03	3.0E-06	5.4E-03	7.5E-03	=Idrat43*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr43	9.6E-04						=Xdrat43	
Total dose rate	mSv/d	tdr43	8.5E-03						=SUM(Hletdr43)+Lletdr43	
Equivalent Doses - Wolverine - RSA										
High LET dose rate	mSv/d	Hletdr44	3.8E-04	3.1E-04	1.4E-03	2.9E-06	5.4E-03	7.4E-03	=Idrat44*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr44	9.6E-04						=Xdrat44	
Total dose rate	mSv/d	tdr44	8.4E-03						=SUM(Hletdr44)+Lletdr44	

Table H.2-3
Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

SUMMARY

1 Screening Criterion in mGy/d	Total Absorbed Dose mGy/d	Total Equivalent Dose mSv/d	Index (Absorbed Dose)	Index (Equivalent Dose)
Bear - LSA	1.5E-03	2.1E-02	1.5E-03	2.1E-02
Caribou - LSA	6.8E-03	2.3E-01	6.8E-03	2.3E-01
Caribou - RSA	6.7E-03	2.3E-01	6.7E-03	2.3E-01
Falcon - LSA	7.6E-03	1.6E-01	7.6E-03	1.6E-01
Falcon - RSA	7.6E-03	1.6E-01	7.6E-03	1.6E-01
Fox - LSA	1.3E-03	1.4E-02	1.3E-03	1.4E-02
Lemming - Rock Lake Watershed	5.2E-03	1.3E-01	5.2E-03	1.3E-01
Lemming - JSL @ Kiggavik Discharge	5.1E-03	1.3E-01	5.1E-03	1.3E-01
Lemming - Kiggavik Camp	1.4E-02	4.6E-01	1.4E-02	4.6E-01
Lemming - JSL @ Sissons Discharge	5.6E-03	1.5E-01	5.6E-03	1.5E-01
Lapland Longspur - Rock Lake Watershed	5.6E-03	1.5E-01	5.6E-03	1.5E-01
Lapland Longspur - JSL @ Kiggavik Discharge	5.7E-03	1.6E-01	5.7E-03	1.6E-01
Lapland Longspur - Kiggavik Camp	6.2E-03	1.7E-01	6.2E-03	1.7E-01
Lapland Longspur - JSL @ Sissons Discharge	5.6E-03	1.6E-01	5.6E-03	1.6E-01
Long-Tailed Duck - Rock Lake	7.1E-03	2.3E-01	7.1E-03	2.3E-01
Long-Tailed Duck - JSL @ Kiggavik Discharge	7.0E-03	2.3E-01	7.0E-03	2.3E-01
Long-Tailed Duck - JSL @ Sissons Discharge	7.0E-03	2.3E-01	7.0E-03	2.3E-01
Merganser - Rock Lake	1.7E-03	2.5E-02	1.7E-03	2.5E-02
Merganser - JSL @ Kiggavik Discharge	1.7E-03	2.4E-02	1.7E-03	2.4E-02
Merganser - JSL @ Sissons Discharge	1.7E-03	2.4E-02	1.7E-03	2.4E-02
Muskox - JSL @ Kiggavik Discharge	2.6E-03	6.4E-02	2.6E-03	6.4E-02
Muskox - JSL @ Sissons Discharge	5.6E-03	1.6E-01	5.6E-03	1.6E-01
Northern Pintail - Rock Lake	7.2E-03	2.1E-01	7.2E-03	2.1E-01
Northern Pintail - JSL @ Kiggavik Discharge	6.9E-03	2.0E-01	6.9E-03	2.0E-01
Northern Pintail - JSL @ Sissons Discharge	7.0E-03	2.0E-01	7.0E-03	2.0E-01
Ptarmigan - Rock Lake Watershed	1.4E-02	4.4E-01	1.4E-02	4.4E-01
Ptarmigan - JSL @ Kiggavik Discharge	1.4E-02	4.4E-01	1.4E-02	4.4E-01
Ptarmigan - Kiggavik Camp	1.4E-02	4.5E-01	1.4E-02	4.5E-01
Ptarmigan - JSL @ Sissons Discharge	1.4E-02	4.4E-01	1.4E-02	4.4E-01
Sandpiper - Rock Lake	1.3E-02	4.6E-01	1.3E-02	4.6E-01
Sandpiper - JSL @ Kiggavik Discharge	1.3E-02	4.5E-01	1.3E-02	4.5E-01
Sandpiper - JSL @ Sissons Discharge	1.3E-02	4.6E-01	1.3E-02	4.6E-01
Shrew - Rock Lake Watershed	2.5E-03	5.3E-02	2.5E-03	5.3E-02
Shrew - JSL @ Kiggavik Discharge	2.5E-03	5.5E-02	2.5E-03	5.5E-02
Shrew - Kiggavik Camp	7.2E-03	2.3E-01	7.2E-03	2.3E-01
Shrew - JSL @ Sissons Discharge	2.1E-03	6.4E-02	2.1E-03	6.4E-02
Squirrel - Rock Lake Watershed	3.5E-03	8.2E-02	3.5E-03	8.2E-02
Squirrel - JSL @ Kiggavik Discharge	3.5E-03	8.2E-02	3.5E-03	8.2E-02
Squirrel - Kiggavik Camp	3.5E-03	8.4E-02	3.5E-03	8.4E-02
Squirrel - JSL @ Sissons Discharge	3.5E-03	8.2E-02	3.5E-03	8.2E-02
Wolf - LSA	1.5E-03	2.4E-02	1.5E-03	2.4E-02
Wolf - RSA	1.5E-03	2.4E-02	1.5E-03	2.4E-02
Wolverine - LSA	1.2E-03	8.5E-03	1.2E-03	8.5E-03
Wolverine - RSA	1.1E-03	8.4E-03	1.1E-03	8.4E-03

U-238+ Internal U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235
Ra-226+ Internal Ra-226 + 0.3* (Rn-222 + ...Po-214)
Pb-210+ Internal Pb-210 + Bi-210

Table H.2-3

Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

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DOSES TO SELECTED VECs - Average Total Dose

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Absorbed Doses - Bear - LSA									
Concentration	Bq/g	Crad	1.27E-05	3.36E-05	2.28E-05	5.31E-05	1.79E-03		
Internal Dose Factor	mGy/d per Bq/g	ldcf	1.4E-01	6.6E-02	1.6E-01	6.0E-03	7.4E-02		
Internal dose rate	mGy/d	ldrat	1.8E-06	2.2E-06	3.6E-06	3.2E-07	1.3E-04	1.4E-04	=Crad*ldcf
External Gamma rate	uGy/h	Xgrat	0.04						
Fraction of time on site	-	fts	1.00						
External dose rate	mGy/d	Xdrat	9.6E-04						=Xgrat*24*fts/1000
Internal plus external	mGy/d	tdrat	1.1E-03						=SUM(ldrat)+Xdrat
Absorbed Doses - Caribou - LSA									
Concentration	Bq/g	Crad2	2.99E-05	4.43E-05	8.68E-05	9.05E-04	2.39E-02		
Internal dose rate	mGy/d	ldrat2	4.3E-06	2.9E-06	1.4E-05	5.5E-06	1.8E-03	1.8E-03	=Crad2*ldcf
Fraction of time on site	-	fts2	1.00						
External dose rate	mGy/d	Xdrat2	9.6E-04						=Xgrat*24*fts2/1000
Internal plus external	mGy/d	tdrat2	2.8E-03						=SUM(ldrat2)+Xdrat2
Absorbed Doses - Caribou - RSA									
Concentration	Bq/g	Crad3	2.99E-05	4.43E-05	8.68E-05	9.05E-04	2.39E-02		
Internal dose rate	mGy/d	ldrat3	4.3E-06	2.9E-06	1.4E-05	5.5E-06	1.8E-03	1.8E-03	=Crad3*ldcf
Fraction of time on site	-	fts3	1.00						
External dose rate	mGy/d	Xdrat3	9.6E-04						=Xgrat*24*fts3/1000
Internal plus external	mGy/d	tdrat3	2.8E-03						=SUM(ldrat3)+Xdrat3
Absorbed Doses - Falcon - LSA									
Concentration	Bq/g	Crad4	3.85E-06	1.20E-04	3.99E-04	1.34E-01	1.47E-02		
Internal dose rate	mGy/d	ldrat4	5.5E-07	7.9E-06	6.3E-05	8.1E-04	1.1E-03	2.0E-03	=Crad4*ldcf
Fraction of time on site	-	fts4	1.00						
External dose rate	mGy/d	Xdrat4	9.6E-04						=Xgrat*24*fts4/1000
Internal plus external	mGy/d	tdrat4	2.9E-03						=SUM(ldrat4)+Xdrat4
Absorbed Doses - Falcon - RSA									
Concentration	Bq/g	Crad5	3.84E-06	1.20E-04	3.98E-04	1.34E-01	1.47E-02		
Internal dose rate	mGy/d	ldrat5	5.5E-07	7.9E-06	6.3E-05	8.1E-04	1.1E-03	2.0E-03	=Crad5*ldcf
Fraction of time on site	-	fts5	1.00						
External dose rate	mGy/d	Xdrat5	9.6E-04						=Xgrat*24*fts5/1000
Internal plus external	mGy/d	tdrat5	2.9E-03						=SUM(ldrat5)+Xdrat5
Absorbed Doses - Fox - LSA									
Concentration	Bq/g	Crad6	8.52E-06	2.48E-05	5.34E-05	1.28E-04	1.09E-03		
Internal dose rate	mGy/d	ldrat6	1.2E-06	1.6E-06	8.5E-06	7.7E-07	8.0E-05	9.2E-05	=Crad6*ldcf
Fraction of time on site	-	fts6	1.00						
External dose rate	mGy/d	Xdrat6	9.6E-04						=Xgrat*24*fts6/1000
Internal plus external	mGy/d	tdrat6	1.1E-03						=SUM(ldrat6)+Xdrat6
Absorbed Doses - Lemming - Rock Lake Watershed									
Concentration	Bq/g	Crad7	3.23E-05	1.14E-03	2.26E-03	4.72E-02	6.01E-03		
Internal dose rate	mGy/d	ldrat7	4.6E-06	7.5E-05	3.6E-04	2.8E-04	4.4E-04	1.2E-03	=Crad7*ldcf
Fraction of time on site	-	fts7	1.00						
External dose rate	mGy/d	Xdrat7	9.6E-04						=Xgrat*24*fts7/1000
Internal plus external	mGy/d	tdrat7	2.1E-03						=SUM(ldrat7)+Xdrat7
Absorbed Doses - Lemming - JSL @ Kiggavik Discharge									
Concentration	Bq/g	Crad8	3.23E-05	1.14E-03	2.26E-03	4.72E-02	6.01E-03		
Internal dose rate	mGy/d	ldrat8	4.6E-06	7.5E-05	3.6E-04	2.8E-04	4.4E-04	1.2E-03	=Crad8*ldcf
Fraction of time on site	-	fts8	1.00						
External dose rate	mGy/d	Xdrat8	9.6E-04						=Xgrat*24*fts8/1000
Internal plus external	mGy/d	tdrat8	2.1E-03						=SUM(ldrat8)+Xdrat8
Absorbed Doses - Lemming - Kiggavik Camp									
Concentration	Bq/g	Crad9	3.45E-05	1.14E-03	2.26E-03	4.73E-02	6.02E-03		
Internal dose rate	mGy/d	ldrat9	4.9E-06	7.5E-05	3.6E-04	2.9E-04	4.5E-04	1.2E-03	=Crad9*ldcf
Fraction of time on site	-	fts9	1.00						
External dose rate	mGy/d	Xdrat9	9.6E-04						=Xgrat*24*fts9/1000
Internal plus external	mGy/d	tdrat9	2.1E-03						=SUM(ldrat9)+Xdrat9
Absorbed Doses - Lemming - JSL @ Sissons Discharge									
Concentration	Bq/g	Crad10	3.24E-05	1.14E-03	2.26E-03	4.72E-02	6.01E-03		
Internal dose rate	mGy/d	ldrat10	4.6E-06	7.5E-05	3.6E-04	2.8E-04	4.4E-04	1.2E-03	=Crad10*ldcf
Fraction of time on site	-	fts10	1.00						
External dose rate	mGy/d	Xdrat10	9.6E-04						=Xgrat*24*fts10/1000
Internal plus external	mGy/d	tdrat10	2.1E-03						=SUM(ldrat10)+Xdrat10
Absorbed Doses - Lapland Longspur - Rock Lake Watershed									
Concentration	Bq/g	Crad11	1.15E-05	7.43E-04	1.58E-03	3.56E-02	1.28E-02		
Internal dose rate	mGy/d	ldrat11	1.6E-06	4.9E-05	2.5E-04	2.1E-04	9.5E-04	1.5E-03	=Crad11*ldcf
Fraction of time on site	-	fts11	1.00						
External dose rate	mGy/d	Xdrat11	9.6E-04						=Xgrat*24*fts11/1000
Internal plus external	mGy/d	tdrat11	2.4E-03						=SUM(ldrat11)+Xdrat11

Table H.2-3
Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

Absorbed Doses - Lapland Longspur - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad12	1.54E-05	7.45E-04	1.62E-03	3.59E-02	1.32E-02			
Internal dose rate	mGy/d	ldrat12	2.2E-06	4.9E-05	2.6E-04	2.2E-04	9.8E-04	1.5E-03	=Crad12*ldcf	
Fraction of time on site	-	fts12	1.00							
External dose rate	mGy/d	Xdrat12	9.6E-04						=Xgrat*24*fts12/1000	
Internal plus external	mGy/d	tdrat12	2.5E-03						=SUM(ldrat12)+Xdrat12	
Absorbed Doses - Lapland Longspur - Kiggavik Camp										
Concentration	Bq/g	Crad13	3.57E-06	7.43E-04	1.55E-03	3.54E-02	1.27E-02			
Internal dose rate	mGy/d	ldrat13	5.1E-07	4.9E-05	2.5E-04	2.1E-04	9.4E-04	1.4E-03	=Crad13*ldcf	
Fraction of time on site	-	fts13	1.00							
External dose rate	mGy/d	Xdrat13	9.6E-04						=Xgrat*24*fts13/1000	
Internal plus external	mGy/d	tdrat13	2.4E-03						=SUM(ldrat13)+Xdrat13	
Absorbed Doses - Lapland Longspur - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad14	1.98E-05	7.44E-04	1.58E-03	3.57E-02	1.29E-02			
Internal dose rate	mGy/d	ldrat14	2.8E-06	4.9E-05	2.5E-04	2.1E-04	9.6E-04	1.5E-03	=Crad14*ldcf	
Fraction of time on site	-	fts14	1.00							
External dose rate	mGy/d	Xdrat14	9.6E-04						=Xgrat*24*fts14/1000	
Internal plus external	mGy/d	tdrat14	2.4E-03						=SUM(ldrat14)+Xdrat14	
Absorbed Doses - Long-Tailed Duck - Rock Lake										
Concentration	Bq/g	Crad15	1.95E-05	2.01E-04	2.30E-03	1.99E-02	1.55E-02			
Internal dose rate	mGy/d	ldrat15	2.8E-06	1.3E-05	3.6E-04	1.2E-04	1.1E-03	1.6E-03	=Crad15*ldcf	
Fraction of time on site	-	fts15	1.00							
External dose rate	mGy/d	Xdrat15	9.6E-04						=Xgrat*24*fts15/1000	
Internal plus external	mGy/d	tdrat15	2.6E-03						=SUM(ldrat15)+Xdrat15	
Absorbed Doses - Long-Tailed Duck - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad16	2.55E-05	1.95E-04	2.21E-03	1.93E-02	1.50E-02			
Internal dose rate	mGy/d	ldrat16	3.6E-06	1.3E-05	3.5E-04	1.2E-04	1.1E-03	1.6E-03	=Crad16*ldcf	
Fraction of time on site	-	fts16	1.00							
External dose rate	mGy/d	Xdrat16	9.6E-04						=Xgrat*24*fts16/1000	
Internal plus external	mGy/d	tdrat16	2.6E-03						=SUM(ldrat16)+Xdrat16	
Absorbed Doses - Long-Tailed Duck - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad17	3.34E-05	1.96E-04	2.22E-03	1.93E-02	1.51E-02			
Internal dose rate	mGy/d	ldrat17	4.7E-06	1.3E-05	3.5E-04	1.2E-04	1.1E-03	1.6E-03	=Crad17*ldcf	
Fraction of time on site	-	fts17	1.00							
External dose rate	mGy/d	Xdrat17	9.6E-04						=Xgrat*24*fts17/1000	
Internal plus external	mGy/d	tdrat17	2.6E-03						=SUM(ldrat17)+Xdrat17	
Absorbed Doses - Merganser - Rock Lake										
Concentration	Bq/g	Crad18	2.29E-06	8.27E-05	1.25E-04	6.29E-03	2.11E-03			
Internal dose rate	mGy/d	ldrat18	3.3E-07	5.4E-06	2.0E-05	3.8E-05	1.6E-04	2.2E-04	=Crad18*ldcf	
Fraction of time on site	-	fts18	1.00							
External dose rate	mGy/d	Xdrat18	9.6E-04						=Xgrat*24*fts18/1000	
Internal plus external	mGy/d	tdrat18	1.2E-03						=SUM(ldrat18)+Xdrat18	
Absorbed Doses - Merganser - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad19	2.31E-06	7.99E-05	1.18E-04	6.10E-03	2.03E-03			
Internal dose rate	mGy/d	ldrat19	3.3E-07	5.3E-06	1.9E-05	3.7E-05	1.5E-04	2.1E-04	=Crad19*ldcf	
Fraction of time on site	-	fts19	1.00							
External dose rate	mGy/d	Xdrat19	9.6E-04						=Xgrat*24*fts19/1000	
Internal plus external	mGy/d	tdrat19	1.2E-03						=SUM(ldrat19)+Xdrat19	
Absorbed Doses - Merganser - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad20	2.32E-06	8.02E-05	1.18E-04	6.12E-03	2.04E-03			
Internal dose rate	mGy/d	ldrat20	3.3E-07	5.3E-06	1.9E-05	3.7E-05	1.5E-04	2.1E-04	=Crad20*ldcf	
Fraction of time on site	-	fts20	1.00							
External dose rate	mGy/d	Xdrat20	9.6E-04						=Xgrat*24*fts20/1000	
Internal plus external	mGy/d	tdrat20	1.2E-03						=SUM(ldrat20)+Xdrat20	
Absorbed Doses - Muskox - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad21	3.12E-05	5.03E-05	7.12E-05	2.23E-04	6.91E-03			
Internal dose rate	mGy/d	ldrat21	4.4E-06	3.3E-06	1.1E-05	1.3E-06	5.1E-04	5.3E-04	=Crad21*ldcf	
Fraction of time on site	-	fts21	1.00							
External dose rate	mGy/d	Xdrat21	9.6E-04						=Xgrat*24*fts21/1000	
Internal plus external	mGy/d	tdrat21	1.5E-03						=SUM(ldrat21)+Xdrat21	
Absorbed Doses - Muskox - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad22	1.98E-05	7.44E-04	1.58E-03	3.57E-02	1.29E-02			
Internal dose rate	mGy/d	ldrat22	2.8E-06	4.9E-05	2.5E-04	2.1E-04	9.6E-04	1.5E-03	=Crad22*ldcf	
Fraction of time on site	-	fts22	1.00							
External dose rate	mGy/d	Xdrat22	9.6E-04						=Xgrat*24*fts22/1000	
Internal plus external	mGy/d	tdrat22	2.4E-03						=SUM(ldrat22)+Xdrat22	
Absorbed Doses - Northern Pintail - Rock Lake										
Concentration	Bq/g	Crad23	7.17E-06	1.15E-03	6.60E-04	5.23E-02	1.76E-02			
Internal dose rate	mGy/d	ldrat23	1.0E-06	7.5E-05	1.0E-04	3.2E-04	1.3E-03	1.8E-03	=Crad23*ldcf	
Fraction of time on site	-	fts23	1.00							
External dose rate	mGy/d	Xdrat23	9.6E-04						=Xgrat*24*fts23/1000	
Internal plus external	mGy/d	tdrat23	2.8E-03						=SUM(ldrat23)+Xdrat23	

Table H.2-3

Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

Absorbed Doses - Northern Pintail - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad24	9.04E-06	1.11E-03	6.37E-04	5.05E-02	1.70E-02			
Internal dose rate	mGy/d	Idrat24	1.3E-06	7.3E-05	1.0E-04	3.0E-04	1.3E-03	1.7E-03	=Crad24*Idcf	
Fraction of time on site	-	fts24	1.00							
External dose rate	mGy/d	Xdrat24	9.6E-04						=Xgrat*24*fts24/1000	
Internal plus external	mGy/d	tdrat24	2.7E-03						=SUM(Idrat24)+Xdrat24	
Absorbed Doses - Northern Pintail - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad25	1.11E-05	1.11E-03	6.41E-04	5.08E-02	1.71E-02			
Internal dose rate	mGy/d	Idrat25	1.6E-06	7.3E-05	1.0E-04	3.1E-04	1.3E-03	1.7E-03	=Crad25*Idcf	
Fraction of time on site	-	fts25	1.00							
External dose rate	mGy/d	Xdrat25	9.6E-04						=Xgrat*24*fts25/1000	
Internal plus external	mGy/d	tdrat25	2.7E-03						=SUM(Idrat25)+Xdrat25	
Absorbed Doses - Ptarmigan - Rock Lake Watershed										
Concentration	Bq/g	Crad26	1.15E-05	2.25E-04	6.65E-04	1.38E-01	4.75E-02			
Internal dose rate	mGy/d	Idrat26	1.6E-06	1.5E-05	1.1E-04	8.3E-04	3.5E-03	4.5E-03	=Crad26*Idcf	
Fraction of time on site	-	fts26	1.00							
External dose rate	mGy/d	Xdrat26	9.6E-04						=Xgrat*24*fts26/1000	
Internal plus external	mGy/d	tdrat26	5.4E-03						=SUM(Idrat26)+Xdrat26	
Absorbed Doses - Ptarmigan - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad27	1.29E-05	2.26E-04	6.77E-04	1.38E-01	4.76E-02			
Internal dose rate	mGy/d	Idrat27	1.8E-06	1.5E-05	1.1E-04	8.3E-04	3.5E-03	4.5E-03	=Crad27*Idcf	
Fraction of time on site	-	fts27	1.00							
External dose rate	mGy/d	Xdrat27	9.6E-04						=Xgrat*24*fts27/1000	
Internal plus external	mGy/d	tdrat27	5.4E-03						=SUM(Idrat27)+Xdrat27	
Absorbed Doses - Ptarmigan - Kiggavik Camp										
Concentration	Bq/g	Crad28	9.50E-06	2.26E-04	6.55E-04	1.38E-01	4.75E-02			
Internal dose rate	mGy/d	Idrat28	1.3E-06	1.5E-05	1.0E-04	8.3E-04	3.5E-03	4.5E-03	=Crad28*Idcf	
Fraction of time on site	-	fts28	1.00							
External dose rate	mGy/d	Xdrat28	9.6E-04						=Xgrat*24*fts28/1000	
Internal plus external	mGy/d	tdrat28	5.4E-03						=SUM(Idrat28)+Xdrat28	
Absorbed Doses - Ptarmigan - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad29	1.44E-05	2.26E-04	6.65E-04	1.38E-01	4.75E-02			
Internal dose rate	mGy/d	Idrat29	2.0E-06	1.5E-05	1.1E-04	8.3E-04	3.5E-03	4.5E-03	=Crad29*Idcf	
Fraction of time on site	-	fts29	1.00							
External dose rate	mGy/d	Xdrat29	9.6E-04						=Xgrat*24*fts29/1000	
Internal plus external	mGy/d	tdrat29	5.4E-03						=SUM(Idrat29)+Xdrat29	
Absorbed Doses - Sandpiper - Rock Lake										
Concentration	Bq/g	Crad30	4.85E-05	7.57E-04	3.86E-03	5.69E-02	3.46E-02			
Internal dose rate	mGy/d	Idrat30	6.9E-06	5.0E-05	6.1E-04	3.4E-04	2.6E-03	3.6E-03	=Crad30*Idcf	
Fraction of time on site	-	fts30	1.00							
External dose rate	mGy/d	Xdrat30	9.6E-04						=Xgrat*24*fts30/1000	
Internal plus external	mGy/d	tdrat30	4.5E-03						=SUM(Idrat30)+Xdrat30	
Absorbed Doses - Sandpiper - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad31	6.12E-05	7.46E-04	3.73E-03	5.57E-02	3.36E-02			
Internal dose rate	mGy/d	Idrat31	8.7E-06	4.9E-05	5.9E-04	3.4E-04	2.5E-03	3.5E-03	=Crad31*Idcf	
Fraction of time on site	-	fts31	1.00							
External dose rate	mGy/d	Xdrat31	9.6E-04						=Xgrat*24*fts31/1000	
Internal plus external	mGy/d	tdrat31	4.4E-03						=SUM(Idrat31)+Xdrat31	
Absorbed Doses - Sandpiper - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad32	7.38E-05	7.46E-04	3.74E-03	5.57E-02	3.38E-02			
Internal dose rate	mGy/d	Idrat32	1.0E-05	4.9E-05	6.0E-04	3.4E-04	2.5E-03	3.5E-03	=Crad32*Idcf	
Fraction of time on site	-	fts32	1.00							
External dose rate	mGy/d	Xdrat32	9.6E-04						=Xgrat*24*fts32/1000	
Internal plus external	mGy/d	tdrat32	4.5E-03						=SUM(Idrat32)+Xdrat32	
Absorbed Doses - Shrew - Rock Lake Watershed										
Concentration	Bq/g	Crad33	3.27E-05	1.90E-04	1.27E-03	1.12E-02	2.07E-03			
Internal dose rate	mGy/d	Idrat33	4.6E-06	1.3E-05	2.0E-04	6.8E-05	1.5E-04	4.4E-04	=Crad33*Idcf	
Fraction of time on site	-	fts33	1.00							
External dose rate	mGy/d	Xdrat33	9.6E-04						=Xgrat*24*fts33/1000	
Internal plus external	mGy/d	tdrat33	1.4E-03						=SUM(Idrat33)+Xdrat33	
Absorbed Doses - Shrew - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad34	4.66E-05	2.01E-04	1.38E-03	1.13E-02	2.12E-03			
Internal dose rate	mGy/d	Idrat34	6.6E-06	1.3E-05	2.2E-04	6.8E-05	1.6E-04	4.6E-04	=Crad34*Idcf	
Fraction of time on site	-	fts34	1.00							
External dose rate	mGy/d	Xdrat34	9.6E-04						=Xgrat*24*fts34/1000	
Internal plus external	mGy/d	tdrat34	1.4E-03						=SUM(Idrat34)+Xdrat34	
Absorbed Doses - Shrew - Kiggavik Camp										
Concentration	Bq/g	Crad35	3.16E-06	1.85E-04	1.18E-03	1.11E-02	2.05E-03			
Internal dose rate	mGy/d	Idrat35	4.5E-07	1.2E-05	1.9E-04	6.7E-05	1.5E-04	4.2E-04	=Crad35*Idcf	
Fraction of time on site	-	fts35	1.00							
External dose rate	mGy/d	Xdrat35	9.6E-04						=Xgrat*24*fts35/1000	
Internal plus external	mGy/d	tdrat35	1.4E-03						=SUM(Idrat35)+Xdrat35	
Absorbed Doses - Shrew - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad36	6.26E-05	1.93E-04	1.27E-03	1.12E-02	2.09E-03			
Internal dose rate	mGy/d	Idrat36	8.9E-06	1.3E-05	2.0E-04	6.8E-05	1.5E-04	4.5E-04	=Crad36*Idcf	
Fraction of time on site	-	fts36	1.00							

Table H.2-3

Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

External dose rate	mGy/d	Xdrat36	2.7E-04							=Xgrat*24*fts36/3600
Internal plus external	mGy/d	tdrat36	7.1E-04							=SUM(ldrat36)+Xdrat36
Absorbed Doses - Squirrel - Rock Lake Watershed										
Concentration	Bq/g	Crad37	2.71E-05	9.87E-04	1.48E-03	1.97E-02	2.34E-03			
Internal dose rate	mGy/d	ldrat37	3.8E-06	6.5E-05	2.4E-04	1.2E-04	1.7E-04	6.0E-04		=Crad37*ldcf
Fraction of time on site	-	fts37	1.00							
External dose rate	mGy/d	Xdrat37	9.6E-04							=Xgrat*24*fts37/1000
Internal plus external	mGy/d	tdrat37	1.6E-03							=SUM(ldrat37)+Xdrat37
Absorbed Doses - Squirrel - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad38	2.70E-05	9.87E-04	1.48E-03	1.97E-02	2.34E-03			
Internal dose rate	mGy/d	ldrat38	3.8E-06	6.5E-05	2.4E-04	1.2E-04	1.7E-04	6.0E-04		=Crad38*ldcf
Fraction of time on site	-	fts38	1.00							
External dose rate	mGy/d	Xdrat38	9.6E-04							=Xgrat*24*fts38/1000
Internal plus external	mGy/d	tdrat38	1.6E-03							=SUM(ldrat38)+Xdrat38
Absorbed Doses - Squirrel - Kiggavik Camp										
Concentration	Bq/g	Crad39	2.88E-05	9.92E-04	1.48E-03	1.97E-02	2.34E-03			
Internal dose rate	mGy/d	ldrat39	4.1E-06	6.5E-05	2.4E-04	1.2E-04	1.7E-04	6.0E-04		=Crad39*ldcf
Fraction of time on site	-	fts39	1.00							
External dose rate	mGy/d	Xdrat39	9.6E-04							=Xgrat*24*fts39/1000
Internal plus external	mGy/d	tdrat39	1.6E-03							=SUM(ldrat39)+Xdrat39

Table H.2-3

Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

Absorbed Doses - Squirrel - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad40	2.71E-05	9.87E-04	1.48E-03	1.97E-02	2.34E-03			
Internal dose rate	mGy/d	Idrat40	3.9E-06	6.5E-05	2.4E-04	1.2E-04	1.7E-04	6.0E-04	=Crad40*Idcf	
Fraction of time on site	-	fts40	1.00							
External dose rate	mGy/d	Xdrat40	9.6E-04						=Xgrat*24*fts40/1000	
Internal plus external	mGy/d	tdrat40	1.6E-03						=SUM(Idrat40)+Xdrat40	
Absorbed Doses - Wolf - LSA										
Concentration	Bq/g	Crad41	1.16E-05	9.61E-06	6.02E-06	3.68E-06	1.90E-03			
Internal dose rate	mGy/d	Idrat41	1.6E-06	6.3E-07	9.6E-07	2.2E-08	1.4E-04	1.4E-04	=Crad41*Idcf	
Fraction of time on site	-	fts41	1.00							
External dose rate	mGy/d	Xdrat41	9.6E-04						=Xgrat*24*fts41/1000	
Internal plus external	mGy/d	tdrat41	1.1E-03						=SUM(Idrat41)+Xdrat41	
Absorbed Doses - Wolf - RSA										
Concentration	Bq/g	Crad42	1.17E-05	9.60E-06	6.02E-06	3.68E-06	1.90E-03			
Internal dose rate	mGy/d	Idrat42	1.7E-06	6.3E-07	9.6E-07	2.2E-08	1.4E-04	1.4E-04	=Crad42*Idcf	
Fraction of time on site	-	fts42	1.00							
External dose rate	mGy/d	Xdrat42	9.6E-04						=Xgrat*24*fts42/1000	
Internal plus external	mGy/d	tdrat42	1.1E-03						=SUM(Idrat42)+Xdrat42	
Absorbed Doses - Wolverine - LSA										
Concentration	Bq/g	Crad43	1.57E-05	3.36E-05	5.34E-05	1.05E-04	4.77E-04			
Internal dose rate	mGy/d	Idrat43	2.2E-06	2.2E-06	8.5E-06	6.3E-07	3.5E-05	4.9E-05	=Crad43*Idcf	
Fraction of time on site	-	fts43	1.00							
External dose rate	mGy/d	Xdrat43	9.6E-04						=Xgrat*24*fts43/1000	
Internal plus external	mGy/d	tdrat43	1.0E-03						=SUM(Idrat43)+Xdrat43	
Absorbed Doses - Wolverine - RSA										
Concentration	Bq/g	Crad44	1.57E-05	3.37E-05	5.34E-05	1.05E-04	4.77E-04			
Internal dose rate	mGy/d	Idrat44	2.2E-06	2.2E-06	8.5E-06	6.3E-07	3.5E-05	4.9E-05	=Crad44*Idcf	
Fraction of time on site	-	fts44	1.00							
External dose rate	mGy/d	Xdrat44	9.6E-04						=Xgrat*24*fts44/1000	
Internal plus external	mGy/d	tdrat44	1.0E-03						=SUM(Idrat44)+Xdrat44	
Equivalent Doses - Bear - LSA										
RBE for alpha	Sv/Gy	RBE	40							
High LET dose rate	mSv/d	Hletdr	7.2E-05	8.8E-05	1.4E-04	3.2E-07	5.3E-03	5.6E-03	=Idrat*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr	9.6E-04						=Xdrat	
Total dose rate	mSv/d	tdr	6.6E-03						=SUM(Hletdr)+Lletdr	
Equivalent Doses - Caribou - LSA										
High LET dose rate	mSv/d	Hletdr2	1.7E-04	1.2E-04	5.5E-04	5.5E-06	7.1E-02	7.2E-02	=Idrat2*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr2	9.6E-04						=Xdrat2	
Total dose rate	mSv/d	tdr2	7.3E-02						=SUM(Hletdr2)+Lletdr2	
Equivalent Doses - Caribou - RSA										
High LET dose rate	mSv/d	Hletdr3	1.7E-04	1.2E-04	5.5E-04	5.5E-06	7.1E-02	7.2E-02	=Idrat3*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr3	9.6E-04						=Xdrat3	
Total dose rate	mSv/d	tdr3	7.3E-02						=SUM(Hletdr3)+Lletdr3	
Equivalent Doses - Falcon - LSA										
High LET dose rate	mSv/d	Hletdr4	2.2E-05	3.2E-04	2.5E-03	8.1E-04	4.3E-02	4.7E-02	=Idrat4*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr4	9.6E-04						=Xdrat4	
Total dose rate	mSv/d	tdr4	4.8E-02						=SUM(Hletdr4)+Lletdr4	
Equivalent Doses - Falcon - RSA										
High LET dose rate	mSv/d	Hletdr5	2.2E-05	3.2E-04	2.5E-03	8.1E-04	4.3E-02	4.7E-02	=Idrat5*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr5	9.6E-04						=Xdrat5	
Total dose rate	mSv/d	tdr5	4.8E-02						=SUM(Hletdr5)+Lletdr5	
Equivalent Doses - Fox - LSA										
High LET dose rate	mSv/d	Hletdr6	4.8E-05	6.5E-05	3.4E-04	7.7E-07	3.2E-03	3.7E-03	=Idrat6*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr6	9.6E-04						=Xdrat6	
Total dose rate	mSv/d	tdr6	4.6E-03						=SUM(Hletdr6)+Lletdr6	
Equivalent Doses - Lemming - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr7	1.8E-04	3.0E-03	1.4E-02	2.8E-04	1.8E-02	3.6E-02	=Idrat7*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr7	9.6E-04						=Xdrat7	
Total dose rate	mSv/d	tdr7	3.7E-02						=SUM(Hletdr7)+Lletdr7	
Equivalent Doses - Lemming - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr8	1.8E-04	3.0E-03	1.4E-02	2.8E-04	1.8E-02	3.6E-02	=Idrat8*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr8	9.6E-04						=Xdrat8	
Total dose rate	mSv/d	tdr8	3.7E-02						=SUM(Hletdr8)+Lletdr8	
Equivalent Doses - Lemming - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr9	2.0E-04	3.0E-03	1.4E-02	2.9E-04	1.8E-02	3.6E-02	=Idrat9*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr9	9.6E-04						=Xdrat9	
Total dose rate	mSv/d	tdr9	3.7E-02						=SUM(Hletdr9)+Lletdr9	
Equivalent Doses - Lemming - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr10	1.8E-04	3.0E-03	1.4E-02	2.8E-04	1.8E-02	3.6E-02	=Idrat10*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr10	9.6E-04						=Xdrat10	
Total dose rate	mSv/d	tdr10	3.7E-02						=SUM(Hletdr10)+Lletdr10	

Table H.2-3

Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

Equivalent Doses - Lapland Longspur - Rock Lake Watershed									
High LET dose rate	mSv/d	Hletdr11	6.5E-05	2.0E-03	1.0E-02	2.1E-04	3.8E-02	5.0E-02	=Idrat11*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr11	9.6E-04						=Xdrat11
Total dose rate	mSv/d	tdr11	5.1E-02						=SUM(Hletdr11)+Lletdr11
Equivalent Doses - Lapland Longspur - JSL @ Kiggavik Discharge									
High LET dose rate	mSv/d	Hletdr12	8.7E-05	2.0E-03	1.0E-02	2.2E-04	3.9E-02	5.2E-02	=Idrat12*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr12	9.6E-04						=Xdrat12
Total dose rate	mSv/d	tdr12	5.3E-02						=SUM(Hletdr12)+Lletdr12
Equivalent Doses - Lapland Longspur - Kiggavik Camp									
High LET dose rate	mSv/d	Hletdr13	2.0E-05	2.0E-03	9.8E-03	2.1E-04	3.7E-02	4.9E-02	=Idrat13*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr13	9.6E-04						=Xdrat13
Total dose rate	mSv/d	tdr13	5.0E-02						=SUM(Hletdr13)+Lletdr13
Equivalent Doses - Lapland Longspur - JSL @ Sissons Discharge									
High LET dose rate	mSv/d	Hletdr14	1.1E-04	2.0E-03	1.0E-02	2.1E-04	3.8E-02	5.1E-02	=Idrat14*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr14	9.6E-04						=Xdrat14
Total dose rate	mSv/d	tdr14	5.2E-02						=SUM(Hletdr14)+Lletdr14
Equivalent Doses - Long-Tailed Duck - Rock Lake									
High LET dose rate	mSv/d	Hletdr15	1.1E-04	5.3E-04	1.5E-02	1.2E-04	4.6E-02	6.1E-02	=Idrat15*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr15	9.6E-04						=Xdrat15
Total dose rate	mSv/d	tdr15	6.2E-02						=SUM(Hletdr15)+Lletdr15
Equivalent Doses - Long-Tailed Duck - JSL @ Kiggavik Discharge									
High LET dose rate	mSv/d	Hletdr16	1.5E-04	5.1E-04	1.4E-02	1.2E-04	4.4E-02	5.9E-02	=Idrat16*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr16	9.6E-04						=Xdrat16
Total dose rate	mSv/d	tdr16	6.0E-02						=SUM(Hletdr16)+Lletdr16
Equivalent Doses - Long-Tailed Duck - JSL @ Sissons Discharge									
High LET dose rate	mSv/d	Hletdr17	1.9E-04	5.2E-04	1.4E-02	1.2E-04	4.5E-02	6.0E-02	=Idrat17*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr17	9.6E-04						=Xdrat17
Total dose rate	mSv/d	tdr17	6.1E-02						=SUM(Hletdr17)+Lletdr17
Equivalent Doses - Merganser - Rock Lake									
High LET dose rate	mSv/d	Hletdr18	1.3E-05	2.2E-04	7.9E-04	3.8E-05	6.3E-03	7.3E-03	=Idrat18*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr18	9.6E-04						=Xdrat18
Total dose rate	mSv/d	tdr18	8.3E-03						=SUM(Hletdr18)+Lletdr18
Equivalent Doses - Merganser - JSL @ Kiggavik Discharge									
High LET dose rate	mSv/d	Hletdr19	1.3E-05	2.1E-04	7.5E-04	3.7E-05	6.0E-03	7.0E-03	=Idrat19*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr19	9.6E-04						=Xdrat19
Total dose rate	mSv/d	tdr19	8.0E-03						=SUM(Hletdr19)+Lletdr19
Equivalent Doses - Merganser - JSL @ Sissons Discharge									
High LET dose rate	mSv/d	Hletdr20	1.3E-05	2.1E-04	7.5E-04	3.7E-05	6.0E-03	7.1E-03	=Idrat20*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr20	9.6E-04						=Xdrat20
Total dose rate	mSv/d	tdr20	8.0E-03						=SUM(Hletdr20)+Lletdr20
Equivalent Doses - Muskox - JSL @ Kiggavik Discharge									
High LET dose rate	mSv/d	Hletdr21	1.8E-04	1.3E-04	4.5E-04	1.3E-06	2.0E-02	2.1E-02	=Idrat21*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr21	9.6E-04						=Xdrat21
Total dose rate	mSv/d	tdr21	2.2E-02						=SUM(Hletdr21)+Lletdr21
Equivalent Doses - Muskox - JSL @ Sissons Discharge									
High LET dose rate	mSv/d	Hletdr22	1.1E-04	2.0E-03	1.0E-02	2.1E-04	3.8E-02	5.1E-02	=Idrat22*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr22	9.6E-04						=Xdrat22
Total dose rate	mSv/d	tdr22	5.2E-02						=SUM(Hletdr22)+Lletdr22
Equivalent Doses - Northern Pintail - Rock Lake									
High LET dose rate	mSv/d	Hletdr23	4.1E-05	3.0E-03	4.2E-03	3.2E-04	5.2E-02	6.0E-02	=Idrat23*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr23	9.6E-04						=Xdrat23
Total dose rate	mSv/d	tdr23	6.1E-02						=SUM(Hletdr23)+Lletdr23
Equivalent Doses - Northern Pintail - JSL @ Kiggavik Discharge									
High LET dose rate	mSv/d	Hletdr24	5.1E-05	2.9E-03	4.1E-03	3.0E-04	5.0E-02	5.8E-02	=Idrat24*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr24	9.6E-04						=Xdrat24
Total dose rate	mSv/d	tdr24	5.9E-02						=SUM(Hletdr24)+Lletdr24
Equivalent Doses - Northern Pintail - JSL @ Sissons Discharge									
High LET dose rate	mSv/d	Hletdr25	6.3E-05	2.9E-03	4.1E-03	3.1E-04	5.1E-02	5.8E-02	=Idrat25*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr25	9.6E-04						=Xdrat25
Total dose rate	mSv/d	tdr25	5.9E-02						=SUM(Hletdr25)+Lletdr25
Equivalent Doses - Ptarmigan - Rock Lake Watershed									
High LET dose rate	mSv/d	Hletdr26	6.5E-05	5.9E-04	4.2E-03	8.3E-04	1.4E-01	1.5E-01	=Idrat26*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr26	9.6E-04						=Xdrat26
Total dose rate	mSv/d	tdr26	1.5E-01						=SUM(Hletdr26)+Lletdr26
Equivalent Doses - Ptarmigan - JSL @ Kiggavik Discharge									
High LET dose rate	mSv/d	Hletdr27	7.3E-05	6.0E-04	4.3E-03	8.3E-04	1.4E-01	1.5E-01	=Idrat27*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr27	9.6E-04						=Xdrat27
Total dose rate	mSv/d	tdr27	1.5E-01						=SUM(Hletdr27)+Lletdr27

Table H.2-3

Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

Equivalent Doses - Ptarmigan - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr28	5.4E-05	6.0E-04	4.2E-03	8.3E-04	1.4E-01	1.5E-01	=Idrat28*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr28	9.6E-04						=Xdrat28	
Total dose rate	mSv/d	tdr28	1.5E-01						=SUM(Hletdr28)+Lletdr28	
Equivalent Doses - Ptarmigan - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr29	8.2E-05	5.9E-04	4.2E-03	8.3E-04	1.4E-01	1.5E-01	=Idrat29*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr29	9.6E-04						=Xdrat29	
Total dose rate	mSv/d	tdr29	1.5E-01						=SUM(Hletdr29)+Lletdr29	
Equivalent Doses - Sandpiper - Rock Lake										
High LET dose rate	mSv/d	Hletdr30	2.8E-04	2.0E-03	2.5E-02	3.4E-04	1.0E-01	1.3E-01	=Idrat30*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr30	9.6E-04						=Xdrat30	
Total dose rate	mSv/d	tdr30	1.3E-01						=SUM(Hletdr30)+Lletdr30	
Equivalent Doses - Sandpiper - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr31	3.5E-04	2.0E-03	2.4E-02	3.4E-04	9.9E-02	1.3E-01	=Idrat31*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr31	9.6E-04						=Xdrat31	
Total dose rate	mSv/d	tdr31	1.3E-01						=SUM(Hletdr31)+Lletdr31	
Equivalent Doses - Sandpiper - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr32	4.2E-04	2.0E-03	2.4E-02	3.4E-04	1.0E-01	1.3E-01	=Idrat32*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr32	9.6E-04						=Xdrat32	
Total dose rate	mSv/d	tdr32	1.3E-01						=SUM(Hletdr32)+Lletdr32	
Equivalent Doses - Shrew - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr33	1.9E-04	5.0E-04	8.1E-03	6.8E-05	6.1E-03	1.5E-02	=Idrat33*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr33	9.6E-04						=Xdrat33	
Total dose rate	mSv/d	tdr33	1.6E-02						=SUM(Hletdr33)+Lletdr33	
Equivalent Doses - Shrew - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr34	2.6E-04	5.3E-04	8.7E-03	6.8E-05	6.3E-03	1.6E-02	=Idrat34*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr34	9.6E-04						=Xdrat34	
Total dose rate	mSv/d	tdr34	1.7E-02						=SUM(Hletdr34)+Lletdr34	
Equivalent Doses - Shrew - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr35	1.8E-05	4.9E-04	7.5E-03	6.7E-05	6.1E-03	1.4E-02	=Idrat35*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr35	9.6E-04						=Xdrat35	
Total dose rate	mSv/d	tdr35	1.5E-02						=SUM(Hletdr35)+Lletdr35	
Equivalent Doses - Shrew - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr36	3.6E-04	5.1E-04	8.1E-03	6.8E-05	6.2E-03	1.5E-02	=Idrat36*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr36	2.7E-04						=Xdrat36	
Total dose rate	mSv/d	tdr36	1.5E-02						=SUM(Hletdr36)+Lletdr36	
Equivalent Doses - Squirrel - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr37	1.5E-04	2.6E-03	9.4E-03	1.2E-04	6.9E-03	1.9E-02	=Idrat37*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr37	9.6E-04						=Xdrat37	
Total dose rate	mSv/d	tdr37	2.0E-02						=SUM(Hletdr37)+Lletdr37	
Equivalent Doses - Squirrel - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr38	1.5E-04	2.6E-03	9.4E-03	1.2E-04	6.9E-03	1.9E-02	=Idrat38*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr38	9.6E-04						=Xdrat38	
Total dose rate	mSv/d	tdr38	2.0E-02						=SUM(Hletdr38)+Lletdr38	
Equivalent Doses - Squirrel - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr39	1.6E-04	2.6E-03	9.4E-03	1.2E-04	6.9E-03	1.9E-02	=Idrat39*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr39	9.6E-04						=Xdrat39	
Total dose rate	mSv/d	tdr39	2.0E-02						=SUM(Hletdr39)+Lletdr39	
Equivalent Doses - Squirrel - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr40	1.5E-04	2.6E-03	9.4E-03	1.2E-04	6.9E-03	1.9E-02	=Idrat40*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr40	9.6E-04						=Xdrat40	
Total dose rate	mSv/d	tdr40	2.0E-02						=SUM(Hletdr40)+Lletdr40	
Equivalent Doses - Wolf - LSA										
High LET dose rate	mSv/d	Hletdr41	6.6E-05	2.5E-05	3.8E-05	2.2E-08	5.6E-03	5.8E-03	=Idrat41*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr41	9.6E-04						=Xdrat41	
Total dose rate	mSv/d	tdr41	6.7E-03						=SUM(Hletdr41)+Lletdr41	
Equivalent Doses - Wolf - RSA										
High LET dose rate	mSv/d	Hletdr42	6.6E-05	2.5E-05	3.8E-05	2.2E-08	5.6E-03	5.8E-03	=Idrat42*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr42	9.6E-04						=Xdrat42	
Total dose rate	mSv/d	tdr42	6.7E-03						=SUM(Hletdr42)+Lletdr42	
Equivalent Doses - Wolverine - LSA										
High LET dose rate	mSv/d	Hletdr43	8.9E-05	8.9E-05	3.4E-04	6.3E-07	1.4E-03	1.9E-03	=Idrat43*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr43	9.6E-04						=Xdrat43	
Total dose rate	mSv/d	tdr43	2.9E-03						=SUM(Hletdr43)+Lletdr43	
Equivalent Doses - Wolverine - RSA										
High LET dose rate	mSv/d	Hletdr44	8.9E-05	8.9E-05	3.4E-04	6.3E-07	1.4E-03	1.9E-03	=Idrat44*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr44	9.6E-04						=Xdrat44	
Total dose rate	mSv/d	tdr44	2.9E-03						=SUM(Hletdr44)+Lletdr44	

Table H.2-3
Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

SUMMARY

1 Screening Criterion in mGy/d	Total Absorbed Dose mGy/d	Total Equivalent Dose mSv/d	Index (Absorbed Dose)	Index (Equivalent Dose)
Bear - LSA	1.1E-03	6.6E-03	1.1E-03	6.6E-03
Caribou - LSA	2.8E-03	7.3E-02	2.8E-03	7.3E-02
Caribou - RSA	2.8E-03	7.3E-02	2.8E-03	7.3E-02
Falcon - LSA	2.9E-03	4.8E-02	2.9E-03	4.8E-02
Falcon - RSA	2.9E-03	4.8E-02	2.9E-03	4.8E-02
Fox - LSA	1.1E-03	4.6E-03	1.1E-03	4.6E-03
Lemming - Rock Lake Watershed	2.1E-03	3.7E-02	2.1E-03	3.7E-02
Lemming - JSL @ Kiggavik Discharge	2.1E-03	3.7E-02	2.1E-03	3.7E-02
Lemming - Kiggavik Camp	2.1E-03	3.7E-02	2.1E-03	3.7E-02
Lemming - JSL @ Sissons Discharge	2.1E-03	3.7E-02	2.1E-03	3.7E-02
Lapland Longspur - Rock Lake Watershed	2.4E-03	5.1E-02	2.4E-03	5.1E-02
Lapland Longspur - JSL @ Kiggavik Discharge	2.5E-03	5.3E-02	2.5E-03	5.3E-02
Lapland Longspur - Kiggavik Camp	2.4E-03	5.0E-02	2.4E-03	5.0E-02
Lapland Longspur - JSL @ Sissons Discharge	2.4E-03	5.2E-02	2.4E-03	5.2E-02
Long-Tailed Duck - Rock Lake	2.6E-03	6.2E-02	2.6E-03	6.2E-02
Long-Tailed Duck - JSL @ Kiggavik Discharge	2.6E-03	6.0E-02	2.6E-03	6.0E-02
Long-Tailed Duck - JSL @ Sissons Discharge	2.6E-03	6.1E-02	2.6E-03	6.1E-02
Merganser - Rock Lake	1.2E-03	8.3E-03	1.2E-03	8.3E-03
Merganser - JSL @ Kiggavik Discharge	1.2E-03	8.0E-03	1.2E-03	8.0E-03
Merganser - JSL @ Sissons Discharge	1.2E-03	8.0E-03	1.2E-03	8.0E-03
Muskox - JSL @ Kiggavik Discharge	1.5E-03	2.2E-02	1.5E-03	2.2E-02
Muskox - JSL @ Sissons Discharge	2.4E-03	5.2E-02	2.4E-03	5.2E-02
Northern Pintail - Rock Lake	2.8E-03	6.1E-02	2.8E-03	6.1E-02
Northern Pintail - JSL @ Kiggavik Discharge	2.7E-03	5.9E-02	2.7E-03	5.9E-02
Northern Pintail - JSL @ Sissons Discharge	2.7E-03	5.9E-02	2.7E-03	5.9E-02
Ptarmigan - Rock Lake Watershed	5.4E-03	1.5E-01	5.4E-03	1.5E-01
Ptarmigan - JSL @ Kiggavik Discharge	5.4E-03	1.5E-01	5.4E-03	1.5E-01
Ptarmigan - Kiggavik Camp	5.4E-03	1.5E-01	5.4E-03	1.5E-01
Ptarmigan - JSL @ Sissons Discharge	5.4E-03	1.5E-01	5.4E-03	1.5E-01
Sandpiper - Rock Lake	4.5E-03	1.3E-01	4.5E-03	1.3E-01
Sandpiper - JSL @ Kiggavik Discharge	4.4E-03	1.3E-01	4.4E-03	1.3E-01
Sandpiper - JSL @ Sissons Discharge	4.5E-03	1.3E-01	4.5E-03	1.3E-01
Shrew - Rock Lake Watershed	1.4E-03	1.6E-02	1.4E-03	1.6E-02
Shrew - JSL @ Kiggavik Discharge	1.4E-03	1.7E-02	1.4E-03	1.7E-02
Shrew - Kiggavik Camp	1.4E-03	1.5E-02	1.4E-03	1.5E-02
Shrew - JSL @ Sissons Discharge	7.1E-04	1.5E-02	7.1E-04	1.5E-02
Squirrel - Rock Lake Watershed	1.6E-03	2.0E-02	1.6E-03	2.0E-02
Squirrel - JSL @ Kiggavik Discharge	1.6E-03	2.0E-02	1.6E-03	2.0E-02
Squirrel - Kiggavik Camp	1.6E-03	2.0E-02	1.6E-03	2.0E-02
Squirrel - JSL @ Sissons Discharge	1.6E-03	2.0E-02	1.6E-03	2.0E-02
Wolf - LSA	1.1E-03	6.7E-03	1.1E-03	6.7E-03
Wolf - RSA	1.1E-03	6.7E-03	1.1E-03	6.7E-03
Wolverine - LSA	1.0E-03	2.9E-03	1.0E-03	2.9E-03
Wolverine - RSA	1.0E-03	2.9E-03	1.0E-03	2.9E-03

U-238+ Internal U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235
Ra-226+ Internal Ra-226 + 0.3* (Rn-222 + ...Po-214)
Pb-210+ Internal Pb-210 + Bi-210

Table H.2-3

Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

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DOSES TO SELECTED VECs - 95th Percentile Total Dose

		U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Absorbed Doses - Bear - LSA								
Concentration	Bq/g	Crad	3.88E-05	1.51E-04	6.99E-05	1.74E-04	6.43E-03	
Internal Dose Factor	mGy/d per Bq/g	ldcf	1.4E-01	6.6E-02	1.6E-01	6.0E-03	7.4E-02	
Internal dose rate	mGy/d	ldrat	5.5E-06	9.9E-06	1.1E-05	1.0E-06	4.8E-04	5.0E-04 =Crad*ldcf
External Gamma rate	uGy/h	Xgrat	0.04					
Fraction of time on site	-	fts	1.00					
External dose rate	mGy/d	Xdrat	9.6E-04					=Xgrat*24*fts/1000
Internal plus external	mGy/d	tdrat	1.5E-03					=SUM(ldrat)+Xdrat
Absorbed Doses - Caribou - LSA								
Concentration	Bq/g	Crad2	8.62E-05	1.33E-04	2.95E-04	2.53E-03	7.65E-02	
Internal dose rate	mGy/d	ldrat2	1.2E-05	8.7E-06	4.7E-05	1.5E-05	5.7E-03	=Crad2*ldcf
Fraction of time on site	-	fts2	1.00					
External dose rate	mGy/d	Xdrat2	9.6E-04					=Xgrat*24*fts2/1000
Internal plus external	mGy/d	tdrat2	6.7E-03					=SUM(ldrat2)+Xdrat2
Absorbed Doses - Caribou - RSA								
Concentration	Bq/g	Crad3	8.62E-05	1.33E-04	2.95E-04	2.53E-03	7.65E-02	
Internal dose rate	mGy/d	ldrat3	1.2E-05	8.7E-06	4.7E-05	1.5E-05	5.7E-03	=Crad3*ldcf
Fraction of time on site	-	fts3	1.00					
External dose rate	mGy/d	Xdrat3	9.6E-04					=Xgrat*24*fts3/1000
Internal plus external	mGy/d	tdrat3	6.7E-03					=SUM(ldrat3)+Xdrat3
Absorbed Doses - Falcon - LSA								
Concentration	Bq/g	Crad4	1.15E-05	3.57E-04	1.38E-03	4.41E-01	5.01E-02	
Internal dose rate	mGy/d	ldrat4	1.6E-06	2.3E-05	2.2E-04	2.7E-03	3.7E-03	6.6E-03 =Crad4*ldcf
Fraction of time on site	-	fts4	1.00					
External dose rate	mGy/d	Xdrat4	9.6E-04					=Xgrat*24*fts4/1000
Internal plus external	mGy/d	tdrat4	7.6E-03					=SUM(ldrat4)+Xdrat4
Absorbed Doses - Falcon - RSA								
Concentration	Bq/g	Crad5	1.14E-05	3.56E-04	1.38E-03	4.41E-01	5.00E-02	
Internal dose rate	mGy/d	ldrat5	1.6E-06	2.3E-05	2.2E-04	2.7E-03	3.7E-03	6.6E-03 =Crad5*ldcf
Fraction of time on site	-	fts5	1.00					
External dose rate	mGy/d	Xdrat5	9.6E-04					=Xgrat*24*fts5/1000
Internal plus external	mGy/d	tdrat5	7.6E-03					=SUM(ldrat5)+Xdrat5
Absorbed Doses - Fox - LSA								
Concentration	Bq/g	Crad6	2.13E-05	7.95E-05	1.30E-04	5.17E-04	3.66E-03	
Internal dose rate	mGy/d	ldrat6	3.0E-06	5.2E-06	2.1E-05	3.1E-06	2.7E-04	3.0E-04 =Crad6*ldcf
Fraction of time on site	-	fts6	1.00					
External dose rate	mGy/d	Xdrat6	9.6E-04					=Xgrat*24*fts6/1000
Internal plus external	mGy/d	tdrat6	1.3E-03					=SUM(ldrat6)+Xdrat6
Absorbed Doses - Lemming - Rock Lake Watershed								
Concentration	Bq/g	Crad7	1.51E-04	3.56E-03	6.36E-03	1.69E-01	2.09E-02	
Internal dose rate	mGy/d	ldrat7	2.1E-05	2.3E-04	1.0E-03	1.0E-03	1.5E-03	3.8E-03 =Crad7*ldcf
Fraction of time on site	-	fts7	1.00					
External dose rate	mGy/d	Xdrat7	9.6E-04					=Xgrat*24*fts7/1000
Internal plus external	mGy/d	tdrat7	4.8E-03					=SUM(ldrat7)+Xdrat7
Absorbed Doses - Lemming - JSL @ Kiggavik Discharge								
Concentration	Bq/g	Crad8	1.50E-04	3.56E-03	6.36E-03	1.69E-01	2.09E-02	
Internal dose rate	mGy/d	ldrat8	2.1E-05	2.3E-04	1.0E-03	1.0E-03	1.5E-03	3.8E-03 =Crad8*ldcf
Fraction of time on site	-	fts8	1.00					
External dose rate	mGy/d	Xdrat8	9.6E-04					=Xgrat*24*fts8/1000
Internal plus external	mGy/d	tdrat8	4.8E-03					=SUM(ldrat8)+Xdrat8
Absorbed Doses - Lemming - Kiggavik Camp								
Concentration	Bq/g	Crad9	1.55E-04	3.57E-03	6.37E-03	1.69E-01	2.09E-02	
Internal dose rate	mGy/d	ldrat9	2.2E-05	2.3E-04	1.0E-03	1.0E-03	1.5E-03	3.8E-03 =Crad9*ldcf
Fraction of time on site	-	fts9	1.00					
External dose rate	mGy/d	Xdrat9	9.6E-04					=Xgrat*24*fts9/1000
Internal plus external	mGy/d	tdrat9	4.8E-03					=SUM(ldrat9)+Xdrat9
Absorbed Doses - Lemming - JSL @ Sissons Discharge								
Concentration	Bq/g	Crad10	1.51E-04	3.56E-03	6.36E-03	1.69E-01	2.09E-02	
Internal dose rate	mGy/d	ldrat10	2.1E-05	2.3E-04	1.0E-03	1.0E-03	1.5E-03	3.8E-03 =Crad10*ldcf
Fraction of time on site	-	fts10	1.00					
External dose rate	mGy/d	Xdrat10	9.6E-04					=Xgrat*24*fts10/1000
Internal plus external	mGy/d	tdrat10	4.8E-03					=SUM(ldrat10)+Xdrat10
Absorbed Doses - Lapland Longspur - Rock Lake Watershed								
Concentration	Bq/g	Crad11	4.07E-05	3.37E-03	5.24E-03	1.35E-01	3.62E-02	
Internal dose rate	mGy/d	ldrat11	5.8E-06	2.2E-04	8.3E-04	8.1E-04	2.7E-03	4.6E-03 =Crad11*ldcf
Fraction of time on site	-	fts11	1.00					
External dose rate	mGy/d	Xdrat11	9.6E-04					=Xgrat*24*fts11/1000
Internal plus external	mGy/d	tdrat11	5.5E-03					=SUM(ldrat11)+Xdrat11

Table H.2-3

Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

Absorbed Doses - Lapland Longspur - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad12	5.50E-05	3.38E-03	5.40E-03	1.37E-01	3.73E-02			
Internal dose rate	mGy/d	ldrat12	7.8E-06	2.2E-04	8.6E-04	8.2E-04	2.8E-03	4.7E-03	=Crad12*ldcf	
Fraction of time on site	-	fts12	1.00							
External dose rate	mGy/d	Xdrat12	9.6E-04						=Xgrat*24*fts12/1000	
Internal plus external	mGy/d	tdrat12	5.6E-03						=SUM(ldrat12)+Xdrat12	
Absorbed Doses - Lapland Longspur - Kiggavik Camp										
Concentration	Bq/g	Crad13	1.30E-05	3.37E-03	5.10E-03	1.34E-01	3.57E-02			
Internal dose rate	mGy/d	ldrat13	1.8E-06	2.2E-04	8.1E-04	8.1E-04	2.6E-03	4.5E-03	=Crad13*ldcf	
Fraction of time on site	-	fts13	1.00							
External dose rate	mGy/d	Xdrat13	9.6E-04						=Xgrat*24*fts13/1000	
Internal plus external	mGy/d	tdrat13	5.4E-03						=SUM(ldrat13)+Xdrat13	
Absorbed Doses - Lapland Longspur - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad14	6.24E-05	3.37E-03	5.26E-03	1.35E-01	3.64E-02			
Internal dose rate	mGy/d	ldrat14	8.9E-06	2.2E-04	8.4E-04	8.1E-04	2.7E-03	4.6E-03	=Crad14*ldcf	
Fraction of time on site	-	fts14	1.00							
External dose rate	mGy/d	Xdrat14	9.6E-04						=Xgrat*24*fts14/1000	
Internal plus external	mGy/d	tdrat14	5.5E-03						=SUM(ldrat14)+Xdrat14	
Absorbed Doses - Long-Tailed Duck - Rock Lake										
Concentration	Bq/g	Crad15	5.55E-05	6.03E-04	9.26E-03	6.39E-02	5.78E-02			
Internal dose rate	mGy/d	ldrat15	7.9E-06	4.0E-05	1.5E-03	3.9E-04	4.3E-03	6.2E-03	=Crad15*ldcf	
Fraction of time on site	-	fts15	1.00							
External dose rate	mGy/d	Xdrat15	9.6E-04						=Xgrat*24*fts15/1000	
Internal plus external	mGy/d	tdrat15	7.1E-03						=SUM(ldrat15)+Xdrat15	
Absorbed Doses - Long-Tailed Duck - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad16	8.71E-05	5.84E-04	8.95E-03	6.16E-02	5.56E-02			
Internal dose rate	mGy/d	ldrat16	1.2E-05	3.8E-05	1.4E-03	3.7E-04	4.1E-03	6.0E-03	=Crad16*ldcf	
Fraction of time on site	-	fts16	1.00							
External dose rate	mGy/d	Xdrat16	9.6E-04						=Xgrat*24*fts16/1000	
Internal plus external	mGy/d	tdrat16	6.9E-03						=SUM(ldrat16)+Xdrat16	
Absorbed Doses - Long-Tailed Duck - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad17	1.11E-04	5.86E-04	9.00E-03	6.18E-02	5.58E-02			
Internal dose rate	mGy/d	ldrat17	1.6E-05	3.9E-05	1.4E-03	3.7E-04	4.1E-03	6.0E-03	=Crad17*ldcf	
Fraction of time on site	-	fts17	1.00							
External dose rate	mGy/d	Xdrat17	9.6E-04						=Xgrat*24*fts17/1000	
Internal plus external	mGy/d	tdrat17	7.0E-03						=SUM(ldrat17)+Xdrat17	
Absorbed Doses - Merganser - Rock Lake										
Concentration	Bq/g	Crad18	7.69E-06	3.15E-04	3.99E-04	1.98E-02	7.05E-03			
Internal dose rate	mGy/d	ldrat18	1.1E-06	2.1E-05	6.3E-05	1.2E-04	5.2E-04	7.3E-04	=Crad18*ldcf	
Fraction of time on site	-	fts18	1.00							
External dose rate	mGy/d	Xdrat18	9.6E-04						=Xgrat*24*fts18/1000	
Internal plus external	mGy/d	tdrat18	1.7E-03						=SUM(ldrat18)+Xdrat18	
Absorbed Doses - Merganser - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad19	7.74E-06	3.09E-04	3.71E-04	1.98E-02	6.69E-03			
Internal dose rate	mGy/d	ldrat19	1.1E-06	2.0E-05	5.9E-05	1.2E-04	5.0E-04	6.9E-04	=Crad19*ldcf	
Fraction of time on site	-	fts19	1.00							
External dose rate	mGy/d	Xdrat19	9.6E-04						=Xgrat*24*fts19/1000	
Internal plus external	mGy/d	tdrat19	1.7E-03						=SUM(ldrat19)+Xdrat19	
Absorbed Doses - Merganser - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad20	7.77E-06	3.09E-04	3.73E-04	1.98E-02	6.85E-03			
Internal dose rate	mGy/d	ldrat20	1.1E-06	2.0E-05	5.9E-05	1.2E-04	5.1E-04	7.1E-04	=Crad20*ldcf	
Fraction of time on site	-	fts20	1.00							
External dose rate	mGy/d	Xdrat20	9.6E-04						=Xgrat*24*fts20/1000	
Internal plus external	mGy/d	tdrat20	1.7E-03						=SUM(ldrat20)+Xdrat20	
Absorbed Doses - Muskox - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad21	1.18E-04	1.86E-04	2.87E-04	6.77E-04	2.04E-02			
Internal dose rate	mGy/d	ldrat21	1.7E-05	1.2E-05	4.6E-05	4.1E-06	1.5E-03	1.6E-03	=Crad21*ldcf	
Fraction of time on site	-	fts21	1.00							
External dose rate	mGy/d	Xdrat21	9.6E-04						=Xgrat*24*fts21/1000	
Internal plus external	mGy/d	tdrat21	2.6E-03						=SUM(ldrat21)+Xdrat21	
Absorbed Doses - Muskox - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad22	6.24E-05	3.37E-03	5.26E-03	1.35E-01	3.64E-02			
Internal dose rate	mGy/d	ldrat22	8.9E-06	2.2E-04	8.4E-04	8.1E-04	2.7E-03	4.6E-03	=Crad22*ldcf	
Fraction of time on site	-	fts22	1.00							
External dose rate	mGy/d	Xdrat22	9.6E-04						=Xgrat*24*fts22/1000	
Internal plus external	mGy/d	tdrat22	5.5E-03						=SUM(ldrat22)+Xdrat22	
Absorbed Doses - Northern Pintail - Rock Lake										
Concentration	Bq/g	Crad23	2.34E-05	4.59E-03	2.26E-03	1.68E-01	6.11E-02			
Internal dose rate	mGy/d	ldrat23	3.3E-06	3.0E-04	3.6E-04	1.0E-03	4.5E-03	6.2E-03	=Crad23*ldcf	
Fraction of time on site	-	fts23	1.00							
External dose rate	mGy/d	Xdrat23	9.6E-04						=Xgrat*24*fts23/1000	
Internal plus external	mGy/d	tdrat23	7.2E-03						=SUM(ldrat23)+Xdrat23	

Table H.2-3

Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

Absorbed Doses - Northern Pintail - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad24	2.66E-05	4.43E-03	2.18E-03	1.62E-01	5.96E-02			
Internal dose rate	mGy/d	Idrat24	3.8E-06	2.9E-04	3.5E-04	9.8E-04	4.4E-03	6.0E-03	=Crad24*Idcf	
Fraction of time on site	-	fts24	1.00							
External dose rate	mGy/d	Xdrat24	9.6E-04						=Xgrat*24*fts24/1000	
Internal plus external	mGy/d	tdrat24	7.0E-03						=SUM(Idrat24)+Xdrat24	
Absorbed Doses - Northern Pintail - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad25	3.78E-05	4.45E-03	2.20E-03	1.63E-01	5.90E-02			
Internal dose rate	mGy/d	Idrat25	5.4E-06	2.9E-04	3.5E-04	9.8E-04	4.4E-03	6.0E-03	=Crad25*Idcf	
Fraction of time on site	-	fts25	1.00							
External dose rate	mGy/d	Xdrat25	9.6E-04						=Xgrat*24*fts25/1000	
Internal plus external	mGy/d	tdrat25	7.0E-03						=SUM(Idrat25)+Xdrat25	
Absorbed Doses - Ptarmigan - Rock Lake Watershed										
Concentration	Bq/g	Crad26	4.26E-05	9.01E-04	2.17E-03	3.89E-01	1.43E-01			
Internal dose rate	mGy/d	Idrat26	6.0E-06	5.9E-05	3.5E-04	2.3E-03	1.1E-02	1.3E-02	=Crad26*Idcf	
Fraction of time on site	-	fts26	1.00							
External dose rate	mGy/d	Xdrat26	9.6E-04						=Xgrat*24*fts26/1000	
Internal plus external	mGy/d	tdrat26	1.4E-02						=SUM(Idrat26)+Xdrat26	
Absorbed Doses - Ptarmigan - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad27	4.59E-05	9.03E-04	2.21E-03	3.89E-01	1.43E-01			
Internal dose rate	mGy/d	Idrat27	6.5E-06	5.9E-05	3.5E-04	2.3E-03	1.1E-02	1.3E-02	=Crad27*Idcf	
Fraction of time on site	-	fts27	1.00							
External dose rate	mGy/d	Xdrat27	9.6E-04						=Xgrat*24*fts27/1000	
Internal plus external	mGy/d	tdrat27	1.4E-02						=SUM(Idrat27)+Xdrat27	
Absorbed Doses - Ptarmigan - Kiggavik Camp										
Concentration	Bq/g	Crad28	3.65E-05	9.03E-04	2.10E-03	3.89E-01	1.43E-01			
Internal dose rate	mGy/d	Idrat28	5.2E-06	5.9E-05	3.3E-04	2.3E-03	1.1E-02	1.3E-02	=Crad28*Idcf	
Fraction of time on site	-	fts28	1.00							
External dose rate	mGy/d	Xdrat28	9.6E-04						=Xgrat*24*fts28/1000	
Internal plus external	mGy/d	tdrat28	1.4E-02						=SUM(Idrat28)+Xdrat28	
Absorbed Doses - Ptarmigan - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad29	5.23E-05	9.01E-04	2.16E-03	3.89E-01	1.43E-01			
Internal dose rate	mGy/d	Idrat29	7.4E-06	5.9E-05	3.4E-04	2.3E-03	1.1E-02	1.3E-02	=Crad29*Idcf	
Fraction of time on site	-	fts29	1.00							
External dose rate	mGy/d	Xdrat29	9.6E-04						=Xgrat*24*fts29/1000	
Internal plus external	mGy/d	tdrat29	1.4E-02						=SUM(Idrat29)+Xdrat29	
Absorbed Doses - Sandpiper - Rock Lake										
Concentration	Bq/g	Crad30	1.96E-04	2.14E-03	1.53E-02	1.83E-01	1.19E-01			
Internal dose rate	mGy/d	Idrat30	2.8E-05	1.4E-04	2.4E-03	1.1E-03	8.8E-03	1.3E-02	=Crad30*Idcf	
Fraction of time on site	-	fts30	1.00							
External dose rate	mGy/d	Xdrat30	9.6E-04						=Xgrat*24*fts30/1000	
Internal plus external	mGy/d	tdrat30	1.3E-02						=SUM(Idrat30)+Xdrat30	
Absorbed Doses - Sandpiper - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad31	2.34E-04	2.11E-03	1.48E-02	1.78E-01	1.14E-01			
Internal dose rate	mGy/d	Idrat31	3.3E-05	1.4E-04	2.4E-03	1.1E-03	8.5E-03	1.2E-02	=Crad31*Idcf	
Fraction of time on site	-	fts31	1.00							
External dose rate	mGy/d	Xdrat31	9.6E-04						=Xgrat*24*fts31/1000	
Internal plus external	mGy/d	tdrat31	1.3E-02						=SUM(Idrat31)+Xdrat31	
Absorbed Doses - Sandpiper - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad32	2.56E-04	2.11E-03	1.49E-02	1.79E-01	1.15E-01			
Internal dose rate	mGy/d	Idrat32	3.6E-05	1.4E-04	2.4E-03	1.1E-03	8.5E-03	1.2E-02	=Crad32*Idcf	
Fraction of time on site	-	fts32	1.00							
External dose rate	mGy/d	Xdrat32	9.6E-04						=Xgrat*24*fts32/1000	
Internal plus external	mGy/d	tdrat32	1.3E-02						=SUM(Idrat32)+Xdrat32	
Absorbed Doses - Shrew - Rock Lake Watershed										
Concentration	Bq/g	Crad33	1.03E-04	6.31E-04	4.02E-03	3.64E-02	5.70E-03			
Internal dose rate	mGy/d	Idrat33	1.5E-05	4.2E-05	6.4E-04	2.2E-04	4.2E-04	1.3E-03	=Crad33*Idcf	
Fraction of time on site	-	fts33	1.00							
External dose rate	mGy/d	Xdrat33	9.6E-04						=Xgrat*24*fts33/1000	
Internal plus external	mGy/d	tdrat33	2.3E-03						=SUM(Idrat33)+Xdrat33	
Absorbed Doses - Shrew - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad34	1.42E-04	6.72E-04	4.37E-03	3.68E-02	6.01E-03			
Internal dose rate	mGy/d	Idrat34	2.0E-05	4.4E-05	7.0E-04	2.2E-04	4.4E-04	1.4E-03	=Crad34*Idcf	
Fraction of time on site	-	fts34	1.00							
External dose rate	mGy/d	Xdrat34	9.6E-04						=Xgrat*24*fts34/1000	
Internal plus external	mGy/d	tdrat34	2.4E-03						=SUM(Idrat34)+Xdrat34	
Absorbed Doses - Shrew - Kiggavik Camp										
Concentration	Bq/g	Crad35	9.53E-06	6.00E-04	3.72E-03	3.61E-02	5.69E-03			
Internal dose rate	mGy/d	Idrat35	1.4E-06	3.9E-05	5.9E-04	2.2E-04	4.2E-04	1.3E-03	=Crad35*Idcf	
Fraction of time on site	-	fts35	1.00							
External dose rate	mGy/d	Xdrat35	9.6E-04						=Xgrat*24*fts35/1000	
Internal plus external	mGy/d	tdrat35	2.2E-03						=SUM(Idrat35)+Xdrat35	
Absorbed Doses - Shrew - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad36	2.20E-04	6.31E-04	4.01E-03	3.65E-02	5.84E-03			
Internal dose rate	mGy/d	Idrat36	3.1E-05	4.2E-05	6.4E-04	2.2E-04	4.3E-04	1.4E-03	=Crad36*Idcf	
Fraction of time on site	-	fts36	1.00							

Table H.2-3

Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

External dose rate	mGy/d	Xdrat36	2.7E-04							=Xgrat*24*fts36/3600
Internal plus external	mGy/d	tdrat36	1.6E-03							=SUM(ldrat36)+Xdrat36
Absorbed Doses - Squirrel - Rock Lake Watershed										
Concentration	Bq/g	Crad37	8.97E-05	3.42E-03	6.40E-03	8.32E-02	1.01E-02			
Internal dose rate	mGy/d	ldrat37	1.3E-05	2.3E-04	1.0E-03	5.0E-04	7.5E-04	2.5E-03		=Crad37*ldcf
Fraction of time on site	-	fts37	1.00							
External dose rate	mGy/d	Xdrat37	9.6E-04							=Xgrat*24*fts37/1000
Internal plus external	mGy/d	tdrat37	3.5E-03							=SUM(ldrat37)+Xdrat37
Absorbed Doses - Squirrel - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad38	8.97E-05	3.42E-03	6.40E-03	8.32E-02	1.01E-02			
Internal dose rate	mGy/d	ldrat38	1.3E-05	2.3E-04	1.0E-03	5.0E-04	7.5E-04	2.5E-03		=Crad38*ldcf
Fraction of time on site	-	fts38	1.00							
External dose rate	mGy/d	Xdrat38	9.6E-04							=Xgrat*24*fts38/1000
Internal plus external	mGy/d	tdrat38	3.5E-03							=SUM(ldrat38)+Xdrat38
Absorbed Doses - Squirrel - Kiggavik Camp										
Concentration	Bq/g	Crad39	9.37E-05	3.43E-03	6.42E-03	8.33E-02	1.01E-02			
Internal dose rate	mGy/d	ldrat39	1.3E-05	2.3E-04	1.0E-03	5.0E-04	7.5E-04	2.5E-03		=Crad39*ldcf
Fraction of time on site	-	fts39	1.00							
External dose rate	mGy/d	Xdrat39	9.6E-04							=Xgrat*24*fts39/1000
Internal plus external	mGy/d	tdrat39	3.5E-03							=SUM(ldrat39)+Xdrat39

Table H.2-3

Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

Absorbed Doses - Squirrel - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad40	8.98E-05	3.42E-03	6.40E-03	8.32E-02	1.01E-02			
Internal dose rate	mGy/d	Idrat40	1.3E-05	2.3E-04	1.0E-03	5.0E-04	7.5E-04	2.5E-03	=Crad40*Idcf	
Fraction of time on site	-	fts40	1.00							
External dose rate	mGy/d	Xdrat40	9.6E-04						=Xgrat*24*fts40/1000	
Internal plus external	mGy/d	tdrat40	3.5E-03						=SUM(Idrat40)+Xdrat40	
Absorbed Doses - Wolf - LSA										
Concentration	Bq/g	Crad41	4.16E-05	2.94E-05	2.20E-05	1.44E-05	7.66E-03			
Internal dose rate	mGy/d	Idrat41	5.9E-06	1.9E-06	3.5E-06	8.7E-08	5.7E-04	5.8E-04	=Crad41*Idcf	
Fraction of time on site	-	fts41	1.00							
External dose rate	mGy/d	Xdrat41	9.6E-04						=Xgrat*24*fts41/1000	
Internal plus external	mGy/d	tdrat41	1.5E-03						=SUM(Idrat41)+Xdrat41	
Absorbed Doses - Wolf - RSA										
Concentration	Bq/g	Crad42	4.17E-05	2.94E-05	2.20E-05	1.44E-05	7.66E-03			
Internal dose rate	mGy/d	Idrat42	5.9E-06	1.9E-06	3.5E-06	8.7E-08	5.7E-04	5.8E-04	=Crad42*Idcf	
Fraction of time on site	-	fts42	1.00							
External dose rate	mGy/d	Xdrat42	9.6E-04						=Xgrat*24*fts42/1000	
Internal plus external	mGy/d	tdrat42	1.5E-03						=SUM(Idrat42)+Xdrat42	
Absorbed Doses - Wolverine - LSA										
Concentration	Bq/g	Crad43	5.83E-05	1.16E-04	2.13E-04	4.70E-04	1.79E-03			
Internal dose rate	mGy/d	Idrat43	8.3E-06	7.6E-06	3.4E-05	2.8E-06	1.3E-04	1.9E-04	=Crad43*Idcf	
Fraction of time on site	-	fts43	1.00							
External dose rate	mGy/d	Xdrat43	9.6E-04						=Xgrat*24*fts43/1000	
Internal plus external	mGy/d	tdrat43	1.1E-03						=SUM(Idrat43)+Xdrat43	
Absorbed Doses - Wolverine - RSA										
Concentration	Bq/g	Crad44	5.84E-05	1.16E-04	2.13E-04	4.70E-04	1.79E-03			
Internal dose rate	mGy/d	Idrat44	8.3E-06	7.6E-06	3.4E-05	2.8E-06	1.3E-04	1.9E-04	=Crad44*Idcf	
Fraction of time on site	-	fts44	1.00							
External dose rate	mGy/d	Xdrat44	9.6E-04						=Xgrat*24*fts44/1000	
Internal plus external	mGy/d	tdrat44	1.1E-03						=SUM(Idrat44)+Xdrat44	
Equivalent Doses - Bear - LSA										
RBE for alpha	Sv/Gy	RBE	40							
High LET dose rate	mSv/d	Hletdr	2.2E-04	4.0E-04	4.4E-04	1.0E-06	1.9E-02	2.0E-02	=Idrat*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr	9.6E-04						=Xdrat	
Total dose rate	mSv/d	tdr	2.1E-02						=SUM(Hletdr)+Lletdr	
Equivalent Doses - Caribou - LSA										
High LET dose rate	mSv/d	Hletdr2	4.9E-04	3.5E-04	1.9E-03	1.5E-05	2.3E-01	2.3E-01	=Idrat2*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr2	9.6E-04						=Xdrat2	
Total dose rate	mSv/d	tdr2	2.3E-01						=SUM(Hletdr2)+Lletdr2	
Equivalent Doses - Caribou - RSA										
High LET dose rate	mSv/d	Hletdr3	4.9E-04	3.5E-04	1.9E-03	1.5E-05	2.3E-01	2.3E-01	=Idrat3*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr3	9.6E-04						=Xdrat3	
Total dose rate	mSv/d	tdr3	2.3E-01						=SUM(Hletdr3)+Lletdr3	
Equivalent Doses - Falcon - LSA										
High LET dose rate	mSv/d	Hletdr4	6.5E-05	9.4E-04	8.8E-03	2.7E-03	1.5E-01	1.6E-01	=Idrat4*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr4	9.6E-04						=Xdrat4	
Total dose rate	mSv/d	tdr4	1.6E-01						=SUM(Hletdr4)+Lletdr4	
Equivalent Doses - Falcon - RSA										
High LET dose rate	mSv/d	Hletdr5	6.5E-05	9.4E-04	8.8E-03	2.7E-03	1.5E-01	1.6E-01	=Idrat5*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr5	9.6E-04						=Xdrat5	
Total dose rate	mSv/d	tdr5	1.6E-01						=SUM(Hletdr5)+Lletdr5	
Equivalent Doses - Fox - LSA										
High LET dose rate	mSv/d	Hletdr6	1.2E-04	2.1E-04	8.3E-04	3.1E-06	1.1E-02	1.2E-02	=Idrat6*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr6	9.6E-04						=Xdrat6	
Total dose rate	mSv/d	tdr6	1.3E-02						=SUM(Hletdr6)+Lletdr6	
Equivalent Doses - Lemming - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr7	8.6E-04	9.4E-03	4.0E-02	1.0E-03	6.2E-02	1.1E-01	=Idrat7*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr7	9.6E-04						=Xdrat7	
Total dose rate	mSv/d	tdr7	1.1E-01						=SUM(Hletdr7)+Lletdr7	
Equivalent Doses - Lemming - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr8	8.5E-04	9.4E-03	4.0E-02	1.0E-03	6.2E-02	1.1E-01	=Idrat8*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr8	9.6E-04						=Xdrat8	
Total dose rate	mSv/d	tdr8	1.1E-01						=SUM(Hletdr8)+Lletdr8	
Equivalent Doses - Lemming - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr9	8.8E-04	9.4E-03	4.0E-02	1.0E-03	6.2E-02	1.1E-01	=Idrat9*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr9	9.6E-04						=Xdrat9	
Total dose rate	mSv/d	tdr9	1.1E-01						=SUM(Hletdr9)+Lletdr9	
Equivalent Doses - Lemming - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr10	8.6E-04	9.4E-03	4.0E-02	1.0E-03	6.2E-02	1.1E-01	=Idrat10*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr10	9.6E-04						=Xdrat10	
Total dose rate	mSv/d	tdr10	1.1E-01						=SUM(Hletdr10)+Lletdr10	

Table H.2-3

Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

Equivalent Doses - Lapland Longspur - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr11	2.3E-04	8.9E-03	3.3E-02	8.1E-04	1.1E-01	1.5E-01	=Idrat11*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr11	9.6E-04						=Xdrat11	
Total dose rate	mSv/d	tdr11	1.5E-01						=SUM(Hletdr11)+Lletdr11	
Equivalent Doses - Lapland Longspur - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr12	3.1E-04	8.9E-03	3.4E-02	8.2E-04	1.1E-01	1.5E-01	=Idrat12*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr12	9.6E-04						=Xdrat12	
Total dose rate	mSv/d	tdr12	1.6E-01						=SUM(Hletdr12)+Lletdr12	
Equivalent Doses - Lapland Longspur - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr13	7.4E-05	8.9E-03	3.2E-02	8.1E-04	1.1E-01	1.5E-01	=Idrat13*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr13	9.6E-04						=Xdrat13	
Total dose rate	mSv/d	tdr13	1.5E-01						=SUM(Hletdr13)+Lletdr13	
Equivalent Doses - Lapland Longspur - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr14	3.5E-04	8.9E-03	3.3E-02	8.1E-04	1.1E-01	1.5E-01	=Idrat14*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr14	9.6E-04						=Xdrat14	
Total dose rate	mSv/d	tdr14	1.5E-01						=SUM(Hletdr14)+Lletdr14	
Equivalent Doses - Long-Tailed Duck - Rock Lake										
High LET dose rate	mSv/d	Hletdr15	3.2E-04	1.6E-03	5.9E-02	3.9E-04	1.7E-01	2.3E-01	=Idrat15*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr15	9.6E-04						=Xdrat15	
Total dose rate	mSv/d	tdr15	2.3E-01						=SUM(Hletdr15)+Lletdr15	
Equivalent Doses - Long-Tailed Duck - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr16	4.9E-04	1.5E-03	5.7E-02	3.7E-04	1.6E-01	2.2E-01	=Idrat16*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr16	9.6E-04						=Xdrat16	
Total dose rate	mSv/d	tdr16	2.2E-01						=SUM(Hletdr16)+Lletdr16	
Equivalent Doses - Long-Tailed Duck - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr17	6.3E-04	1.5E-03	5.7E-02	3.7E-04	1.7E-01	2.3E-01	=Idrat17*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr17	9.6E-04						=Xdrat17	
Total dose rate	mSv/d	tdr17	2.3E-01						=SUM(Hletdr17)+Lletdr17	
Equivalent Doses - Merganser - Rock Lake										
High LET dose rate	mSv/d	Hletdr18	4.4E-05	8.3E-04	2.5E-03	1.2E-04	2.1E-02	2.4E-02	=Idrat18*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr18	9.6E-04						=Xdrat18	
Total dose rate	mSv/d	tdr18	2.5E-02						=SUM(Hletdr18)+Lletdr18	
Equivalent Doses - Merganser - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr19	4.4E-05	8.1E-04	2.4E-03	1.2E-04	2.0E-02	2.3E-02	=Idrat19*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr19	9.6E-04						=Xdrat19	
Total dose rate	mSv/d	tdr19	2.4E-02						=SUM(Hletdr19)+Lletdr19	
Equivalent Doses - Merganser - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr20	4.4E-05	8.1E-04	2.4E-03	1.2E-04	2.0E-02	2.4E-02	=Idrat20*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr20	9.6E-04						=Xdrat20	
Total dose rate	mSv/d	tdr20	2.5E-02						=SUM(Hletdr20)+Lletdr20	
Equivalent Doses - Muskox - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr21	6.7E-04	4.9E-04	1.8E-03	4.1E-06	6.1E-02	6.3E-02	=Idrat21*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr21	9.6E-04						=Xdrat21	
Total dose rate	mSv/d	tdr21	6.4E-02						=SUM(Hletdr21)+Lletdr21	
Equivalent Doses - Muskox - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr22	3.5E-04	8.9E-03	3.3E-02	8.1E-04	1.1E-01	1.5E-01	=Idrat22*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr22	9.6E-04						=Xdrat22	
Total dose rate	mSv/d	tdr22	1.5E-01						=SUM(Hletdr22)+Lletdr22	
Equivalent Doses - Northern Pintail - Rock Lake										
High LET dose rate	mSv/d	Hletdr23	1.3E-04	1.2E-02	1.4E-02	1.0E-03	1.8E-01	2.1E-01	=Idrat23*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr23	9.6E-04						=Xdrat23	
Total dose rate	mSv/d	tdr23	2.1E-01						=SUM(Hletdr23)+Lletdr23	
Equivalent Doses - Northern Pintail - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr24	1.5E-04	1.2E-02	1.4E-02	9.8E-04	1.8E-01	2.0E-01	=Idrat24*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr24	9.6E-04						=Xdrat24	
Total dose rate	mSv/d	tdr24	2.0E-01						=SUM(Hletdr24)+Lletdr24	
Equivalent Doses - Northern Pintail - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr25	2.1E-04	1.2E-02	1.4E-02	9.8E-04	1.7E-01	2.0E-01	=Idrat25*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr25	9.6E-04						=Xdrat25	
Total dose rate	mSv/d	tdr25	2.0E-01						=SUM(Hletdr25)+Lletdr25	
Equivalent Doses - Ptarmigan - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr26	2.4E-04	2.4E-03	1.4E-02	2.3E-03	4.2E-01	4.4E-01	=Idrat26*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr26	9.6E-04						=Xdrat26	
Total dose rate	mSv/d	tdr26	4.4E-01						=SUM(Hletdr26)+Lletdr26	
Equivalent Doses - Ptarmigan - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr27	2.6E-04	2.4E-03	1.4E-02	2.3E-03	4.2E-01	4.4E-01	=Idrat27*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr27	9.6E-04						=Xdrat27	
Total dose rate	mSv/d	tdr27	4.4E-01						=SUM(Hletdr27)+Lletdr27	

Table H.2-3

Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

Equivalent Doses - Ptarmigan - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr28	2.1E-04	2.4E-03	1.3E-02	2.3E-03	4.2E-01	4.4E-01	=Idrat28*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr28	9.6E-04						=Xdrat28	
Total dose rate	mSv/d	tdr28	4.4E-01						=SUM(Hletdr28)+Lletdr28	
Equivalent Doses - Ptarmigan - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr29	3.0E-04	2.4E-03	1.4E-02	2.3E-03	4.2E-01	4.4E-01	=Idrat29*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr29	9.6E-04						=Xdrat29	
Total dose rate	mSv/d	tdr29	4.4E-01						=SUM(Hletdr29)+Lletdr29	
Equivalent Doses - Sandpiper - Rock Lake										
High LET dose rate	mSv/d	Hletdr30	1.1E-03	5.6E-03	9.7E-02	1.1E-03	3.5E-01	4.6E-01	=Idrat30*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr30	9.6E-04						=Xdrat30	
Total dose rate	mSv/d	tdr30	4.6E-01						=SUM(Hletdr30)+Lletdr30	
Equivalent Doses - Sandpiper - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr31	1.3E-03	5.6E-03	9.4E-02	1.1E-03	3.4E-01	4.4E-01	=Idrat31*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr31	9.6E-04						=Xdrat31	
Total dose rate	mSv/d	tdr31	4.4E-01						=SUM(Hletdr31)+Lletdr31	
Equivalent Doses - Sandpiper - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr32	1.5E-03	5.5E-03	9.5E-02	1.1E-03	3.4E-01	4.4E-01	=Idrat32*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr32	9.6E-04						=Xdrat32	
Total dose rate	mSv/d	tdr32	4.4E-01						=SUM(Hletdr32)+Lletdr32	
Equivalent Doses - Shrew - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr33	5.9E-04	1.7E-03	2.6E-02	2.2E-04	1.7E-02	4.5E-02	=Idrat33*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr33	9.6E-04						=Xdrat33	
Total dose rate	mSv/d	tdr33	4.6E-02						=SUM(Hletdr33)+Lletdr33	
Equivalent Doses - Shrew - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr34	8.1E-04	1.8E-03	2.8E-02	2.2E-04	1.8E-02	4.8E-02	=Idrat34*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr34	9.6E-04						=Xdrat34	
Total dose rate	mSv/d	tdr34	4.9E-02						=SUM(Hletdr34)+Lletdr34	
Equivalent Doses - Shrew - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr35	5.4E-05	1.6E-03	2.4E-02	2.2E-04	1.7E-02	4.2E-02	=Idrat35*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr35	9.6E-04						=Xdrat35	
Total dose rate	mSv/d	tdr35	4.3E-02						=SUM(Hletdr35)+Lletdr35	
Equivalent Doses - Shrew - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr36	1.3E-03	1.7E-03	2.5E-02	2.2E-04	1.7E-02	4.6E-02	=Idrat36*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr36	2.7E-04						=Xdrat36	
Total dose rate	mSv/d	tdr36	4.6E-02						=SUM(Hletdr36)+Lletdr36	
Equivalent Doses - Squirrel - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr37	5.1E-04	9.0E-03	4.1E-02	5.0E-04	3.0E-02	8.1E-02	=Idrat37*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr37	9.6E-04						=Xdrat37	
Total dose rate	mSv/d	tdr37	8.2E-02						=SUM(Hletdr37)+Lletdr37	
Equivalent Doses - Squirrel - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr38	5.1E-04	9.0E-03	4.1E-02	5.0E-04	3.0E-02	8.1E-02	=Idrat38*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr38	9.6E-04						=Xdrat38	
Total dose rate	mSv/d	tdr38	8.2E-02						=SUM(Hletdr38)+Lletdr38	
Equivalent Doses - Squirrel - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr39	5.3E-04	9.0E-03	4.1E-02	5.0E-04	3.0E-02	8.1E-02	=Idrat39*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr39	9.6E-04						=Xdrat39	
Total dose rate	mSv/d	tdr39	8.2E-02						=SUM(Hletdr39)+Lletdr39	
Equivalent Doses - Squirrel - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr40	5.1E-04	9.0E-03	4.1E-02	5.0E-04	3.0E-02	8.1E-02	=Idrat40*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr40	9.6E-04						=Xdrat40	
Total dose rate	mSv/d	tdr40	8.2E-02						=SUM(Hletdr40)+Lletdr40	
Equivalent Doses - Wolf - LSA										
High LET dose rate	mSv/d	Hletdr41	2.4E-04	7.7E-05	1.4E-04	8.7E-08	2.3E-02	2.3E-02	=Idrat41*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr41	9.6E-04						=Xdrat41	
Total dose rate	mSv/d	tdr41	2.4E-02						=SUM(Hletdr41)+Lletdr41	
Equivalent Doses - Wolf - RSA										
High LET dose rate	mSv/d	Hletdr42	2.4E-04	7.7E-05	1.4E-04	8.7E-08	2.3E-02	2.3E-02	=Idrat42*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr42	9.6E-04						=Xdrat42	
Total dose rate	mSv/d	tdr42	2.4E-02						=SUM(Hletdr42)+Lletdr42	
Equivalent Doses - Wolverine - LSA										
High LET dose rate	mSv/d	Hletdr43	3.3E-04	3.0E-04	1.4E-03	2.8E-06	5.3E-03	7.3E-03	=Idrat43*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr43	9.6E-04						=Xdrat43	
Total dose rate	mSv/d	tdr43	8.3E-03						=SUM(Hletdr43)+Lletdr43	
Equivalent Doses - Wolverine - RSA										
High LET dose rate	mSv/d	Hletdr44	3.3E-04	3.0E-04	1.4E-03	2.8E-06	5.3E-03	7.3E-03	=Idrat44*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr44	9.6E-04						=Xdrat44	
Total dose rate	mSv/d	tdr44	8.3E-03						=SUM(Hletdr44)+Lletdr44	

Table H.2-3
Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

SUMMARY

1 Screening Criterion in mGy/d	Total Absorbed Dose mGy/d	Total Equivalent Dose mSv/d	Index (Absorbed Dose)	Index (Equivalent Dose)
Bear - LSA	1.5E-03	2.1E-02	1.5E-03	2.1E-02
Caribou - LSA	6.7E-03	2.3E-01	6.7E-03	2.3E-01
Caribou - RSA	6.7E-03	2.3E-01	6.7E-03	2.3E-01
Falcon - LSA	7.6E-03	1.6E-01	7.6E-03	1.6E-01
Falcon - RSA	7.6E-03	1.6E-01	7.6E-03	1.6E-01
Fox - LSA	1.3E-03	1.3E-02	1.3E-03	1.3E-02
Lemming - Rock Lake Watershed	4.8E-03	1.1E-01	4.8E-03	1.1E-01
Lemming - JSL @ Kiggavik Discharge	4.8E-03	1.1E-01	4.8E-03	1.1E-01
Lemming - Kiggavik Camp	4.8E-03	1.1E-01	4.8E-03	1.1E-01
Lemming - JSL @ Sissons Discharge	4.8E-03	1.1E-01	4.8E-03	1.1E-01
Lapland Longspur - Rock Lake Watershed	5.5E-03	1.5E-01	5.5E-03	1.5E-01
Lapland Longspur - JSL @ Kiggavik Discharge	5.6E-03	1.6E-01	5.6E-03	1.6E-01
Lapland Longspur - Kiggavik Camp	5.4E-03	1.5E-01	5.4E-03	1.5E-01
Lapland Longspur - JSL @ Sissons Discharge	5.5E-03	1.5E-01	5.5E-03	1.5E-01
Long-Tailed Duck - Rock Lake	7.1E-03	2.3E-01	7.1E-03	2.3E-01
Long-Tailed Duck - JSL @ Kiggavik Discharge	6.9E-03	2.2E-01	6.9E-03	2.2E-01
Long-Tailed Duck - JSL @ Sissons Discharge	7.0E-03	2.3E-01	7.0E-03	2.3E-01
Merganser - Rock Lake	1.7E-03	2.5E-02	1.7E-03	2.5E-02
Merganser - JSL @ Kiggavik Discharge	1.7E-03	2.4E-02	1.7E-03	2.4E-02
Merganser - JSL @ Sissons Discharge	1.7E-03	2.5E-02	1.7E-03	2.5E-02
Muskox - JSL @ Kiggavik Discharge	2.6E-03	6.4E-02	2.6E-03	6.4E-02
Muskox - JSL @ Sissons Discharge	5.5E-03	1.5E-01	5.5E-03	1.5E-01
Northern Pintail - Rock Lake	7.2E-03	2.1E-01	7.2E-03	2.1E-01
Northern Pintail - JSL @ Kiggavik Discharge	7.0E-03	2.0E-01	7.0E-03	2.0E-01
Northern Pintail - JSL @ Sissons Discharge	7.0E-03	2.0E-01	7.0E-03	2.0E-01
Ptarmigan - Rock Lake Watershed	1.4E-02	4.4E-01	1.4E-02	4.4E-01
Ptarmigan - JSL @ Kiggavik Discharge	1.4E-02	4.4E-01	1.4E-02	4.4E-01
Ptarmigan - Kiggavik Camp	1.4E-02	4.4E-01	1.4E-02	4.4E-01
Ptarmigan - JSL @ Sissons Discharge	1.4E-02	4.4E-01	1.4E-02	4.4E-01
Sandpiper - Rock Lake	1.3E-02	4.6E-01	1.3E-02	4.6E-01
Sandpiper - JSL @ Kiggavik Discharge	1.3E-02	4.4E-01	1.3E-02	4.4E-01
Sandpiper - JSL @ Sissons Discharge	1.3E-02	4.4E-01	1.3E-02	4.4E-01
Shrew - Rock Lake Watershed	2.3E-03	4.6E-02	2.3E-03	4.6E-02
Shrew - JSL @ Kiggavik Discharge	2.4E-03	4.9E-02	2.4E-03	4.9E-02
Shrew - Kiggavik Camp	2.2E-03	4.3E-02	2.2E-03	4.3E-02
Shrew - JSL @ Sissons Discharge	1.6E-03	4.6E-02	1.6E-03	4.6E-02
Squirrel - Rock Lake Watershed	3.5E-03	8.2E-02	3.5E-03	8.2E-02
Squirrel - JSL @ Kiggavik Discharge	3.5E-03	8.2E-02	3.5E-03	8.2E-02
Squirrel - Kiggavik Camp	3.5E-03	8.2E-02	3.5E-03	8.2E-02
Squirrel - JSL @ Sissons Discharge	3.5E-03	8.2E-02	3.5E-03	8.2E-02
Wolf - LSA	1.5E-03	2.4E-02	1.5E-03	2.4E-02
Wolf - RSA	1.5E-03	2.4E-02	1.5E-03	2.4E-02
Wolverine - LSA	1.1E-03	8.3E-03	1.1E-03	8.3E-03
Wolverine - RSA	1.1E-03	8.3E-03	1.1E-03	8.3E-03

U-238+ Internal U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235
Ra-226+ Internal Ra-226 + 0.3* (Rn-222 + ...Po-214)
Pb-210+ Internal Pb-210 + Bi-210

Table H.2-3

Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

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DOSES TO SELECTED VECs - Average Total Dose

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Absorbed Doses - Bear - LSA									
Concentration	Bq/g	Crad	1.27E-05	3.35E-05	2.28E-05	5.31E-05	1.79E-03		
Internal Dose Factor	mGy/d per Bq/g	ldcf	1.4E-01	6.6E-02	1.6E-01	6.0E-03	7.4E-02		
Internal dose rate	mGy/d	ldrat	1.8E-06	2.2E-06	3.6E-06	3.2E-07	1.3E-04	1.4E-04	=Crad*ldcf
External Gamma rate	uGy/h	Xgrat	0.04						
Fraction of time on site	-	fts	1.00						
External dose rate	mGy/d	Xdrat	9.6E-04						=Xgrat*24*fts/1000
Internal plus external	mGy/d	tdrat	1.1E-03						=SUM(ldrat)+Xdrat
Absorbed Doses - Caribou - LSA									
Concentration	Bq/g	Crad2	2.99E-05	4.43E-05	8.68E-05	9.05E-04	2.39E-02		
Internal dose rate	mGy/d	ldrat2	4.3E-06	2.9E-06	1.4E-05	5.5E-06	1.8E-03	1.8E-03	=Crad2*ldcf
Fraction of time on site	-	fts2	1.00						
External dose rate	mGy/d	Xdrat2	9.6E-04						=Xgrat*24*fts2/1000
Internal plus external	mGy/d	tdrat2	2.8E-03						=SUM(ldrat2)+Xdrat2
Absorbed Doses - Caribou - RSA									
Concentration	Bq/g	Crad3	2.99E-05	4.43E-05	8.68E-05	9.05E-04	2.39E-02		
Internal dose rate	mGy/d	ldrat3	4.3E-06	2.9E-06	1.4E-05	5.5E-06	1.8E-03	1.8E-03	=Crad3*ldcf
Fraction of time on site	-	fts3	1.00						
External dose rate	mGy/d	Xdrat3	9.6E-04						=Xgrat*24*fts3/1000
Internal plus external	mGy/d	tdrat3	2.8E-03						=SUM(ldrat3)+Xdrat3
Absorbed Doses - Falcon - LSA									
Concentration	Bq/g	Crad4	3.80E-06	1.20E-04	3.99E-04	1.34E-01	1.47E-02		
Internal dose rate	mGy/d	ldrat4	5.4E-07	7.9E-06	6.3E-05	8.1E-04	1.1E-03	2.0E-03	=Crad4*ldcf
Fraction of time on site	-	fts4	1.00						
External dose rate	mGy/d	Xdrat4	9.6E-04						=Xgrat*24*fts4/1000
Internal plus external	mGy/d	tdrat4	2.9E-03						=SUM(ldrat4)+Xdrat4
Absorbed Doses - Falcon - RSA									
Concentration	Bq/g	Crad5	3.79E-06	1.20E-04	3.98E-04	1.34E-01	1.47E-02		
Internal dose rate	mGy/d	ldrat5	5.4E-07	7.9E-06	6.3E-05	8.1E-04	1.1E-03	2.0E-03	=Crad5*ldcf
Fraction of time on site	-	fts5	1.00						
External dose rate	mGy/d	Xdrat5	9.6E-04						=Xgrat*24*fts5/1000
Internal plus external	mGy/d	tdrat5	2.9E-03						=SUM(ldrat5)+Xdrat5
Absorbed Doses - Fox - LSA									
Concentration	Bq/g	Crad6	8.21E-06	2.48E-05	5.34E-05	1.28E-04	1.09E-03		
Internal dose rate	mGy/d	ldrat6	1.2E-06	1.6E-06	8.5E-06	7.7E-07	8.0E-05	9.2E-05	=Crad6*ldcf
Fraction of time on site	-	fts6	1.00						
External dose rate	mGy/d	Xdrat6	9.6E-04						=Xgrat*24*fts6/1000
Internal plus external	mGy/d	tdrat6	1.1E-03						=SUM(ldrat6)+Xdrat6
Absorbed Doses - Lemming - Rock Lake Watershed									
Concentration	Bq/g	Crad7	3.23E-05	1.14E-03	2.26E-03	4.73E-02	6.01E-03		
Internal dose rate	mGy/d	ldrat7	4.6E-06	7.5E-05	3.6E-04	2.8E-04	4.4E-04	1.2E-03	=Crad7*ldcf
Fraction of time on site	-	fts7	1.00						
External dose rate	mGy/d	Xdrat7	9.6E-04						=Xgrat*24*fts7/1000
Internal plus external	mGy/d	tdrat7	2.1E-03						=SUM(ldrat7)+Xdrat7
Absorbed Doses - Lemming - JSL @ Kiggavik Discharge									
Concentration	Bq/g	Crad8	3.23E-05	1.14E-03	2.26E-03	4.73E-02	6.01E-03		
Internal dose rate	mGy/d	ldrat8	4.6E-06	7.5E-05	3.6E-04	2.8E-04	4.4E-04	1.2E-03	=Crad8*ldcf
Fraction of time on site	-	fts8	1.00						
External dose rate	mGy/d	Xdrat8	9.6E-04						=Xgrat*24*fts8/1000
Internal plus external	mGy/d	tdrat8	2.1E-03						=SUM(ldrat8)+Xdrat8
Absorbed Doses - Lemming - Kiggavik Camp									
Concentration	Bq/g	Crad9	3.43E-05	1.15E-03	2.26E-03	4.73E-02	6.02E-03		
Internal dose rate	mGy/d	ldrat9	4.9E-06	7.6E-05	3.6E-04	2.9E-04	4.5E-04	1.2E-03	=Crad9*ldcf
Fraction of time on site	-	fts9	1.00						
External dose rate	mGy/d	Xdrat9	9.6E-04						=Xgrat*24*fts9/1000
Internal plus external	mGy/d	tdrat9	2.1E-03						=SUM(ldrat9)+Xdrat9
Absorbed Doses - Lemming - JSL @ Sissons Discharge									
Concentration	Bq/g	Crad10	3.24E-05	1.14E-03	2.26E-03	4.73E-02	6.01E-03		
Internal dose rate	mGy/d	ldrat10	4.6E-06	7.5E-05	3.6E-04	2.8E-04	4.4E-04	1.2E-03	=Crad10*ldcf
Fraction of time on site	-	fts10	1.00						
External dose rate	mGy/d	Xdrat10	9.6E-04						=Xgrat*24*fts10/1000
Internal plus external	mGy/d	tdrat10	2.1E-03						=SUM(ldrat10)+Xdrat10
Absorbed Doses - Lapland Longspur - Rock Lake Watershed									
Concentration	Bq/g	Crad11	1.15E-05	7.43E-04	1.58E-03	3.56E-02	1.28E-02		
Internal dose rate	mGy/d	ldrat11	1.6E-06	4.9E-05	2.5E-04	2.1E-04	9.5E-04	1.5E-03	=Crad11*ldcf
Fraction of time on site	-	fts11	1.00						
External dose rate	mGy/d	Xdrat11	9.6E-04						=Xgrat*24*fts11/1000
Internal plus external	mGy/d	tdrat11	2.4E-03						=SUM(ldrat11)+Xdrat11

Table H.2-3

Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

Absorbed Doses - Lapland Longspur - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad12	1.27E-05	7.45E-04	1.62E-03	3.59E-02	1.32E-02			
Internal dose rate	mGy/d	ldrat12	1.8E-06	4.9E-05	2.6E-04	2.2E-04	9.8E-04	1.5E-03	=Crad12*ldcf	
Fraction of time on site	-	fts12	1.00							
External dose rate	mGy/d	Xdrat12	9.6E-04						=Xgrat*24*fts12/1000	
Internal plus external	mGy/d	tdrat12	2.5E-03						=SUM(ldrat12)+Xdrat12	
Absorbed Doses - Lapland Longspur - Kiggavik Camp										
Concentration	Bq/g	Crad13	3.57E-06	7.44E-04	1.55E-03	3.54E-02	1.27E-02			
Internal dose rate	mGy/d	ldrat13	5.1E-07	4.9E-05	2.5E-04	2.1E-04	9.4E-04	1.4E-03	=Crad13*ldcf	
Fraction of time on site	-	fts13	1.00							
External dose rate	mGy/d	Xdrat13	9.6E-04						=Xgrat*24*fts13/1000	
Internal plus external	mGy/d	tdrat13	2.4E-03						=SUM(ldrat13)+Xdrat13	
Absorbed Doses - Lapland Longspur - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad14	1.17E-05	7.43E-04	1.58E-03	3.56E-02	1.29E-02			
Internal dose rate	mGy/d	ldrat14	1.7E-06	4.9E-05	2.5E-04	2.1E-04	9.5E-04	1.5E-03	=Crad14*ldcf	
Fraction of time on site	-	fts14	1.00							
External dose rate	mGy/d	Xdrat14	9.6E-04						=Xgrat*24*fts14/1000	
Internal plus external	mGy/d	tdrat14	2.4E-03						=SUM(ldrat14)+Xdrat14	
Absorbed Doses - Long-Tailed Duck - Rock Lake										
Concentration	Bq/g	Crad15	1.95E-05	2.01E-04	2.30E-03	1.99E-02	1.55E-02			
Internal dose rate	mGy/d	ldrat15	2.8E-06	1.3E-05	3.6E-04	1.2E-04	1.1E-03	1.6E-03	=Crad15*ldcf	
Fraction of time on site	-	fts15	1.00							
External dose rate	mGy/d	Xdrat15	9.6E-04						=Xgrat*24*fts15/1000	
Internal plus external	mGy/d	tdrat15	2.6E-03						=SUM(ldrat15)+Xdrat15	
Absorbed Doses - Long-Tailed Duck - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad16	1.85E-05	1.95E-04	2.21E-03	1.92E-02	1.49E-02			
Internal dose rate	mGy/d	ldrat16	2.6E-06	1.3E-05	3.5E-04	1.2E-04	1.1E-03	1.6E-03	=Crad16*ldcf	
Fraction of time on site	-	fts16	1.00							
External dose rate	mGy/d	Xdrat16	9.6E-04						=Xgrat*24*fts16/1000	
Internal plus external	mGy/d	tdrat16	2.5E-03						=SUM(ldrat16)+Xdrat16	
Absorbed Doses - Long-Tailed Duck - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad17	1.81E-05	1.95E-04	2.22E-03	1.93E-02	1.50E-02			
Internal dose rate	mGy/d	ldrat17	2.6E-06	1.3E-05	3.5E-04	1.2E-04	1.1E-03	1.6E-03	=Crad17*ldcf	
Fraction of time on site	-	fts17	1.00							
External dose rate	mGy/d	Xdrat17	9.6E-04						=Xgrat*24*fts17/1000	
Internal plus external	mGy/d	tdrat17	2.6E-03						=SUM(ldrat17)+Xdrat17	
Absorbed Doses - Merganser - Rock Lake										
Concentration	Bq/g	Crad18	2.29E-06	8.27E-05	1.25E-04	6.29E-03	2.11E-03			
Internal dose rate	mGy/d	ldrat18	3.3E-07	5.4E-06	2.0E-05	3.8E-05	1.6E-04	2.2E-04	=Crad18*ldcf	
Fraction of time on site	-	fts18	1.00							
External dose rate	mGy/d	Xdrat18	9.6E-04						=Xgrat*24*fts18/1000	
Internal plus external	mGy/d	tdrat18	1.2E-03						=SUM(ldrat18)+Xdrat18	
Absorbed Doses - Merganser - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad19	2.29E-06	7.96E-05	1.17E-04	6.09E-03	2.00E-03			
Internal dose rate	mGy/d	ldrat19	3.3E-07	5.2E-06	1.9E-05	3.7E-05	1.5E-04	2.1E-04	=Crad19*ldcf	
Fraction of time on site	-	fts19	1.00							
External dose rate	mGy/d	Xdrat19	9.6E-04						=Xgrat*24*fts19/1000	
Internal plus external	mGy/d	tdrat19	1.2E-03						=SUM(ldrat19)+Xdrat19	
Absorbed Doses - Merganser - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad20	2.29E-06	7.99E-05	1.18E-04	6.10E-03	2.02E-03			
Internal dose rate	mGy/d	ldrat20	3.2E-07	5.3E-06	1.9E-05	3.7E-05	1.5E-04	2.1E-04	=Crad20*ldcf	
Fraction of time on site	-	fts20	1.00							
External dose rate	mGy/d	Xdrat20	9.6E-04						=Xgrat*24*fts20/1000	
Internal plus external	mGy/d	tdrat20	1.2E-03						=SUM(ldrat20)+Xdrat20	
Absorbed Doses - Muskox - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad21	3.12E-05	5.03E-05	7.12E-05	2.23E-04	6.91E-03			
Internal dose rate	mGy/d	ldrat21	4.4E-06	3.3E-06	1.1E-05	1.3E-06	5.1E-04	5.3E-04	=Crad21*ldcf	
Fraction of time on site	-	fts21	1.00							
External dose rate	mGy/d	Xdrat21	9.6E-04						=Xgrat*24*fts21/1000	
Internal plus external	mGy/d	tdrat21	1.5E-03						=SUM(ldrat21)+Xdrat21	
Absorbed Doses - Muskox - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad22	1.17E-05	7.43E-04	1.58E-03	3.56E-02	1.29E-02			
Internal dose rate	mGy/d	ldrat22	1.7E-06	4.9E-05	2.5E-04	2.1E-04	9.5E-04	1.5E-03	=Crad22*ldcf	
Fraction of time on site	-	fts22	1.00							
External dose rate	mGy/d	Xdrat22	9.6E-04						=Xgrat*24*fts22/1000	
Internal plus external	mGy/d	tdrat22	2.4E-03						=SUM(ldrat22)+Xdrat22	
Absorbed Doses - Northern Pintail - Rock Lake										
Concentration	Bq/g	Crad23	7.17E-06	1.15E-03	6.60E-04	5.23E-02	1.76E-02			
Internal dose rate	mGy/d	ldrat23	1.0E-06	7.5E-05	1.0E-04	3.2E-04	1.3E-03	1.8E-03	=Crad23*ldcf	
Fraction of time on site	-	fts23	1.00							
External dose rate	mGy/d	Xdrat23	9.6E-04						=Xgrat*24*fts23/1000	
Internal plus external	mGy/d	tdrat23	2.8E-03						=SUM(ldrat23)+Xdrat23	

Table H.2-3

Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

Absorbed Doses - Northern Pintail - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad24	6.94E-06	1.10E-03	6.36E-04	5.04E-02	1.68E-02			
Internal dose rate	mGy/d	Idrat24	9.9E-07	7.2E-05	1.0E-04	3.0E-04	1.2E-03	1.7E-03	=Crad24*Idcf	
Fraction of time on site	-	fts24	1.00							
External dose rate	mGy/d	Xdrat24	9.6E-04						=Xgrat*24*fts24/1000	
Internal plus external	mGy/d	tdrat24	2.7E-03						=SUM(Idrat24)+Xdrat24	
Absorbed Doses - Northern Pintail - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad25	6.74E-06	1.11E-03	6.38E-04	5.06E-02	1.70E-02			
Internal dose rate	mGy/d	Idrat25	9.6E-07	7.3E-05	1.0E-04	3.1E-04	1.3E-03	1.7E-03	=Crad25*Idcf	
Fraction of time on site	-	fts25	1.00							
External dose rate	mGy/d	Xdrat25	9.6E-04						=Xgrat*24*fts25/1000	
Internal plus external	mGy/d	tdrat25	2.7E-03						=SUM(Idrat25)+Xdrat25	
Absorbed Doses - Ptarmigan - Rock Lake Watershed										
Concentration	Bq/g	Crad26	1.15E-05	2.26E-04	6.65E-04	1.38E-01	4.75E-02			
Internal dose rate	mGy/d	Idrat26	1.6E-06	1.5E-05	1.1E-04	8.3E-04	3.5E-03	4.5E-03	=Crad26*Idcf	
Fraction of time on site	-	fts26	1.00							
External dose rate	mGy/d	Xdrat26	9.6E-04						=Xgrat*24*fts26/1000	
Internal plus external	mGy/d	tdrat26	5.4E-03						=SUM(Idrat26)+Xdrat26	
Absorbed Doses - Ptarmigan - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad27	1.19E-05	2.26E-04	6.77E-04	1.38E-01	4.77E-02			
Internal dose rate	mGy/d	Idrat27	1.7E-06	1.5E-05	1.1E-04	8.3E-04	3.5E-03	4.5E-03	=Crad27*Idcf	
Fraction of time on site	-	fts27	1.00							
External dose rate	mGy/d	Xdrat27	9.6E-04						=Xgrat*24*fts27/1000	
Internal plus external	mGy/d	tdrat27	5.4E-03						=SUM(Idrat27)+Xdrat27	
Absorbed Doses - Ptarmigan - Kiggavik Camp										
Concentration	Bq/g	Crad28	9.45E-06	2.27E-04	6.56E-04	1.38E-01	4.76E-02			
Internal dose rate	mGy/d	Idrat28	1.3E-06	1.5E-05	1.0E-04	8.3E-04	3.5E-03	4.5E-03	=Crad28*Idcf	
Fraction of time on site	-	fts28	1.00							
External dose rate	mGy/d	Xdrat28	9.6E-04						=Xgrat*24*fts28/1000	
Internal plus external	mGy/d	tdrat28	5.4E-03						=SUM(Idrat28)+Xdrat28	
Absorbed Doses - Ptarmigan - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad29	1.16E-05	2.26E-04	6.64E-04	1.38E-01	4.76E-02			
Internal dose rate	mGy/d	Idrat29	1.6E-06	1.5E-05	1.1E-04	8.3E-04	3.5E-03	4.5E-03	=Crad29*Idcf	
Fraction of time on site	-	fts29	1.00							
External dose rate	mGy/d	Xdrat29	9.6E-04						=Xgrat*24*fts29/1000	
Internal plus external	mGy/d	tdrat29	5.4E-03						=SUM(Idrat29)+Xdrat29	
Absorbed Doses - Sandpiper - Rock Lake										
Concentration	Bq/g	Crad30	4.85E-05	7.57E-04	3.86E-03	5.69E-02	3.46E-02			
Internal dose rate	mGy/d	Idrat30	6.9E-06	5.0E-05	6.1E-04	3.4E-04	2.6E-03	3.6E-03	=Crad30*Idcf	
Fraction of time on site	-	fts30	1.00							
External dose rate	mGy/d	Xdrat30	9.6E-04						=Xgrat*24*fts30/1000	
Internal plus external	mGy/d	tdrat30	4.5E-03						=SUM(Idrat30)+Xdrat30	
Absorbed Doses - Sandpiper - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad31	4.69E-05	7.45E-04	3.72E-03	5.55E-02	3.32E-02			
Internal dose rate	mGy/d	Idrat31	6.7E-06	4.9E-05	5.9E-04	3.3E-04	2.5E-03	3.4E-03	=Crad31*Idcf	
Fraction of time on site	-	fts31	1.00							
External dose rate	mGy/d	Xdrat31	9.6E-04						=Xgrat*24*fts31/1000	
Internal plus external	mGy/d	tdrat31	4.4E-03						=SUM(Idrat31)+Xdrat31	
Absorbed Doses - Sandpiper - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad32	4.58E-05	7.45E-04	3.74E-03	5.55E-02	3.34E-02			
Internal dose rate	mGy/d	Idrat32	6.5E-06	4.9E-05	5.9E-04	3.3E-04	2.5E-03	3.5E-03	=Crad32*Idcf	
Fraction of time on site	-	fts32	1.00							
External dose rate	mGy/d	Xdrat32	9.6E-04						=Xgrat*24*fts32/1000	
Internal plus external	mGy/d	tdrat32	4.4E-03						=SUM(Idrat32)+Xdrat32	
Absorbed Doses - Shrew - Rock Lake Watershed										
Concentration	Bq/g	Crad33	3.27E-05	1.90E-04	1.27E-03	1.12E-02	2.07E-03			
Internal dose rate	mGy/d	Idrat33	4.6E-06	1.3E-05	2.0E-04	6.8E-05	1.5E-04	4.4E-04	=Crad33*Idcf	
Fraction of time on site	-	fts33	1.00							
External dose rate	mGy/d	Xdrat33	9.6E-04						=Xgrat*24*fts33/1000	
Internal plus external	mGy/d	tdrat33	1.4E-03						=SUM(Idrat33)+Xdrat33	
Absorbed Doses - Shrew - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad34	3.69E-05	2.00E-04	1.37E-03	1.13E-02	2.12E-03			
Internal dose rate	mGy/d	Idrat34	5.2E-06	1.3E-05	2.2E-04	6.8E-05	1.6E-04	4.6E-04	=Crad34*Idcf	
Fraction of time on site	-	fts34	1.00							
External dose rate	mGy/d	Xdrat34	9.6E-04						=Xgrat*24*fts34/1000	
Internal plus external	mGy/d	tdrat34	1.4E-03						=SUM(Idrat34)+Xdrat34	
Absorbed Doses - Shrew - Kiggavik Camp										
Concentration	Bq/g	Crad35	3.15E-06	1.85E-04	1.18E-03	1.11E-02	2.05E-03			
Internal dose rate	mGy/d	Idrat35	4.5E-07	1.2E-05	1.9E-04	6.7E-05	1.5E-04	4.2E-04	=Crad35*Idcf	
Fraction of time on site	-	fts35	1.00							
External dose rate	mGy/d	Xdrat35	9.6E-04						=Xgrat*24*fts35/1000	
Internal plus external	mGy/d	tdrat35	1.4E-03						=SUM(Idrat35)+Xdrat35	
Absorbed Doses - Shrew - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad36	3.34E-05	1.91E-04	1.26E-03	1.12E-02	2.08E-03			
Internal dose rate	mGy/d	Idrat36	4.7E-06	1.3E-05	2.0E-04	6.8E-05	1.5E-04	4.4E-04	=Crad36*Idcf	
Fraction of time on site	-	fts36	1.00							

Table H.2-3

Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

External dose rate	mGy/d	Xdrat36	2.7E-04							=Xgrat*24*fts36/3600
Internal plus external	mGy/d	tdrat36	7.1E-04							=SUM(ldrat36)+Xdrat36
Absorbed Doses - Squirrel - Rock Lake Watershed										
Concentration	Bq/g	Crad37	2.70E-05	9.88E-04	1.48E-03	1.97E-02	2.34E-03			
Internal dose rate	mGy/d	ldrat37	3.8E-06	6.5E-05	2.4E-04	1.2E-04	1.7E-04	6.0E-04		=Crad37*ldcf
Fraction of time on site	-	fts37	1.00							
External dose rate	mGy/d	Xdrat37	9.6E-04							=Xgrat*24*fts37/1000
Internal plus external	mGy/d	tdrat37	1.6E-03							=SUM(ldrat37)+Xdrat37
Absorbed Doses - Squirrel - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad38	2.70E-05	9.87E-04	1.48E-03	1.97E-02	2.34E-03			
Internal dose rate	mGy/d	ldrat38	3.8E-06	6.5E-05	2.4E-04	1.2E-04	1.7E-04	6.0E-04		=Crad38*ldcf
Fraction of time on site	-	fts38	1.00							
External dose rate	mGy/d	Xdrat38	9.6E-04							=Xgrat*24*fts38/1000
Internal plus external	mGy/d	tdrat38	1.6E-03							=SUM(ldrat38)+Xdrat38
Absorbed Doses - Squirrel - Kiggavik Camp										
Concentration	Bq/g	Crad39	2.87E-05	9.95E-04	1.49E-03	1.97E-02	2.35E-03			
Internal dose rate	mGy/d	ldrat39	4.1E-06	6.5E-05	2.4E-04	1.2E-04	1.7E-04	6.0E-04		=Crad39*ldcf
Fraction of time on site	-	fts39	1.00							
External dose rate	mGy/d	Xdrat39	9.6E-04							=Xgrat*24*fts39/1000
Internal plus external	mGy/d	tdrat39	1.6E-03							=SUM(ldrat39)+Xdrat39

Table H.2-3

Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

Absorbed Doses - Squirrel - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad40	2.71E-05	9.88E-04	1.48E-03	1.97E-02	2.34E-03			
Internal dose rate	mGy/d	Idrat40	3.8E-06	6.5E-05	2.4E-04	1.2E-04	1.7E-04	6.0E-04	=Crad40*Idcf	
Fraction of time on site	-	fts40	1.00							
External dose rate	mGy/d	Xdrat40	9.6E-04						=Xgrat*24*fts40/1000	
Internal plus external	mGy/d	tdrat40	1.6E-03						=SUM(Idrat40)+Xdrat40	
Absorbed Doses - Wolf - LSA										
Concentration	Bq/g	Crad41	1.16E-05	9.61E-06	6.02E-06	3.68E-06	1.90E-03			
Internal dose rate	mGy/d	Idrat41	1.6E-06	6.3E-07	9.6E-07	2.2E-08	1.4E-04	1.4E-04	=Crad41*Idcf	
Fraction of time on site	-	fts41	1.00							
External dose rate	mGy/d	Xdrat41	9.6E-04						=Xgrat*24*fts41/1000	
Internal plus external	mGy/d	tdrat41	1.1E-03						=SUM(Idrat41)+Xdrat41	
Absorbed Doses - Wolf - RSA										
Concentration	Bq/g	Crad42	1.16E-05	9.60E-06	6.02E-06	3.68E-06	1.90E-03			
Internal dose rate	mGy/d	Idrat42	1.6E-06	6.3E-07	9.6E-07	2.2E-08	1.4E-04	1.4E-04	=Crad42*Idcf	
Fraction of time on site	-	fts42	1.00							
External dose rate	mGy/d	Xdrat42	9.6E-04						=Xgrat*24*fts42/1000	
Internal plus external	mGy/d	tdrat42	1.1E-03						=SUM(Idrat42)+Xdrat42	
Absorbed Doses - Wolverine - LSA										
Concentration	Bq/g	Crad43	1.56E-05	3.36E-05	5.34E-05	1.05E-04	4.77E-04			
Internal dose rate	mGy/d	Idrat43	2.2E-06	2.2E-06	8.5E-06	6.3E-07	3.5E-05	4.9E-05	=Crad43*Idcf	
Fraction of time on site	-	fts43	1.00							
External dose rate	mGy/d	Xdrat43	9.6E-04						=Xgrat*24*fts43/1000	
Internal plus external	mGy/d	tdrat43	1.0E-03						=SUM(Idrat43)+Xdrat43	
Absorbed Doses - Wolverine - RSA										
Concentration	Bq/g	Crad44	1.56E-05	3.37E-05	5.34E-05	1.05E-04	4.77E-04			
Internal dose rate	mGy/d	Idrat44	2.2E-06	2.2E-06	8.5E-06	6.3E-07	3.5E-05	4.9E-05	=Crad44*Idcf	
Fraction of time on site	-	fts44	1.00							
External dose rate	mGy/d	Xdrat44	9.6E-04						=Xgrat*24*fts44/1000	
Internal plus external	mGy/d	tdrat44	1.0E-03						=SUM(Idrat44)+Xdrat44	
Equivalent Doses - Bear - LSA										
RBE for alpha	Sv/Gy	RBE	40							
High LET dose rate	mSv/d	Hletdr	7.2E-05	8.8E-05	1.4E-04	3.2E-07	5.3E-03	5.6E-03	=Idrat*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr	9.6E-04						=Xdrat	
Total dose rate	mSv/d	tdr	6.6E-03						=SUM(Hletdr)+Lletdr	
Equivalent Doses - Caribou - LSA										
High LET dose rate	mSv/d	Hletdr2	1.7E-04	1.2E-04	5.5E-04	5.5E-06	7.1E-02	7.2E-02	=Idrat2*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr2	9.6E-04						=Xdrat2	
Total dose rate	mSv/d	tdr2	7.3E-02						=SUM(Hletdr2)+Lletdr2	
Equivalent Doses - Caribou - RSA										
High LET dose rate	mSv/d	Hletdr3	1.7E-04	1.2E-04	5.5E-04	5.5E-06	7.1E-02	7.2E-02	=Idrat3*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr3	9.6E-04						=Xdrat3	
Total dose rate	mSv/d	tdr3	7.3E-02						=SUM(Hletdr3)+Lletdr3	
Equivalent Doses - Falcon - LSA										
High LET dose rate	mSv/d	Hletdr4	2.2E-05	3.2E-04	2.5E-03	8.1E-04	4.3E-02	4.7E-02	=Idrat4*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr4	9.6E-04						=Xdrat4	
Total dose rate	mSv/d	tdr4	4.8E-02						=SUM(Hletdr4)+Lletdr4	
Equivalent Doses - Falcon - RSA										
High LET dose rate	mSv/d	Hletdr5	2.2E-05	3.2E-04	2.5E-03	8.1E-04	4.3E-02	4.7E-02	=Idrat5*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr5	9.6E-04						=Xdrat5	
Total dose rate	mSv/d	tdr5	4.8E-02						=SUM(Hletdr5)+Lletdr5	
Equivalent Doses - Fox - LSA										
High LET dose rate	mSv/d	Hletdr6	4.7E-05	6.5E-05	3.4E-04	7.7E-07	3.2E-03	3.7E-03	=Idrat6*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr6	9.6E-04						=Xdrat6	
Total dose rate	mSv/d	tdr6	4.6E-03						=SUM(Hletdr6)+Lletdr6	
Equivalent Doses - Lemming - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr7	1.8E-04	3.0E-03	1.4E-02	2.8E-04	1.8E-02	3.6E-02	=Idrat7*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr7	9.6E-04						=Xdrat7	
Total dose rate	mSv/d	tdr7	3.7E-02						=SUM(Hletdr7)+Lletdr7	
Equivalent Doses - Lemming - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr8	1.8E-04	3.0E-03	1.4E-02	2.8E-04	1.8E-02	3.6E-02	=Idrat8*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr8	9.6E-04						=Xdrat8	
Total dose rate	mSv/d	tdr8	3.7E-02						=SUM(Hletdr8)+Lletdr8	
Equivalent Doses - Lemming - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr9	1.9E-04	3.0E-03	1.4E-02	2.9E-04	1.8E-02	3.6E-02	=Idrat9*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr9	9.6E-04						=Xdrat9	
Total dose rate	mSv/d	tdr9	3.7E-02						=SUM(Hletdr9)+Lletdr9	
Equivalent Doses - Lemming - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr10	1.8E-04	3.0E-03	1.4E-02	2.8E-04	1.8E-02	3.6E-02	=Idrat10*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr10	9.6E-04						=Xdrat10	
Total dose rate	mSv/d	tdr10	3.7E-02						=SUM(Hletdr10)+Lletdr10	

Table H.2-3

Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

Equivalent Doses - Lapland Longspur - Rock Lake Watershed									
High LET dose rate	mSv/d	Hletdr11	6.5E-05	2.0E-03	1.0E-02	2.1E-04	3.8E-02	5.0E-02	=Idrat11*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr11	9.6E-04						=Xdrat11
Total dose rate	mSv/d	tdr11	5.1E-02						=SUM(Hletdr11)+Lletdr11
Equivalent Doses - Lapland Longspur - JSL @ Kiggavik Discharge									
High LET dose rate	mSv/d	Hletdr12	7.2E-05	2.0E-03	1.0E-02	2.2E-04	3.9E-02	5.2E-02	=Idrat12*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr12	9.6E-04						=Xdrat12
Total dose rate	mSv/d	tdr12	5.3E-02						=SUM(Hletdr12)+Lletdr12
Equivalent Doses - Lapland Longspur - Kiggavik Camp									
High LET dose rate	mSv/d	Hletdr13	2.0E-05	2.0E-03	9.8E-03	2.1E-04	3.7E-02	4.9E-02	=Idrat13*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr13	9.6E-04						=Xdrat13
Total dose rate	mSv/d	tdr13	5.0E-02						=SUM(Hletdr13)+Lletdr13
Equivalent Doses - Lapland Longspur - JSL @ Sissons Discharge									
High LET dose rate	mSv/d	Hletdr14	6.7E-05	2.0E-03	1.0E-02	2.1E-04	3.8E-02	5.0E-02	=Idrat14*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr14	9.6E-04						=Xdrat14
Total dose rate	mSv/d	tdr14	5.1E-02						=SUM(Hletdr14)+Lletdr14
Equivalent Doses - Long-Tailed Duck - Rock Lake									
High LET dose rate	mSv/d	Hletdr15	1.1E-04	5.3E-04	1.5E-02	1.2E-04	4.6E-02	6.1E-02	=Idrat15*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr15	9.6E-04						=Xdrat15
Total dose rate	mSv/d	tdr15	6.2E-02						=SUM(Hletdr15)+Lletdr15
Equivalent Doses - Long-Tailed Duck - JSL @ Kiggavik Discharge									
High LET dose rate	mSv/d	Hletdr16	1.1E-04	5.1E-04	1.4E-02	1.2E-04	4.4E-02	5.9E-02	=Idrat16*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr16	9.6E-04						=Xdrat16
Total dose rate	mSv/d	tdr16	6.0E-02						=SUM(Hletdr16)+Lletdr16
Equivalent Doses - Long-Tailed Duck - JSL @ Sissons Discharge									
High LET dose rate	mSv/d	Hletdr17	1.0E-04	5.1E-04	1.4E-02	1.2E-04	4.4E-02	5.9E-02	=Idrat17*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr17	9.6E-04						=Xdrat17
Total dose rate	mSv/d	tdr17	6.0E-02						=SUM(Hletdr17)+Lletdr17
Equivalent Doses - Merganser - Rock Lake									
High LET dose rate	mSv/d	Hletdr18	1.3E-05	2.2E-04	7.9E-04	3.8E-05	6.3E-03	7.3E-03	=Idrat18*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr18	9.6E-04						=Xdrat18
Total dose rate	mSv/d	tdr18	8.3E-03						=SUM(Hletdr18)+Lletdr18
Equivalent Doses - Merganser - JSL @ Kiggavik Discharge									
High LET dose rate	mSv/d	Hletdr19	1.3E-05	2.1E-04	7.5E-04	3.7E-05	5.9E-03	6.9E-03	=Idrat19*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr19	9.6E-04						=Xdrat19
Total dose rate	mSv/d	tdr19	7.9E-03						=SUM(Hletdr19)+Lletdr19
Equivalent Doses - Merganser - JSL @ Sissons Discharge									
High LET dose rate	mSv/d	Hletdr20	1.3E-05	2.1E-04	7.5E-04	3.7E-05	6.0E-03	7.0E-03	=Idrat20*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr20	9.6E-04						=Xdrat20
Total dose rate	mSv/d	tdr20	8.0E-03						=SUM(Hletdr20)+Lletdr20
Equivalent Doses - Muskox - JSL @ Kiggavik Discharge									
High LET dose rate	mSv/d	Hletdr21	1.8E-04	1.3E-04	4.5E-04	1.3E-06	2.0E-02	2.1E-02	=Idrat21*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr21	9.6E-04						=Xdrat21
Total dose rate	mSv/d	tdr21	2.2E-02						=SUM(Hletdr21)+Lletdr21
Equivalent Doses - Muskox - JSL @ Sissons Discharge									
High LET dose rate	mSv/d	Hletdr22	6.7E-05	2.0E-03	1.0E-02	2.1E-04	3.8E-02	5.0E-02	=Idrat22*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr22	9.6E-04						=Xdrat22
Total dose rate	mSv/d	tdr22	5.1E-02						=SUM(Hletdr22)+Lletdr22
Equivalent Doses - Northern Pintail - Rock Lake									
High LET dose rate	mSv/d	Hletdr23	4.1E-05	3.0E-03	4.2E-03	3.2E-04	5.2E-02	6.0E-02	=Idrat23*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr23	9.6E-04						=Xdrat23
Total dose rate	mSv/d	tdr23	6.1E-02						=SUM(Hletdr23)+Lletdr23
Equivalent Doses - Northern Pintail - JSL @ Kiggavik Discharge									
High LET dose rate	mSv/d	Hletdr24	3.9E-05	2.9E-03	4.0E-03	3.0E-04	5.0E-02	5.7E-02	=Idrat24*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr24	9.6E-04						=Xdrat24
Total dose rate	mSv/d	tdr24	5.8E-02						=SUM(Hletdr24)+Lletdr24
Equivalent Doses - Northern Pintail - JSL @ Sissons Discharge									
High LET dose rate	mSv/d	Hletdr25	3.8E-05	2.9E-03	4.1E-03	3.1E-04	5.0E-02	5.8E-02	=Idrat25*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr25	9.6E-04						=Xdrat25
Total dose rate	mSv/d	tdr25	5.8E-02						=SUM(Hletdr25)+Lletdr25
Equivalent Doses - Ptarmigan - Rock Lake Watershed									
High LET dose rate	mSv/d	Hletdr26	6.5E-05	5.9E-04	4.2E-03	8.3E-04	1.4E-01	1.5E-01	=Idrat26*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr26	9.6E-04						=Xdrat26
Total dose rate	mSv/d	tdr26	1.5E-01						=SUM(Hletdr26)+Lletdr26
Equivalent Doses - Ptarmigan - JSL @ Kiggavik Discharge									
High LET dose rate	mSv/d	Hletdr27	6.8E-05	6.0E-04	4.3E-03	8.3E-04	1.4E-01	1.5E-01	=Idrat27*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr27	9.6E-04						=Xdrat27
Total dose rate	mSv/d	tdr27	1.5E-01						=SUM(Hletdr27)+Lletdr27

Table H.2-3

Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

Equivalent Doses - Ptarmigan - Kiggavik Camp											
High LET dose rate	mSv/d	Hletdr28	5.4E-05	6.0E-04	4.2E-03	8.3E-04	1.4E-01	1.5E-01	=Idrat28*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr28	9.6E-04						=Xdrat28		
Total dose rate	mSv/d	tdr28	1.5E-01						=SUM(Hletdr28)+Lletdr28		
Equivalent Doses - Ptarmigan - JSL @ Sissons Discharge											
High LET dose rate	mSv/d	Hletdr29	6.6E-05	5.9E-04	4.2E-03	8.3E-04	1.4E-01	1.5E-01	=Idrat29*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr29	9.6E-04						=Xdrat29		
Total dose rate	mSv/d	tdr29	1.5E-01						=SUM(Hletdr29)+Lletdr29		
Equivalent Doses - Sandpiper - Rock Lake											
High LET dose rate	mSv/d	Hletdr30	2.8E-04	2.0E-03	2.5E-02	3.4E-04	1.0E-01	1.3E-01	=Idrat30*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr30	9.6E-04						=Xdrat30		
Total dose rate	mSv/d	tdr30	1.3E-01						=SUM(Hletdr30)+Lletdr30		
Equivalent Doses - Sandpiper - JSL @ Kiggavik Discharge											
High LET dose rate	mSv/d	Hletdr31	2.7E-04	2.0E-03	2.4E-02	3.3E-04	9.8E-02	1.2E-01	=Idrat31*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr31	9.6E-04						=Xdrat31		
Total dose rate	mSv/d	tdr31	1.3E-01						=SUM(Hletdr31)+Lletdr31		
Equivalent Doses - Sandpiper - JSL @ Sissons Discharge											
High LET dose rate	mSv/d	Hletdr32	2.6E-04	2.0E-03	2.4E-02	3.3E-04	9.9E-02	1.3E-01	=Idrat32*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr32	9.6E-04						=Xdrat32		
Total dose rate	mSv/d	tdr32	1.3E-01						=SUM(Hletdr32)+Lletdr32		
Equivalent Doses - Shrew - Rock Lake Watershed											
High LET dose rate	mSv/d	Hletdr33	1.9E-04	5.0E-04	8.1E-03	6.8E-05	6.1E-03	1.5E-02	=Idrat33*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr33	9.6E-04						=Xdrat33		
Total dose rate	mSv/d	tdr33	1.6E-02						=SUM(Hletdr33)+Lletdr33		
Equivalent Doses - Shrew - JSL @ Kiggavik Discharge											
High LET dose rate	mSv/d	Hletdr34	2.1E-04	5.3E-04	8.7E-03	6.8E-05	6.3E-03	1.6E-02	=Idrat34*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr34	9.6E-04						=Xdrat34		
Total dose rate	mSv/d	tdr34	1.7E-02						=SUM(Hletdr34)+Lletdr34		
Equivalent Doses - Shrew - Kiggavik Camp											
High LET dose rate	mSv/d	Hletdr35	1.8E-05	4.9E-04	7.5E-03	6.7E-05	6.1E-03	1.4E-02	=Idrat35*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr35	9.6E-04						=Xdrat35		
Total dose rate	mSv/d	tdr35	1.5E-02						=SUM(Hletdr35)+Lletdr35		
Equivalent Doses - Shrew - JSL @ Sissons Discharge											
High LET dose rate	mSv/d	Hletdr36	1.9E-04	5.0E-04	8.0E-03	6.8E-05	6.2E-03	1.5E-02	=Idrat36*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr36	2.7E-04						=Xdrat36		
Total dose rate	mSv/d	tdr36	1.5E-02						=SUM(Hletdr36)+Lletdr36		
Equivalent Doses - Squirrel - Rock Lake Watershed											
High LET dose rate	mSv/d	Hletdr37	1.5E-04	2.6E-03	9.4E-03	1.2E-04	6.9E-03	1.9E-02	=Idrat37*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr37	9.6E-04						=Xdrat37		
Total dose rate	mSv/d	tdr37	2.0E-02						=SUM(Hletdr37)+Lletdr37		
Equivalent Doses - Squirrel - JSL @ Kiggavik Discharge											
High LET dose rate	mSv/d	Hletdr38	1.5E-04	2.6E-03	9.4E-03	1.2E-04	6.9E-03	1.9E-02	=Idrat38*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr38	9.6E-04						=Xdrat38		
Total dose rate	mSv/d	tdr38	2.0E-02						=SUM(Hletdr38)+Lletdr38		
Equivalent Doses - Squirrel - Kiggavik Camp											
High LET dose rate	mSv/d	Hletdr39	1.6E-04	2.6E-03	9.4E-03	1.2E-04	6.9E-03	1.9E-02	=Idrat39*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr39	9.6E-04						=Xdrat39		
Total dose rate	mSv/d	tdr39	2.0E-02						=SUM(Hletdr39)+Lletdr39		
Equivalent Doses - Squirrel - JSL @ Sissons Discharge											
High LET dose rate	mSv/d	Hletdr40	1.5E-04	2.6E-03	9.4E-03	1.2E-04	6.9E-03	1.9E-02	=Idrat40*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr40	9.6E-04						=Xdrat40		
Total dose rate	mSv/d	tdr40	2.0E-02						=SUM(Hletdr40)+Lletdr40		
Equivalent Doses - Wolf - LSA											
High LET dose rate	mSv/d	Hletdr41	6.6E-05	2.5E-05	3.8E-05	2.2E-08	5.6E-03	5.8E-03	=Idrat41*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr41	9.6E-04						=Xdrat41		
Total dose rate	mSv/d	tdr41	6.7E-03						=SUM(Hletdr41)+Lletdr41		
Equivalent Doses - Wolf - RSA											
High LET dose rate	mSv/d	Hletdr42	6.6E-05	2.5E-05	3.8E-05	2.2E-08	5.6E-03	5.8E-03	=Idrat42*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr42	9.6E-04						=Xdrat42		
Total dose rate	mSv/d	tdr42	6.7E-03						=SUM(Hletdr42)+Lletdr42		
Equivalent Doses - Wolverine - LSA											
High LET dose rate	mSv/d	Hletdr43	8.9E-05	8.9E-05	3.4E-04	6.3E-07	1.4E-03	1.9E-03	=Idrat43*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr43	9.6E-04						=Xdrat43		
Total dose rate	mSv/d	tdr43	2.9E-03						=SUM(Hletdr43)+Lletdr43		
Equivalent Doses - Wolverine - RSA											
High LET dose rate	mSv/d	Hletdr44	8.9E-05	8.9E-05	3.4E-04	6.3E-07	1.4E-03	1.9E-03	=Idrat44*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr44	9.6E-04						=Xdrat44		
Total dose rate	mSv/d	tdr44	2.9E-03						=SUM(Hletdr44)+Lletdr44		

Table H.2-3
Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

SUMMARY

1 Screening Criterion in mGy/d	Total Absorbed Dose mGy/d	Total Equivalent Dose mSv/d	Index (Absorbed Dose)	Index (Equivalent Dose)
Bear - LSA	1.1E-03	6.6E-03	1.1E-03	6.6E-03
Caribou - LSA	2.8E-03	7.3E-02	2.8E-03	7.3E-02
Caribou - RSA	2.8E-03	7.3E-02	2.8E-03	7.3E-02
Falcon - LSA	2.9E-03	4.8E-02	2.9E-03	4.8E-02
Falcon - RSA	2.9E-03	4.8E-02	2.9E-03	4.8E-02
Fox - LSA	1.1E-03	4.6E-03	1.1E-03	4.6E-03
Lemming - Rock Lake Watershed	2.1E-03	3.7E-02	2.1E-03	3.7E-02
Lemming - JSL @ Kiggavik Discharge	2.1E-03	3.7E-02	2.1E-03	3.7E-02
Lemming - Kiggavik Camp	2.1E-03	3.7E-02	2.1E-03	3.7E-02
Lemming - JSL @ Sissons Discharge	2.1E-03	3.7E-02	2.1E-03	3.7E-02
Lapland Longspur - Rock Lake Watershed	2.4E-03	5.1E-02	2.4E-03	5.1E-02
Lapland Longspur - JSL @ Kiggavik Discharge	2.5E-03	5.3E-02	2.5E-03	5.3E-02
Lapland Longspur - Kiggavik Camp	2.4E-03	5.0E-02	2.4E-03	5.0E-02
Lapland Longspur - JSL @ Sissons Discharge	2.4E-03	5.1E-02	2.4E-03	5.1E-02
Long-Tailed Duck - Rock Lake	2.6E-03	6.2E-02	2.6E-03	6.2E-02
Long-Tailed Duck - JSL @ Kiggavik Discharge	2.5E-03	6.0E-02	2.5E-03	6.0E-02
Long-Tailed Duck - JSL @ Sissons Discharge	2.6E-03	6.0E-02	2.6E-03	6.0E-02
Merganser - Rock Lake	1.2E-03	8.3E-03	1.2E-03	8.3E-03
Merganser - JSL @ Kiggavik Discharge	1.2E-03	7.9E-03	1.2E-03	7.9E-03
Merganser - JSL @ Sissons Discharge	1.2E-03	8.0E-03	1.2E-03	8.0E-03
Muskox - JSL @ Kiggavik Discharge	1.5E-03	2.2E-02	1.5E-03	2.2E-02
Muskox - JSL @ Sissons Discharge	2.4E-03	5.1E-02	2.4E-03	5.1E-02
Northern Pintail - Rock Lake	2.8E-03	6.1E-02	2.8E-03	6.1E-02
Northern Pintail - JSL @ Kiggavik Discharge	2.7E-03	5.8E-02	2.7E-03	5.8E-02
Northern Pintail - JSL @ Sissons Discharge	2.7E-03	5.8E-02	2.7E-03	5.8E-02
Ptarmigan - Rock Lake Watershed	5.4E-03	1.5E-01	5.4E-03	1.5E-01
Ptarmigan - JSL @ Kiggavik Discharge	5.4E-03	1.5E-01	5.4E-03	1.5E-01
Ptarmigan - Kiggavik Camp	5.4E-03	1.5E-01	5.4E-03	1.5E-01
Ptarmigan - JSL @ Sissons Discharge	5.4E-03	1.5E-01	5.4E-03	1.5E-01
Sandpiper - Rock Lake	4.5E-03	1.3E-01	4.5E-03	1.3E-01
Sandpiper - JSL @ Kiggavik Discharge	4.4E-03	1.3E-01	4.4E-03	1.3E-01
Sandpiper - JSL @ Sissons Discharge	4.4E-03	1.3E-01	4.4E-03	1.3E-01
Shrew - Rock Lake Watershed	1.4E-03	1.6E-02	1.4E-03	1.6E-02
Shrew - JSL @ Kiggavik Discharge	1.4E-03	1.7E-02	1.4E-03	1.7E-02
Shrew - Kiggavik Camp	1.4E-03	1.5E-02	1.4E-03	1.5E-02
Shrew - JSL @ Sissons Discharge	7.1E-04	1.5E-02	7.1E-04	1.5E-02
Squirrel - Rock Lake Watershed	1.6E-03	2.0E-02	1.6E-03	2.0E-02
Squirrel - JSL @ Kiggavik Discharge	1.6E-03	2.0E-02	1.6E-03	2.0E-02
Squirrel - Kiggavik Camp	1.6E-03	2.0E-02	1.6E-03	2.0E-02
Squirrel - JSL @ Sissons Discharge	1.6E-03	2.0E-02	1.6E-03	2.0E-02
Wolf - LSA	1.1E-03	6.7E-03	1.1E-03	6.7E-03
Wolf - RSA	1.1E-03	6.7E-03	1.1E-03	6.7E-03
Wolverine - LSA	1.0E-03	2.9E-03	1.0E-03	2.9E-03
Wolverine - RSA	1.0E-03	2.9E-03	1.0E-03	2.9E-03

U-238+ Internal U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235
Ra-226+ Internal Ra-226 + 0.3* (Rn-222 + ...Po-214)
Pb-210+ Internal Pb-210 + Bi-210

Table H.2-3

Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

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DOSES TO SELECTED VECs - 95th Percentile Total Dose

		U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Absorbed Doses - Bear - LSA								
Concentration	Bq/g	Crad	3.88E-05	1.51E-04	6.99E-05	1.74E-04	6.44E-03	
Internal Dose Factor	mGy/d per Bq/g	ldcf	1.4E-01	6.6E-02	1.6E-01	6.0E-03	7.4E-02	
Internal dose rate	mGy/d	ldrat	5.5E-06	9.9E-06	1.1E-05	1.1E-06	4.8E-04	5.0E-04 =Crad*ldcf
External Gamma rate	uGy/h	Xgrat	0.04					
Fraction of time on site	-	fts	1.00					
External dose rate	mGy/d	Xdrat	9.6E-04					=Xgrat*24*fts/1000
Internal plus external	mGy/d	tdrat	1.5E-03					=SUM(ldrat)+Xdrat
Absorbed Doses - Caribou - LSA								
Concentration	Bq/g	Crad2	8.62E-05	1.33E-04	2.95E-04	2.53E-03	7.65E-02	
Internal dose rate	mGy/d	ldrat2	1.2E-05	8.7E-06	4.7E-05	1.5E-05	5.7E-03	=Crad2*ldcf
Fraction of time on site	-	fts2	1.00					
External dose rate	mGy/d	Xdrat2	9.6E-04					=Xgrat*24*fts2/1000
Internal plus external	mGy/d	tdrat2	6.7E-03					=SUM(ldrat2)+Xdrat2
Absorbed Doses - Caribou - RSA								
Concentration	Bq/g	Crad3	8.62E-05	1.33E-04	2.95E-04	2.53E-03	7.65E-02	
Internal dose rate	mGy/d	ldrat3	1.2E-05	8.7E-06	4.7E-05	1.5E-05	5.7E-03	=Crad3*ldcf
Fraction of time on site	-	fts3	1.00					
External dose rate	mGy/d	Xdrat3	9.6E-04					=Xgrat*24*fts3/1000
Internal plus external	mGy/d	tdrat3	6.7E-03					=SUM(ldrat3)+Xdrat3
Absorbed Doses - Falcon - LSA								
Concentration	Bq/g	Crad4	1.15E-05	3.57E-04	1.38E-03	4.40E-01	5.01E-02	
Internal dose rate	mGy/d	ldrat4	1.6E-06	2.3E-05	2.2E-04	2.7E-03	3.7E-03	6.6E-03 =Crad4*ldcf
Fraction of time on site	-	fts4	1.00					
External dose rate	mGy/d	Xdrat4	9.6E-04					=Xgrat*24*fts4/1000
Internal plus external	mGy/d	tdrat4	7.6E-03					=SUM(ldrat4)+Xdrat4
Absorbed Doses - Falcon - RSA								
Concentration	Bq/g	Crad5	1.14E-05	3.56E-04	1.38E-03	4.40E-01	5.00E-02	
Internal dose rate	mGy/d	ldrat5	1.6E-06	2.3E-05	2.2E-04	2.7E-03	3.7E-03	6.6E-03 =Crad5*ldcf
Fraction of time on site	-	fts5	1.00					
External dose rate	mGy/d	Xdrat5	9.6E-04					=Xgrat*24*fts5/1000
Internal plus external	mGy/d	tdrat5	7.6E-03					=SUM(ldrat5)+Xdrat5
Absorbed Doses - Fox - LSA								
Concentration	Bq/g	Crad6	2.02E-05	7.95E-05	1.30E-04	5.17E-04	3.66E-03	
Internal dose rate	mGy/d	ldrat6	2.9E-06	5.2E-06	2.1E-05	3.1E-06	2.7E-04	3.0E-04 =Crad6*ldcf
Fraction of time on site	-	fts6	1.00					
External dose rate	mGy/d	Xdrat6	9.6E-04					=Xgrat*24*fts6/1000
Internal plus external	mGy/d	tdrat6	1.3E-03					=SUM(ldrat6)+Xdrat6
Absorbed Doses - Lemming - Rock Lake Watershed								
Concentration	Bq/g	Crad7	1.50E-04	3.56E-03	6.36E-03	1.69E-01	2.09E-02	
Internal dose rate	mGy/d	ldrat7	2.1E-05	2.3E-04	1.0E-03	1.0E-03	1.5E-03	3.8E-03 =Crad7*ldcf
Fraction of time on site	-	fts7	1.00					
External dose rate	mGy/d	Xdrat7	9.6E-04					=Xgrat*24*fts7/1000
Internal plus external	mGy/d	tdrat7	4.8E-03					=SUM(ldrat7)+Xdrat7
Absorbed Doses - Lemming - JSL @ Kiggavik Discharge								
Concentration	Bq/g	Crad8	1.50E-04	3.56E-03	6.36E-03	1.69E-01	2.09E-02	
Internal dose rate	mGy/d	ldrat8	2.1E-05	2.3E-04	1.0E-03	1.0E-03	1.5E-03	3.8E-03 =Crad8*ldcf
Fraction of time on site	-	fts8	1.00					
External dose rate	mGy/d	Xdrat8	9.6E-04					=Xgrat*24*fts8/1000
Internal plus external	mGy/d	tdrat8	4.8E-03					=SUM(ldrat8)+Xdrat8
Absorbed Doses - Lemming - Kiggavik Camp								
Concentration	Bq/g	Crad9	1.53E-04	3.58E-03	6.37E-03	1.69E-01	2.09E-02	
Internal dose rate	mGy/d	ldrat9	2.2E-05	2.4E-04	1.0E-03	1.0E-03	1.5E-03	3.8E-03 =Crad9*ldcf
Fraction of time on site	-	fts9	1.00					
External dose rate	mGy/d	Xdrat9	9.6E-04					=Xgrat*24*fts9/1000
Internal plus external	mGy/d	tdrat9	4.8E-03					=SUM(ldrat9)+Xdrat9
Absorbed Doses - Lemming - JSL @ Sissons Discharge								
Concentration	Bq/g	Crad10	1.51E-04	3.56E-03	6.36E-03	1.69E-01	2.09E-02	
Internal dose rate	mGy/d	ldrat10	2.1E-05	2.3E-04	1.0E-03	1.0E-03	1.5E-03	3.8E-03 =Crad10*ldcf
Fraction of time on site	-	fts10	1.00					
External dose rate	mGy/d	Xdrat10	9.6E-04					=Xgrat*24*fts10/1000
Internal plus external	mGy/d	tdrat10	4.8E-03					=SUM(ldrat10)+Xdrat10
Absorbed Doses - Lapland Longspur - Rock Lake Watershed								
Concentration	Bq/g	Crad11	4.07E-05	3.37E-03	5.24E-03	1.35E-01	3.62E-02	
Internal dose rate	mGy/d	ldrat11	5.8E-06	2.2E-04	8.3E-04	8.1E-04	2.7E-03	4.6E-03 =Crad11*ldcf
Fraction of time on site	-	fts11	1.00					
External dose rate	mGy/d	Xdrat11	9.6E-04					=Xgrat*24*fts11/1000
Internal plus external	mGy/d	tdrat11	5.5E-03					=SUM(ldrat11)+Xdrat11

Table H.2-3

Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

Absorbed Doses - Lapland Longspur - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad12	4.40E-05	3.38E-03	5.39E-03	1.36E-01	3.72E-02			
Internal dose rate	mGy/d	ldrat12	6.2E-06	2.2E-04	8.6E-04	8.2E-04	2.8E-03	4.7E-03	=Crad12*ldcf	
Fraction of time on site	-	fts12	1.00							
External dose rate	mGy/d	Xdrat12	9.6E-04						=Xgrat*24*fts12/1000	
Internal plus external	mGy/d	tdrat12	5.6E-03						=SUM(ldrat12)+Xdrat12	
Absorbed Doses - Lapland Longspur - Kiggavik Camp										
Concentration	Bq/g	Crad13	1.30E-05	3.38E-03	5.10E-03	1.34E-01	3.57E-02			
Internal dose rate	mGy/d	ldrat13	1.8E-06	2.2E-04	8.1E-04	8.1E-04	2.6E-03	4.5E-03	=Crad13*ldcf	
Fraction of time on site	-	fts13	1.00							
External dose rate	mGy/d	Xdrat13	9.6E-04						=Xgrat*24*fts13/1000	
Internal plus external	mGy/d	tdrat13	5.4E-03						=SUM(ldrat13)+Xdrat13	
Absorbed Doses - Lapland Longspur - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad14	4.08E-05	3.37E-03	5.22E-03	1.35E-01	3.64E-02			
Internal dose rate	mGy/d	ldrat14	5.8E-06	2.2E-04	8.3E-04	8.1E-04	2.7E-03	4.6E-03	=Crad14*ldcf	
Fraction of time on site	-	fts14	1.00							
External dose rate	mGy/d	Xdrat14	9.6E-04						=Xgrat*24*fts14/1000	
Internal plus external	mGy/d	tdrat14	5.5E-03						=SUM(ldrat14)+Xdrat14	
Absorbed Doses - Long-Tailed Duck - Rock Lake										
Concentration	Bq/g	Crad15	5.55E-05	6.03E-04	9.26E-03	6.39E-02	5.78E-02			
Internal dose rate	mGy/d	ldrat15	7.9E-06	4.0E-05	1.5E-03	3.9E-04	4.3E-03	6.2E-03	=Crad15*ldcf	
Fraction of time on site	-	fts15	1.00							
External dose rate	mGy/d	Xdrat15	9.6E-04						=Xgrat*24*fts15/1000	
Internal plus external	mGy/d	tdrat15	7.1E-03						=SUM(ldrat15)+Xdrat15	
Absorbed Doses - Long-Tailed Duck - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad16	5.74E-05	5.83E-04	8.89E-03	6.15E-02	5.54E-02			
Internal dose rate	mGy/d	ldrat16	8.2E-06	3.8E-05	1.4E-03	3.7E-04	4.1E-03	5.9E-03	=Crad16*ldcf	
Fraction of time on site	-	fts16	1.00							
External dose rate	mGy/d	Xdrat16	9.6E-04						=Xgrat*24*fts16/1000	
Internal plus external	mGy/d	tdrat16	6.9E-03						=SUM(ldrat16)+Xdrat16	
Absorbed Doses - Long-Tailed Duck - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad17	5.29E-05	5.85E-04	8.94E-03	6.18E-02	5.58E-02			
Internal dose rate	mGy/d	ldrat17	7.5E-06	3.9E-05	1.4E-03	3.7E-04	4.1E-03	6.0E-03	=Crad17*ldcf	
Fraction of time on site	-	fts17	1.00							
External dose rate	mGy/d	Xdrat17	9.6E-04						=Xgrat*24*fts17/1000	
Internal plus external	mGy/d	tdrat17	6.9E-03						=SUM(ldrat17)+Xdrat17	
Absorbed Doses - Merganser - Rock Lake										
Concentration	Bq/g	Crad18	7.69E-06	3.15E-04	3.99E-04	1.98E-02	7.05E-03			
Internal dose rate	mGy/d	ldrat18	1.1E-06	2.1E-05	6.3E-05	1.2E-04	5.2E-04	7.3E-04	=Crad18*ldcf	
Fraction of time on site	-	fts18	1.00							
External dose rate	mGy/d	Xdrat18	9.6E-04						=Xgrat*24*fts18/1000	
Internal plus external	mGy/d	tdrat18	1.7E-03						=SUM(ldrat18)+Xdrat18	
Absorbed Doses - Merganser - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad19	7.66E-06	3.08E-04	3.71E-04	1.97E-02	6.67E-03			
Internal dose rate	mGy/d	ldrat19	1.1E-06	2.0E-05	5.9E-05	1.2E-04	4.9E-04	6.9E-04	=Crad19*ldcf	
Fraction of time on site	-	fts19	1.00							
External dose rate	mGy/d	Xdrat19	9.6E-04						=Xgrat*24*fts19/1000	
Internal plus external	mGy/d	tdrat19	1.7E-03						=SUM(ldrat19)+Xdrat19	
Absorbed Doses - Merganser - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad20	7.65E-06	3.09E-04	3.73E-04	1.97E-02	6.68E-03			
Internal dose rate	mGy/d	ldrat20	1.1E-06	2.0E-05	5.9E-05	1.2E-04	4.9E-04	6.9E-04	=Crad20*ldcf	
Fraction of time on site	-	fts20	1.00							
External dose rate	mGy/d	Xdrat20	9.6E-04						=Xgrat*24*fts20/1000	
Internal plus external	mGy/d	tdrat20	1.7E-03						=SUM(ldrat20)+Xdrat20	
Absorbed Doses - Muskox - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad21	1.18E-04	1.86E-04	2.87E-04	6.77E-04	2.04E-02			
Internal dose rate	mGy/d	ldrat21	1.7E-05	1.2E-05	4.6E-05	4.1E-06	1.5E-03	1.6E-03	=Crad21*ldcf	
Fraction of time on site	-	fts21	1.00							
External dose rate	mGy/d	Xdrat21	9.6E-04						=Xgrat*24*fts21/1000	
Internal plus external	mGy/d	tdrat21	2.6E-03						=SUM(ldrat21)+Xdrat21	
Absorbed Doses - Muskox - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad22	4.08E-05	3.37E-03	5.22E-03	1.35E-01	3.64E-02			
Internal dose rate	mGy/d	ldrat22	5.8E-06	2.2E-04	8.3E-04	8.1E-04	2.7E-03	4.6E-03	=Crad22*ldcf	
Fraction of time on site	-	fts22	1.00							
External dose rate	mGy/d	Xdrat22	9.6E-04						=Xgrat*24*fts22/1000	
Internal plus external	mGy/d	tdrat22	5.5E-03						=SUM(ldrat22)+Xdrat22	
Absorbed Doses - Northern Pintail - Rock Lake										
Concentration	Bq/g	Crad23	2.34E-05	4.59E-03	2.26E-03	1.68E-01	6.11E-02			
Internal dose rate	mGy/d	ldrat23	3.3E-06	3.0E-04	3.6E-04	1.0E-03	4.5E-03	6.2E-03	=Crad23*ldcf	
Fraction of time on site	-	fts23	1.00							
External dose rate	mGy/d	Xdrat23	9.6E-04						=Xgrat*24*fts23/1000	
Internal plus external	mGy/d	tdrat23	7.2E-03						=SUM(ldrat23)+Xdrat23	

Table H.2-3
Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

Absorbed Doses - Northern Pintail - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad24	2.14E-05	4.42E-03	2.17E-03	1.62E-01	5.85E-02			
Internal dose rate	mGy/d	Idrat24	3.0E-06	2.9E-04	3.5E-04	9.8E-04	4.3E-03	5.9E-03	=Crad24*Idcf	
Fraction of time on site	-	fts24	1.00							
External dose rate	mGy/d	Xdrat24	9.6E-04						=Xgrat*24*fts24/1000	
Internal plus external	mGy/d	tdrat24	6.9E-03						=SUM(Idrat24)+Xdrat24	
Absorbed Doses - Northern Pintail - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad25	2.14E-05	4.45E-03	2.18E-03	1.63E-01	5.90E-02			
Internal dose rate	mGy/d	Idrat25	3.0E-06	2.9E-04	3.5E-04	9.8E-04	4.4E-03	6.0E-03	=Crad25*Idcf	
Fraction of time on site	-	fts25	1.00							
External dose rate	mGy/d	Xdrat25	9.6E-04						=Xgrat*24*fts25/1000	
Internal plus external	mGy/d	tdrat25	6.9E-03						=SUM(Idrat25)+Xdrat25	
Absorbed Doses - Ptarmigan - Rock Lake Watershed										
Concentration	Bq/g	Crad26	4.26E-05	9.01E-04	2.17E-03	3.89E-01	1.43E-01			
Internal dose rate	mGy/d	Idrat26	6.0E-06	5.9E-05	3.5E-04	2.3E-03	1.1E-02	1.3E-02	=Crad26*Idcf	
Fraction of time on site	-	fts26	1.00							
External dose rate	mGy/d	Xdrat26	9.6E-04						=Xgrat*24*fts26/1000	
Internal plus external	mGy/d	tdrat26	1.4E-02						=SUM(Idrat26)+Xdrat26	
Absorbed Doses - Ptarmigan - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad27	4.35E-05	9.03E-04	2.21E-03	3.89E-01	1.43E-01			
Internal dose rate	mGy/d	Idrat27	6.2E-06	5.9E-05	3.5E-04	2.3E-03	1.1E-02	1.3E-02	=Crad27*Idcf	
Fraction of time on site	-	fts27	1.00							
External dose rate	mGy/d	Xdrat27	9.6E-04						=Xgrat*24*fts27/1000	
Internal plus external	mGy/d	tdrat27	1.4E-02						=SUM(Idrat27)+Xdrat27	
Absorbed Doses - Ptarmigan - Kiggavik Camp										
Concentration	Bq/g	Crad28	3.58E-05	9.05E-04	2.10E-03	3.89E-01	1.44E-01			
Internal dose rate	mGy/d	Idrat28	5.1E-06	6.0E-05	3.3E-04	2.3E-03	1.1E-02	1.3E-02	=Crad28*Idcf	
Fraction of time on site	-	fts28	1.00							
External dose rate	mGy/d	Xdrat28	9.6E-04						=Xgrat*24*fts28/1000	
Internal plus external	mGy/d	tdrat28	1.4E-02						=SUM(Idrat28)+Xdrat28	
Absorbed Doses - Ptarmigan - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad29	4.28E-05	9.02E-04	2.16E-03	3.89E-01	1.43E-01			
Internal dose rate	mGy/d	Idrat29	6.1E-06	5.9E-05	3.4E-04	2.3E-03	1.1E-02	1.3E-02	=Crad29*Idcf	
Fraction of time on site	-	fts29	1.00							
External dose rate	mGy/d	Xdrat29	9.6E-04						=Xgrat*24*fts29/1000	
Internal plus external	mGy/d	tdrat29	1.4E-02						=SUM(Idrat29)+Xdrat29	
Absorbed Doses - Sandpiper - Rock Lake										
Concentration	Bq/g	Crad30	1.96E-04	2.14E-03	1.53E-02	1.83E-01	1.19E-01			
Internal dose rate	mGy/d	Idrat30	2.8E-05	1.4E-04	2.4E-03	1.1E-03	8.8E-03	1.3E-02	=Crad30*Idcf	
Fraction of time on site	-	fts30	1.00							
External dose rate	mGy/d	Xdrat30	9.6E-04						=Xgrat*24*fts30/1000	
Internal plus external	mGy/d	tdrat30	1.3E-02						=SUM(Idrat30)+Xdrat30	
Absorbed Doses - Sandpiper - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad31	1.85E-04	2.11E-03	1.47E-02	1.78E-01	1.14E-01			
Internal dose rate	mGy/d	Idrat31	2.6E-05	1.4E-04	2.3E-03	1.1E-03	8.5E-03	1.2E-02	=Crad31*Idcf	
Fraction of time on site	-	fts31	1.00							
External dose rate	mGy/d	Xdrat31	9.6E-04						=Xgrat*24*fts31/1000	
Internal plus external	mGy/d	tdrat31	1.3E-02						=SUM(Idrat31)+Xdrat31	
Absorbed Doses - Sandpiper - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad32	1.84E-04	2.10E-03	1.48E-02	1.78E-01	1.15E-01			
Internal dose rate	mGy/d	Idrat32	2.6E-05	1.4E-04	2.4E-03	1.1E-03	8.5E-03	1.2E-02	=Crad32*Idcf	
Fraction of time on site	-	fts32	1.00							
External dose rate	mGy/d	Xdrat32	9.6E-04						=Xgrat*24*fts32/1000	
Internal plus external	mGy/d	tdrat32	1.3E-02						=SUM(Idrat32)+Xdrat32	
Absorbed Doses - Shrew - Rock Lake Watershed										
Concentration	Bq/g	Crad33	1.03E-04	6.31E-04	4.02E-03	3.64E-02	5.70E-03			
Internal dose rate	mGy/d	Idrat33	1.5E-05	4.2E-05	6.4E-04	2.2E-04	4.2E-04	1.3E-03	=Crad33*Idcf	
Fraction of time on site	-	fts33	1.00							
External dose rate	mGy/d	Xdrat33	9.6E-04						=Xgrat*24*fts33/1000	
Internal plus external	mGy/d	tdrat33	2.3E-03						=SUM(Idrat33)+Xdrat33	
Absorbed Doses - Shrew - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad34	1.18E-04	6.72E-04	4.37E-03	3.68E-02	5.88E-03			
Internal dose rate	mGy/d	Idrat34	1.7E-05	4.4E-05	6.9E-04	2.2E-04	4.4E-04	1.4E-03	=Crad34*Idcf	
Fraction of time on site	-	fts34	1.00							
External dose rate	mGy/d	Xdrat34	9.6E-04						=Xgrat*24*fts34/1000	
Internal plus external	mGy/d	tdrat34	2.4E-03						=SUM(Idrat34)+Xdrat34	
Absorbed Doses - Shrew - Kiggavik Camp										
Concentration	Bq/g	Crad35	9.52E-06	6.00E-04	3.72E-03	3.61E-02	5.69E-03			
Internal dose rate	mGy/d	Idrat35	1.4E-06	4.0E-05	5.9E-04	2.2E-04	4.2E-04	1.3E-03	=Crad35*Idcf	
Fraction of time on site	-	fts35	1.00							
External dose rate	mGy/d	Xdrat35	9.6E-04						=Xgrat*24*fts35/1000	
Internal plus external	mGy/d	tdrat35	2.2E-03						=SUM(Idrat35)+Xdrat35	
Absorbed Doses - Shrew - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad36	1.04E-04	6.31E-04	4.01E-03	3.64E-02	5.72E-03			
Internal dose rate	mGy/d	Idrat36	1.5E-05	4.2E-05	6.4E-04	2.2E-04	4.2E-04	1.3E-03	=Crad36*Idcf	
Fraction of time on site	-	fts36	1.00							

Table H.2-3

Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

External dose rate	mGy/d	Xdrat36	2.7E-04							=Xgrat*24*fts36/3600
Internal plus external	mGy/d	tdrat36	1.6E-03							=SUM(ldrat36)+Xdrat36
Absorbed Doses - Squirrel - Rock Lake Watershed										
Concentration	Bq/g	Crad37	8.97E-05	3.42E-03	6.40E-03	8.33E-02	1.01E-02			
Internal dose rate	mGy/d	ldrat37	1.3E-05	2.3E-04	1.0E-03	5.0E-04	7.5E-04	2.5E-03		=Crad37*ldcf
Fraction of time on site	-	fts37	1.00							
External dose rate	mGy/d	Xdrat37	9.6E-04							=Xgrat*24*fts37/1000
Internal plus external	mGy/d	tdrat37	3.5E-03							=SUM(ldrat37)+Xdrat37
Absorbed Doses - Squirrel - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad38	8.96E-05	3.42E-03	6.40E-03	8.33E-02	1.01E-02			
Internal dose rate	mGy/d	ldrat38	1.3E-05	2.3E-04	1.0E-03	5.0E-04	7.5E-04	2.5E-03		=Crad38*ldcf
Fraction of time on site	-	fts38	1.00							
External dose rate	mGy/d	Xdrat38	9.6E-04							=Xgrat*24*fts38/1000
Internal plus external	mGy/d	tdrat38	3.5E-03							=SUM(ldrat38)+Xdrat38
Absorbed Doses - Squirrel - Kiggavik Camp										
Concentration	Bq/g	Crad39	9.34E-05	3.44E-03	6.43E-03	8.34E-02	1.01E-02			
Internal dose rate	mGy/d	ldrat39	1.3E-05	2.3E-04	1.0E-03	5.0E-04	7.5E-04	2.5E-03		=Crad39*ldcf
Fraction of time on site	-	fts39	1.00							
External dose rate	mGy/d	Xdrat39	9.6E-04							=Xgrat*24*fts39/1000
Internal plus external	mGy/d	tdrat39	3.5E-03							=SUM(ldrat39)+Xdrat39

Table H.2-3

Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

Absorbed Doses - Squirrel - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad40	8.98E-05	3.42E-03	6.40E-03	8.33E-02	1.01E-02			
Internal dose rate	mGy/d	Idrat40	1.3E-05	2.3E-04	1.0E-03	5.0E-04	7.5E-04	2.5E-03	=Crad40*Idcf	
Fraction of time on site	-	fts40	1.00							
External dose rate	mGy/d	Xdrat40	9.6E-04						=Xgrat*24*fts40/1000	
Internal plus external	mGy/d	tdrat40	3.5E-03						=SUM(Idrat40)+Xdrat40	
Absorbed Doses - Wolf - LSA										
Concentration	Bq/g	Crad41	4.16E-05	2.94E-05	2.20E-05	1.44E-05	7.66E-03			
Internal dose rate	mGy/d	Idrat41	5.9E-06	1.9E-06	3.5E-06	8.7E-08	5.7E-04	5.8E-04	=Crad41*Idcf	
Fraction of time on site	-	fts41	1.00							
External dose rate	mGy/d	Xdrat41	9.6E-04						=Xgrat*24*fts41/1000	
Internal plus external	mGy/d	tdrat41	1.5E-03						=SUM(Idrat41)+Xdrat41	
Absorbed Doses - Wolf - RSA										
Concentration	Bq/g	Crad42	4.16E-05	2.93E-05	2.20E-05	1.44E-05	7.66E-03			
Internal dose rate	mGy/d	Idrat42	5.9E-06	1.9E-06	3.5E-06	8.7E-08	5.7E-04	5.8E-04	=Crad42*Idcf	
Fraction of time on site	-	fts42	1.00							
External dose rate	mGy/d	Xdrat42	9.6E-04						=Xgrat*24*fts42/1000	
Internal plus external	mGy/d	tdrat42	1.5E-03						=SUM(Idrat42)+Xdrat42	
Absorbed Doses - Wolverine - LSA										
Concentration	Bq/g	Crad43	5.83E-05	1.16E-04	2.13E-04	4.70E-04	1.79E-03			
Internal dose rate	mGy/d	Idrat43	8.3E-06	7.6E-06	3.4E-05	2.8E-06	1.3E-04	1.9E-04	=Crad43*Idcf	
Fraction of time on site	-	fts43	1.00							
External dose rate	mGy/d	Xdrat43	9.6E-04						=Xgrat*24*fts43/1000	
Internal plus external	mGy/d	tdrat43	1.1E-03						=SUM(Idrat43)+Xdrat43	
Absorbed Doses - Wolverine - RSA										
Concentration	Bq/g	Crad44	5.82E-05	1.16E-04	2.13E-04	4.70E-04	1.79E-03			
Internal dose rate	mGy/d	Idrat44	8.3E-06	7.6E-06	3.4E-05	2.8E-06	1.3E-04	1.9E-04	=Crad44*Idcf	
Fraction of time on site	-	fts44	1.00							
External dose rate	mGy/d	Xdrat44	9.6E-04						=Xgrat*24*fts44/1000	
Internal plus external	mGy/d	tdrat44	1.1E-03						=SUM(Idrat44)+Xdrat44	
Equivalent Doses - Bear - LSA										
RBE for alpha	Sv/Gy	RBE	40							
High LET dose rate	mSv/d	Hletdr	2.2E-04	4.0E-04	4.4E-04	1.1E-06	1.9E-02	2.0E-02	=Idrat*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr	9.6E-04						=Xdrat	
Total dose rate	mSv/d	tdr	2.1E-02						=SUM(Hletdr)+Lletdr	
Equivalent Doses - Caribou - LSA										
High LET dose rate	mSv/d	Hletdr2	4.9E-04	3.5E-04	1.9E-03	1.5E-05	2.3E-01	2.3E-01	=Idrat2*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr2	9.6E-04						=Xdrat2	
Total dose rate	mSv/d	tdr2	2.3E-01						=SUM(Hletdr2)+Lletdr2	
Equivalent Doses - Caribou - RSA										
High LET dose rate	mSv/d	Hletdr3	4.9E-04	3.5E-04	1.9E-03	1.5E-05	2.3E-01	2.3E-01	=Idrat3*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr3	9.6E-04						=Xdrat3	
Total dose rate	mSv/d	tdr3	2.3E-01						=SUM(Hletdr3)+Lletdr3	
Equivalent Doses - Falcon - LSA										
High LET dose rate	mSv/d	Hletdr4	6.5E-05	9.4E-04	8.8E-03	2.7E-03	1.5E-01	1.6E-01	=Idrat4*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr4	9.6E-04						=Xdrat4	
Total dose rate	mSv/d	tdr4	1.6E-01						=SUM(Hletdr4)+Lletdr4	
Equivalent Doses - Falcon - RSA										
High LET dose rate	mSv/d	Hletdr5	6.5E-05	9.4E-04	8.8E-03	2.7E-03	1.5E-01	1.6E-01	=Idrat5*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr5	9.6E-04						=Xdrat5	
Total dose rate	mSv/d	tdr5	1.6E-01						=SUM(Hletdr5)+Lletdr5	
Equivalent Doses - Fox - LSA										
High LET dose rate	mSv/d	Hletdr6	1.1E-04	2.1E-04	8.3E-04	3.1E-06	1.1E-02	1.2E-02	=Idrat6*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr6	9.6E-04						=Xdrat6	
Total dose rate	mSv/d	tdr6	1.3E-02						=SUM(Hletdr6)+Lletdr6	
Equivalent Doses - Lemming - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr7	8.5E-04	9.4E-03	4.0E-02	1.0E-03	6.2E-02	1.1E-01	=Idrat7*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr7	9.6E-04						=Xdrat7	
Total dose rate	mSv/d	tdr7	1.1E-01						=SUM(Hletdr7)+Lletdr7	
Equivalent Doses - Lemming - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr8	8.5E-04	9.4E-03	4.0E-02	1.0E-03	6.2E-02	1.1E-01	=Idrat8*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr8	9.6E-04						=Xdrat8	
Total dose rate	mSv/d	tdr8	1.1E-01						=SUM(Hletdr8)+Lletdr8	
Equivalent Doses - Lemming - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr9	8.7E-04	9.4E-03	4.1E-02	1.0E-03	6.2E-02	1.1E-01	=Idrat9*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr9	9.6E-04						=Xdrat9	
Total dose rate	mSv/d	tdr9	1.1E-01						=SUM(Hletdr9)+Lletdr9	
Equivalent Doses - Lemming - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr10	8.6E-04	9.4E-03	4.0E-02	1.0E-03	6.2E-02	1.1E-01	=Idrat10*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr10	9.6E-04						=Xdrat10	
Total dose rate	mSv/d	tdr10	1.1E-01						=SUM(Hletdr10)+Lletdr10	

Table H.2-3

Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

Equivalent Doses - Lapland Longspur - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr11	2.3E-04	8.9E-03	3.3E-02	8.1E-04	1.1E-01	1.5E-01	=Idrat11*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr11	9.6E-04						=Xdrat11	
Total dose rate	mSv/d	tdr11	1.5E-01						=SUM(Hletdr11)+Lletdr11	
Equivalent Doses - Lapland Longspur - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr12	2.5E-04	8.9E-03	3.4E-02	8.2E-04	1.1E-01	1.5E-01	=Idrat12*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr12	9.6E-04						=Xdrat12	
Total dose rate	mSv/d	tdr12	1.6E-01						=SUM(Hletdr12)+Lletdr12	
Equivalent Doses - Lapland Longspur - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr13	7.4E-05	8.9E-03	3.2E-02	8.1E-04	1.1E-01	1.5E-01	=Idrat13*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr13	9.6E-04						=Xdrat13	
Total dose rate	mSv/d	tdr13	1.5E-01						=SUM(Hletdr13)+Lletdr13	
Equivalent Doses - Lapland Longspur - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr14	2.3E-04	8.9E-03	3.3E-02	8.1E-04	1.1E-01	1.5E-01	=Idrat14*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr14	9.6E-04						=Xdrat14	
Total dose rate	mSv/d	tdr14	1.5E-01						=SUM(Hletdr14)+Lletdr14	
Equivalent Doses - Long-Tailed Duck - Rock Lake										
High LET dose rate	mSv/d	Hletdr15	3.2E-04	1.6E-03	5.9E-02	3.9E-04	1.7E-01	2.3E-01	=Idrat15*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr15	9.6E-04						=Xdrat15	
Total dose rate	mSv/d	tdr15	2.3E-01						=SUM(Hletdr15)+Lletdr15	
Equivalent Doses - Long-Tailed Duck - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr16	3.3E-04	1.5E-03	5.7E-02	3.7E-04	1.6E-01	2.2E-01	=Idrat16*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr16	9.6E-04						=Xdrat16	
Total dose rate	mSv/d	tdr16	2.2E-01						=SUM(Hletdr16)+Lletdr16	
Equivalent Doses - Long-Tailed Duck - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr17	3.0E-04	1.5E-03	5.7E-02	3.7E-04	1.7E-01	2.2E-01	=Idrat17*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr17	9.6E-04						=Xdrat17	
Total dose rate	mSv/d	tdr17	2.3E-01						=SUM(Hletdr17)+Lletdr17	
Equivalent Doses - Merganser - Rock Lake										
High LET dose rate	mSv/d	Hletdr18	4.4E-05	8.3E-04	2.5E-03	1.2E-04	2.1E-02	2.4E-02	=Idrat18*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr18	9.6E-04						=Xdrat18	
Total dose rate	mSv/d	tdr18	2.5E-02						=SUM(Hletdr18)+Lletdr18	
Equivalent Doses - Merganser - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr19	4.4E-05	8.1E-04	2.4E-03	1.2E-04	2.0E-02	2.3E-02	=Idrat19*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr19	9.6E-04						=Xdrat19	
Total dose rate	mSv/d	tdr19	2.4E-02						=SUM(Hletdr19)+Lletdr19	
Equivalent Doses - Merganser - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr20	4.3E-05	8.1E-04	2.4E-03	1.2E-04	2.0E-02	2.3E-02	=Idrat20*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr20	9.6E-04						=Xdrat20	
Total dose rate	mSv/d	tdr20	2.4E-02						=SUM(Hletdr20)+Lletdr20	
Equivalent Doses - Muskox - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr21	6.7E-04	4.9E-04	1.8E-03	4.1E-06	6.1E-02	6.3E-02	=Idrat21*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr21	9.6E-04						=Xdrat21	
Total dose rate	mSv/d	tdr21	6.4E-02						=SUM(Hletdr21)+Lletdr21	
Equivalent Doses - Muskox - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr22	2.3E-04	8.9E-03	3.3E-02	8.1E-04	1.1E-01	1.5E-01	=Idrat22*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr22	9.6E-04						=Xdrat22	
Total dose rate	mSv/d	tdr22	1.5E-01						=SUM(Hletdr22)+Lletdr22	
Equivalent Doses - Northern Pintail - Rock Lake										
High LET dose rate	mSv/d	Hletdr23	1.3E-04	1.2E-02	1.4E-02	1.0E-03	1.8E-01	2.1E-01	=Idrat23*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr23	9.6E-04						=Xdrat23	
Total dose rate	mSv/d	tdr23	2.1E-01						=SUM(Hletdr23)+Lletdr23	
Equivalent Doses - Northern Pintail - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr24	1.2E-04	1.2E-02	1.4E-02	9.8E-04	1.7E-01	2.0E-01	=Idrat24*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr24	9.6E-04						=Xdrat24	
Total dose rate	mSv/d	tdr24	2.0E-01						=SUM(Hletdr24)+Lletdr24	
Equivalent Doses - Northern Pintail - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr25	1.2E-04	1.2E-02	1.4E-02	9.8E-04	1.7E-01	2.0E-01	=Idrat25*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr25	9.6E-04						=Xdrat25	
Total dose rate	mSv/d	tdr25	2.0E-01						=SUM(Hletdr25)+Lletdr25	
Equivalent Doses - Ptarmigan - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr26	2.4E-04	2.4E-03	1.4E-02	2.3E-03	4.2E-01	4.4E-01	=Idrat26*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr26	9.6E-04						=Xdrat26	
Total dose rate	mSv/d	tdr26	4.4E-01						=SUM(Hletdr26)+Lletdr26	
Equivalent Doses - Ptarmigan - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr27	2.5E-04	2.4E-03	1.4E-02	2.3E-03	4.2E-01	4.4E-01	=Idrat27*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr27	9.6E-04						=Xdrat27	
Total dose rate	mSv/d	tdr27	4.4E-01						=SUM(Hletdr27)+Lletdr27	

Table H.2-3

Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

Equivalent Doses - Ptarmigan - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr28	2.0E-04	2.4E-03	1.3E-02	2.3E-03	4.3E-01	4.4E-01	=Idrat28*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr28	9.6E-04						=Xdrat28	
Total dose rate	mSv/d	tdr28	4.4E-01						=SUM(Hletdr28)+Lletdr28	
Equivalent Doses - Ptarmigan - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr29	2.4E-04	2.4E-03	1.4E-02	2.3E-03	4.2E-01	4.4E-01	=Idrat29*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr29	9.6E-04						=Xdrat29	
Total dose rate	mSv/d	tdr29	4.4E-01						=SUM(Hletdr29)+Lletdr29	
Equivalent Doses - Sandpiper - Rock Lake										
High LET dose rate	mSv/d	Hletdr30	1.1E-03	5.6E-03	9.7E-02	1.1E-03	3.5E-01	4.6E-01	=Idrat30*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr30	9.6E-04						=Xdrat30	
Total dose rate	mSv/d	tdr30	4.6E-01						=SUM(Hletdr30)+Lletdr30	
Equivalent Doses - Sandpiper - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr31	1.1E-03	5.5E-03	9.4E-02	1.1E-03	3.4E-01	4.4E-01	=Idrat31*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr31	9.6E-04						=Xdrat31	
Total dose rate	mSv/d	tdr31	4.4E-01						=SUM(Hletdr31)+Lletdr31	
Equivalent Doses - Sandpiper - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr32	1.0E-03	5.5E-03	9.4E-02	1.1E-03	3.4E-01	4.4E-01	=Idrat32*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr32	9.6E-04						=Xdrat32	
Total dose rate	mSv/d	tdr32	4.4E-01						=SUM(Hletdr32)+Lletdr32	
Equivalent Doses - Shrew - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr33	5.9E-04	1.7E-03	2.6E-02	2.2E-04	1.7E-02	4.5E-02	=Idrat33*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr33	9.6E-04						=Xdrat33	
Total dose rate	mSv/d	tdr33	4.6E-02						=SUM(Hletdr33)+Lletdr33	
Equivalent Doses - Shrew - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr34	6.7E-04	1.8E-03	2.8E-02	2.2E-04	1.7E-02	4.8E-02	=Idrat34*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr34	9.6E-04						=Xdrat34	
Total dose rate	mSv/d	tdr34	4.9E-02						=SUM(Hletdr34)+Lletdr34	
Equivalent Doses - Shrew - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr35	5.4E-05	1.6E-03	2.4E-02	2.2E-04	1.7E-02	4.2E-02	=Idrat35*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr35	9.6E-04						=Xdrat35	
Total dose rate	mSv/d	tdr35	4.3E-02						=SUM(Hletdr35)+Lletdr35	
Equivalent Doses - Shrew - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr36	5.9E-04	1.7E-03	2.5E-02	2.2E-04	1.7E-02	4.5E-02	=Idrat36*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr36	2.7E-04						=Xdrat36	
Total dose rate	mSv/d	tdr36	4.5E-02						=SUM(Hletdr36)+Lletdr36	
Equivalent Doses - Squirrel - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr37	5.1E-04	9.0E-03	4.1E-02	5.0E-04	3.0E-02	8.1E-02	=Idrat37*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr37	9.6E-04						=Xdrat37	
Total dose rate	mSv/d	tdr37	8.2E-02						=SUM(Hletdr37)+Lletdr37	
Equivalent Doses - Squirrel - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr38	5.1E-04	9.0E-03	4.1E-02	5.0E-04	3.0E-02	8.1E-02	=Idrat38*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr38	9.6E-04						=Xdrat38	
Total dose rate	mSv/d	tdr38	8.2E-02						=SUM(Hletdr38)+Lletdr38	
Equivalent Doses - Squirrel - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr39	5.3E-04	9.1E-03	4.1E-02	5.0E-04	3.0E-02	8.1E-02	=Idrat39*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr39	9.6E-04						=Xdrat39	
Total dose rate	mSv/d	tdr39	8.2E-02						=SUM(Hletdr39)+Lletdr39	
Equivalent Doses - Squirrel - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr40	5.1E-04	9.0E-03	4.1E-02	5.0E-04	3.0E-02	8.1E-02	=Idrat40*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr40	9.6E-04						=Xdrat40	
Total dose rate	mSv/d	tdr40	8.2E-02						=SUM(Hletdr40)+Lletdr40	
Equivalent Doses - Wolf - LSA										
High LET dose rate	mSv/d	Hletdr41	2.4E-04	7.7E-05	1.4E-04	8.7E-08	2.3E-02	2.3E-02	=Idrat41*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr41	9.6E-04						=Xdrat41	
Total dose rate	mSv/d	tdr41	2.4E-02						=SUM(Hletdr41)+Lletdr41	
Equivalent Doses - Wolf - RSA										
High LET dose rate	mSv/d	Hletdr42	2.4E-04	7.7E-05	1.4E-04	8.7E-08	2.3E-02	2.3E-02	=Idrat42*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr42	9.6E-04						=Xdrat42	
Total dose rate	mSv/d	tdr42	2.4E-02						=SUM(Hletdr42)+Lletdr42	
Equivalent Doses - Wolverine - LSA										
High LET dose rate	mSv/d	Hletdr43	3.3E-04	3.0E-04	1.4E-03	2.8E-06	5.3E-03	7.3E-03	=Idrat43*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr43	9.6E-04						=Xdrat43	
Total dose rate	mSv/d	tdr43	8.3E-03						=SUM(Hletdr43)+Lletdr43	
Equivalent Doses - Wolverine - RSA										
High LET dose rate	mSv/d	Hletdr44	3.3E-04	3.0E-04	1.4E-03	2.8E-06	5.3E-03	7.3E-03	=Idrat44*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr44	9.6E-04						=Xdrat44	
Total dose rate	mSv/d	tdr44	8.3E-03						=SUM(Hletdr44)+Lletdr44	

Table H.2-3
Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

SUMMARY

1 Screening Criterion in mGy/d	Total Absorbed Dose mGy/d	Total Equivalent Dose mSv/d	Index (Absorbed Dose)	Index (Equivalent Dose)
Bear - LSA	1.5E-03	2.1E-02	1.5E-03	2.1E-02
Caribou - LSA	6.7E-03	2.3E-01	6.7E-03	2.3E-01
Caribou - RSA	6.7E-03	2.3E-01	6.7E-03	2.3E-01
Falcon - LSA	7.6E-03	1.6E-01	7.6E-03	1.6E-01
Falcon - RSA	7.6E-03	1.6E-01	7.6E-03	1.6E-01
Fox - LSA	1.3E-03	1.3E-02	1.3E-03	1.3E-02
Lemming - Rock Lake Watershed	4.8E-03	1.1E-01	4.8E-03	1.1E-01
Lemming - JSL @ Kiggavik Discharge	4.8E-03	1.1E-01	4.8E-03	1.1E-01
Lemming - Kiggavik Camp	4.8E-03	1.1E-01	4.8E-03	1.1E-01
Lemming - JSL @ Sissons Discharge	4.8E-03	1.1E-01	4.8E-03	1.1E-01
Lapland Longspur - Rock Lake Watershed	5.5E-03	1.5E-01	5.5E-03	1.5E-01
Lapland Longspur - JSL @ Kiggavik Discharge	5.6E-03	1.6E-01	5.6E-03	1.6E-01
Lapland Longspur - Kiggavik Camp	5.4E-03	1.5E-01	5.4E-03	1.5E-01
Lapland Longspur - JSL @ Sissons Discharge	5.5E-03	1.5E-01	5.5E-03	1.5E-01
Long-Tailed Duck - Rock Lake	7.1E-03	2.3E-01	7.1E-03	2.3E-01
Long-Tailed Duck - JSL @ Kiggavik Discharge	6.9E-03	2.2E-01	6.9E-03	2.2E-01
Long-Tailed Duck - JSL @ Sissons Discharge	6.9E-03	2.3E-01	6.9E-03	2.3E-01
Merganser - Rock Lake	1.7E-03	2.5E-02	1.7E-03	2.5E-02
Merganser - JSL @ Kiggavik Discharge	1.7E-03	2.4E-02	1.7E-03	2.4E-02
Merganser - JSL @ Sissons Discharge	1.7E-03	2.4E-02	1.7E-03	2.4E-02
Muskox - JSL @ Kiggavik Discharge	2.6E-03	6.4E-02	2.6E-03	6.4E-02
Muskox - JSL @ Sissons Discharge	5.5E-03	1.5E-01	5.5E-03	1.5E-01
Northern Pintail - Rock Lake	7.2E-03	2.1E-01	7.2E-03	2.1E-01
Northern Pintail - JSL @ Kiggavik Discharge	6.9E-03	2.0E-01	6.9E-03	2.0E-01
Northern Pintail - JSL @ Sissons Discharge	6.9E-03	2.0E-01	6.9E-03	2.0E-01
Ptarmigan - Rock Lake Watershed	1.4E-02	4.4E-01	1.4E-02	4.4E-01
Ptarmigan - JSL @ Kiggavik Discharge	1.4E-02	4.4E-01	1.4E-02	4.4E-01
Ptarmigan - Kiggavik Camp	1.4E-02	4.4E-01	1.4E-02	4.4E-01
Ptarmigan - JSL @ Sissons Discharge	1.4E-02	4.4E-01	1.4E-02	4.4E-01
Sandpiper - Rock Lake	1.3E-02	4.6E-01	1.3E-02	4.6E-01
Sandpiper - JSL @ Kiggavik Discharge	1.3E-02	4.4E-01	1.3E-02	4.4E-01
Sandpiper - JSL @ Sissons Discharge	1.3E-02	4.4E-01	1.3E-02	4.4E-01
Shrew - Rock Lake Watershed	2.3E-03	4.6E-02	2.3E-03	4.6E-02
Shrew - JSL @ Kiggavik Discharge	2.4E-03	4.9E-02	2.4E-03	4.9E-02
Shrew - Kiggavik Camp	2.2E-03	4.3E-02	2.2E-03	4.3E-02
Shrew - JSL @ Sissons Discharge	1.6E-03	4.5E-02	1.6E-03	4.5E-02
Squirrel - Rock Lake Watershed	3.5E-03	8.2E-02	3.5E-03	8.2E-02
Squirrel - JSL @ Kiggavik Discharge	3.5E-03	8.2E-02	3.5E-03	8.2E-02
Squirrel - Kiggavik Camp	3.5E-03	8.2E-02	3.5E-03	8.2E-02
Squirrel - JSL @ Sissons Discharge	3.5E-03	8.2E-02	3.5E-03	8.2E-02
Wolf - LSA	1.5E-03	2.4E-02	1.5E-03	2.4E-02
Wolf - RSA	1.5E-03	2.4E-02	1.5E-03	2.4E-02
Wolverine - LSA	1.1E-03	8.3E-03	1.1E-03	8.3E-03
Wolverine - RSA	1.1E-03	8.3E-03	1.1E-03	8.3E-03

U-238+ Internal U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235
Ra-226+ Internal Ra-226 + 0.3* (Rn-222 + ...Po-214)
Pb-210+ Internal Pb-210 + Bi-210

Table H.2-3

Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

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DOSES TO SELECTED VECs - Average Total Dose

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Absorbed Doses - Bear - LSA									
Concentration	Bq/g	Crad	1.27E-05	3.35E-05	2.28E-05	5.31E-05	1.79E-03		
Internal Dose Factor	mGy/d per Bq/g	ldcf	1.4E-01	6.6E-02	1.6E-01	6.0E-03	7.4E-02		
Internal dose rate	mGy/d	ldrat	1.8E-06	2.2E-06	3.6E-06	3.2E-07	1.3E-04	1.4E-04	=Crad*ldcf
External Gamma rate	uGy/h	Xgrat	0.04						
Fraction of time on site	-	fts	1.00						
External dose rate	mGy/d	Xdrat	9.6E-04						=Xgrat*24*fts/1000
Internal plus external	mGy/d	tdrat	1.1E-03						=SUM(ldrat)+Xdrat
Absorbed Doses - Caribou - LSA									
Concentration	Bq/g	Crad2	2.99E-05	4.43E-05	8.68E-05	9.05E-04	2.39E-02		
Internal dose rate	mGy/d	ldrat2	4.3E-06	2.9E-06	1.4E-05	5.5E-06	1.8E-03	1.8E-03	=Crad2*ldcf
Fraction of time on site	-	fts2	1.00						
External dose rate	mGy/d	Xdrat2	9.6E-04						=Xgrat*24*fts2/1000
Internal plus external	mGy/d	tdrat2	2.8E-03						=SUM(ldrat2)+Xdrat2
Absorbed Doses - Caribou - RSA									
Concentration	Bq/g	Crad3	2.99E-05	4.43E-05	8.68E-05	9.05E-04	2.39E-02		
Internal dose rate	mGy/d	ldrat3	4.3E-06	2.9E-06	1.4E-05	5.5E-06	1.8E-03	1.8E-03	=Crad3*ldcf
Fraction of time on site	-	fts3	1.00						
External dose rate	mGy/d	Xdrat3	9.6E-04						=Xgrat*24*fts3/1000
Internal plus external	mGy/d	tdrat3	2.8E-03						=SUM(ldrat3)+Xdrat3
Absorbed Doses - Falcon - LSA									
Concentration	Bq/g	Crad4	3.80E-06	1.20E-04	3.99E-04	1.34E-01	1.47E-02		
Internal dose rate	mGy/d	ldrat4	5.4E-07	7.9E-06	6.3E-05	8.1E-04	1.1E-03	2.0E-03	=Crad4*ldcf
Fraction of time on site	-	fts4	1.00						
External dose rate	mGy/d	Xdrat4	9.6E-04						=Xgrat*24*fts4/1000
Internal plus external	mGy/d	tdrat4	2.9E-03						=SUM(ldrat4)+Xdrat4
Absorbed Doses - Falcon - RSA									
Concentration	Bq/g	Crad5	3.79E-06	1.20E-04	3.98E-04	1.34E-01	1.47E-02		
Internal dose rate	mGy/d	ldrat5	5.4E-07	7.9E-06	6.3E-05	8.1E-04	1.1E-03	2.0E-03	=Crad5*ldcf
Fraction of time on site	-	fts5	1.00						
External dose rate	mGy/d	Xdrat5	9.6E-04						=Xgrat*24*fts5/1000
Internal plus external	mGy/d	tdrat5	2.9E-03						=SUM(ldrat5)+Xdrat5
Absorbed Doses - Fox - LSA									
Concentration	Bq/g	Crad6	8.18E-06	2.48E-05	5.34E-05	1.29E-04	1.09E-03		
Internal dose rate	mGy/d	ldrat6	1.2E-06	1.6E-06	8.5E-06	7.8E-07	8.0E-05	9.2E-05	=Crad6*ldcf
Fraction of time on site	-	fts6	1.00						
External dose rate	mGy/d	Xdrat6	9.6E-04						=Xgrat*24*fts6/1000
Internal plus external	mGy/d	tdrat6	1.1E-03						=SUM(ldrat6)+Xdrat6
Absorbed Doses - Lemming - Rock Lake Watershed									
Concentration	Bq/g	Crad7	3.23E-05	1.14E-03	2.26E-03	4.73E-02	6.02E-03		
Internal dose rate	mGy/d	ldrat7	4.6E-06	7.5E-05	3.6E-04	2.9E-04	4.5E-04	1.2E-03	=Crad7*ldcf
Fraction of time on site	-	fts7	1.00						
External dose rate	mGy/d	Xdrat7	9.6E-04						=Xgrat*24*fts7/1000
Internal plus external	mGy/d	tdrat7	2.1E-03						=SUM(ldrat7)+Xdrat7
Absorbed Doses - Lemming - JSL @ Kiggavik Discharge									
Concentration	Bq/g	Crad8	3.23E-05	1.14E-03	2.26E-03	4.73E-02	6.02E-03		
Internal dose rate	mGy/d	ldrat8	4.6E-06	7.5E-05	3.6E-04	2.9E-04	4.5E-04	1.2E-03	=Crad8*ldcf
Fraction of time on site	-	fts8	1.00						
External dose rate	mGy/d	Xdrat8	9.6E-04						=Xgrat*24*fts8/1000
Internal plus external	mGy/d	tdrat8	2.1E-03						=SUM(ldrat8)+Xdrat8
Absorbed Doses - Lemming - Kiggavik Camp									
Concentration	Bq/g	Crad9	3.40E-05	1.15E-03	2.27E-03	4.73E-02	6.02E-03		
Internal dose rate	mGy/d	ldrat9	4.8E-06	7.6E-05	3.6E-04	2.9E-04	4.5E-04	1.2E-03	=Crad9*ldcf
Fraction of time on site	-	fts9	1.00						
External dose rate	mGy/d	Xdrat9	9.6E-04						=Xgrat*24*fts9/1000
Internal plus external	mGy/d	tdrat9	2.1E-03						=SUM(ldrat9)+Xdrat9
Absorbed Doses - Lemming - JSL @ Sissons Discharge									
Concentration	Bq/g	Crad10	3.24E-05	1.14E-03	2.26E-03	4.73E-02	6.02E-03		
Internal dose rate	mGy/d	ldrat10	4.6E-06	7.5E-05	3.6E-04	2.9E-04	4.5E-04	1.2E-03	=Crad10*ldcf
Fraction of time on site	-	fts10	1.00						
External dose rate	mGy/d	Xdrat10	9.6E-04						=Xgrat*24*fts10/1000
Internal plus external	mGy/d	tdrat10	2.1E-03						=SUM(ldrat10)+Xdrat10
Absorbed Doses - Lapland Longspur - Rock Lake Watershed									
Concentration	Bq/g	Crad11	1.15E-05	7.43E-04	1.58E-03	3.56E-02	1.28E-02		
Internal dose rate	mGy/d	ldrat11	1.6E-06	4.9E-05	2.5E-04	2.1E-04	9.5E-04	1.5E-03	=Crad11*ldcf
Fraction of time on site	-	fts11	1.00						
External dose rate	mGy/d	Xdrat11	9.6E-04						=Xgrat*24*fts11/1000
Internal plus external	mGy/d	tdrat11	2.4E-03						=SUM(ldrat11)+Xdrat11

Table H.2-3

Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

Absorbed Doses - Lapland Longspur - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad12	1.24E-05	7.45E-04	1.62E-03	3.59E-02	1.32E-02			
Internal dose rate	mGy/d	ldrat12	1.8E-06	4.9E-05	2.6E-04	2.2E-04	9.8E-04	1.5E-03	=Crad12*ldcf	
Fraction of time on site	-	fts12	1.00							
External dose rate	mGy/d	Xdrat12	9.6E-04						=Xgrat*24*fts12/1000	
Internal plus external	mGy/d	tdrat12	2.5E-03						=SUM(ldrat12)+Xdrat12	
Absorbed Doses - Lapland Longspur - Kiggavik Camp										
Concentration	Bq/g	Crad13	3.56E-06	7.44E-04	1.55E-03	3.54E-02	1.27E-02			
Internal dose rate	mGy/d	ldrat13	5.1E-07	4.9E-05	2.5E-04	2.1E-04	9.4E-04	1.4E-03	=Crad13*ldcf	
Fraction of time on site	-	fts13	1.00							
External dose rate	mGy/d	Xdrat13	9.6E-04						=Xgrat*24*fts13/1000	
Internal plus external	mGy/d	tdrat13	2.4E-03						=SUM(ldrat13)+Xdrat13	
Absorbed Doses - Lapland Longspur - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad14	1.17E-05	7.44E-04	1.58E-03	3.56E-02	1.29E-02			
Internal dose rate	mGy/d	ldrat14	1.7E-06	4.9E-05	2.5E-04	2.1E-04	9.5E-04	1.5E-03	=Crad14*ldcf	
Fraction of time on site	-	fts14	1.00							
External dose rate	mGy/d	Xdrat14	9.6E-04						=Xgrat*24*fts14/1000	
Internal plus external	mGy/d	tdrat14	2.4E-03						=SUM(ldrat14)+Xdrat14	
Absorbed Doses - Long-Tailed Duck - Rock Lake										
Concentration	Bq/g	Crad15	1.95E-05	2.01E-04	2.30E-03	1.99E-02	1.55E-02			
Internal dose rate	mGy/d	ldrat15	2.8E-06	1.3E-05	3.6E-04	1.2E-04	1.1E-03	1.6E-03	=Crad15*ldcf	
Fraction of time on site	-	fts15	1.00							
External dose rate	mGy/d	Xdrat15	9.6E-04						=Xgrat*24*fts15/1000	
Internal plus external	mGy/d	tdrat15	2.6E-03						=SUM(ldrat15)+Xdrat15	
Absorbed Doses - Long-Tailed Duck - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad16	1.76E-05	1.95E-04	2.21E-03	1.92E-02	1.49E-02			
Internal dose rate	mGy/d	ldrat16	2.5E-06	1.3E-05	3.5E-04	1.2E-04	1.1E-03	1.6E-03	=Crad16*ldcf	
Fraction of time on site	-	fts16	1.00							
External dose rate	mGy/d	Xdrat16	9.6E-04						=Xgrat*24*fts16/1000	
Internal plus external	mGy/d	tdrat16	2.5E-03						=SUM(ldrat16)+Xdrat16	
Absorbed Doses - Long-Tailed Duck - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad17	1.79E-05	1.95E-04	2.22E-03	1.93E-02	1.50E-02			
Internal dose rate	mGy/d	ldrat17	2.5E-06	1.3E-05	3.5E-04	1.2E-04	1.1E-03	1.6E-03	=Crad17*ldcf	
Fraction of time on site	-	fts17	1.00							
External dose rate	mGy/d	Xdrat17	9.6E-04						=Xgrat*24*fts17/1000	
Internal plus external	mGy/d	tdrat17	2.6E-03						=SUM(ldrat17)+Xdrat17	
Absorbed Doses - Merganser - Rock Lake										
Concentration	Bq/g	Crad18	2.29E-06	8.27E-05	1.25E-04	6.29E-03	2.11E-03			
Internal dose rate	mGy/d	ldrat18	3.3E-07	5.4E-06	2.0E-05	3.8E-05	1.6E-04	2.2E-04	=Crad18*ldcf	
Fraction of time on site	-	fts18	1.00							
External dose rate	mGy/d	Xdrat18	9.6E-04						=Xgrat*24*fts18/1000	
Internal plus external	mGy/d	tdrat18	1.2E-03						=SUM(ldrat18)+Xdrat18	
Absorbed Doses - Merganser - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad19	2.29E-06	7.95E-05	1.17E-04	6.08E-03	2.00E-03			
Internal dose rate	mGy/d	ldrat19	3.3E-07	5.2E-06	1.9E-05	3.7E-05	1.5E-04	2.1E-04	=Crad19*ldcf	
Fraction of time on site	-	fts19	1.00							
External dose rate	mGy/d	Xdrat19	9.6E-04						=Xgrat*24*fts19/1000	
Internal plus external	mGy/d	tdrat19	1.2E-03						=SUM(ldrat19)+Xdrat19	
Absorbed Doses - Merganser - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad20	2.29E-06	7.99E-05	1.18E-04	6.10E-03	2.02E-03			
Internal dose rate	mGy/d	ldrat20	3.2E-07	5.3E-06	1.9E-05	3.7E-05	1.5E-04	2.1E-04	=Crad20*ldcf	
Fraction of time on site	-	fts20	1.00							
External dose rate	mGy/d	Xdrat20	9.6E-04						=Xgrat*24*fts20/1000	
Internal plus external	mGy/d	tdrat20	1.2E-03						=SUM(ldrat20)+Xdrat20	
Absorbed Doses - Muskox - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad21	3.12E-05	5.03E-05	7.12E-05	2.23E-04	6.91E-03			
Internal dose rate	mGy/d	ldrat21	4.4E-06	3.3E-06	1.1E-05	1.3E-06	5.1E-04	5.3E-04	=Crad21*ldcf	
Fraction of time on site	-	fts21	1.00							
External dose rate	mGy/d	Xdrat21	9.6E-04						=Xgrat*24*fts21/1000	
Internal plus external	mGy/d	tdrat21	1.5E-03						=SUM(ldrat21)+Xdrat21	
Absorbed Doses - Muskox - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad22	1.17E-05	7.44E-04	1.58E-03	3.56E-02	1.29E-02			
Internal dose rate	mGy/d	ldrat22	1.7E-06	4.9E-05	2.5E-04	2.1E-04	9.5E-04	1.5E-03	=Crad22*ldcf	
Fraction of time on site	-	fts22	1.00							
External dose rate	mGy/d	Xdrat22	9.6E-04						=Xgrat*24*fts22/1000	
Internal plus external	mGy/d	tdrat22	2.4E-03						=SUM(ldrat22)+Xdrat22	
Absorbed Doses - Northern Pintail - Rock Lake										
Concentration	Bq/g	Crad23	7.17E-06	1.15E-03	6.60E-04	5.23E-02	1.76E-02			
Internal dose rate	mGy/d	ldrat23	1.0E-06	7.5E-05	1.0E-04	3.2E-04	1.3E-03	1.8E-03	=Crad23*ldcf	
Fraction of time on site	-	fts23	1.00							
External dose rate	mGy/d	Xdrat23	9.6E-04						=Xgrat*24*fts23/1000	
Internal plus external	mGy/d	tdrat23	2.8E-03						=SUM(ldrat23)+Xdrat23	

Table H.2-3

Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

Absorbed Doses - Northern Pintail - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad24	6.58E-06	1.10E-03	6.36E-04	5.04E-02	1.68E-02			
Internal dose rate	mGy/d	Idrat24	9.3E-07	7.2E-05	1.0E-04	3.0E-04	1.2E-03	1.7E-03	=Crad24*Idcf	
Fraction of time on site	-	fts24	1.00							
External dose rate	mGy/d	Xdrat24	9.6E-04						=Xgrat*24*fts24/1000	
Internal plus external	mGy/d	tdrat24	2.7E-03						=SUM(Idrat24)+Xdrat24	
Absorbed Doses - Northern Pintail - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad25	6.68E-06	1.11E-03	6.38E-04	5.06E-02	1.70E-02			
Internal dose rate	mGy/d	Idrat25	9.5E-07	7.3E-05	1.0E-04	3.1E-04	1.3E-03	1.7E-03	=Crad25*Idcf	
Fraction of time on site	-	fts25	1.00							
External dose rate	mGy/d	Xdrat25	9.6E-04						=Xgrat*24*fts25/1000	
Internal plus external	mGy/d	tdrat25	2.7E-03						=SUM(Idrat25)+Xdrat25	
Absorbed Doses - Ptarmigan - Rock Lake Watershed										
Concentration	Bq/g	Crad26	1.15E-05	2.26E-04	6.65E-04	1.38E-01	4.76E-02			
Internal dose rate	mGy/d	Idrat26	1.6E-06	1.5E-05	1.1E-04	8.3E-04	3.5E-03	4.5E-03	=Crad26*Idcf	
Fraction of time on site	-	fts26	1.00							
External dose rate	mGy/d	Xdrat26	9.6E-04						=Xgrat*24*fts26/1000	
Internal plus external	mGy/d	tdrat26	5.4E-03						=SUM(Idrat26)+Xdrat26	
Absorbed Doses - Ptarmigan - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad27	1.18E-05	2.26E-04	6.77E-04	1.38E-01	4.77E-02			
Internal dose rate	mGy/d	Idrat27	1.7E-06	1.5E-05	1.1E-04	8.3E-04	3.5E-03	4.5E-03	=Crad27*Idcf	
Fraction of time on site	-	fts27	1.00							
External dose rate	mGy/d	Xdrat27	9.6E-04						=Xgrat*24*fts27/1000	
Internal plus external	mGy/d	tdrat27	5.4E-03						=SUM(Idrat27)+Xdrat27	
Absorbed Doses - Ptarmigan - Kiggavik Camp										
Concentration	Bq/g	Crad28	9.38E-06	2.27E-04	6.56E-04	1.38E-01	4.76E-02			
Internal dose rate	mGy/d	Idrat28	1.3E-06	1.5E-05	1.0E-04	8.3E-04	3.5E-03	4.5E-03	=Crad28*Idcf	
Fraction of time on site	-	fts28	1.00							
External dose rate	mGy/d	Xdrat28	9.6E-04						=Xgrat*24*fts28/1000	
Internal plus external	mGy/d	tdrat28	5.4E-03						=SUM(Idrat28)+Xdrat28	
Absorbed Doses - Ptarmigan - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad29	1.16E-05	2.26E-04	6.64E-04	1.38E-01	4.76E-02			
Internal dose rate	mGy/d	Idrat29	1.6E-06	1.5E-05	1.1E-04	8.3E-04	3.5E-03	4.5E-03	=Crad29*Idcf	
Fraction of time on site	-	fts29	1.00							
External dose rate	mGy/d	Xdrat29	9.6E-04						=Xgrat*24*fts29/1000	
Internal plus external	mGy/d	tdrat29	5.4E-03						=SUM(Idrat29)+Xdrat29	
Absorbed Doses - Sandpiper - Rock Lake										
Concentration	Bq/g	Crad30	4.85E-05	7.57E-04	3.86E-03	5.69E-02	3.46E-02			
Internal dose rate	mGy/d	Idrat30	6.9E-06	5.0E-05	6.1E-04	3.4E-04	2.6E-03	3.6E-03	=Crad30*Idcf	
Fraction of time on site	-	fts30	1.00							
External dose rate	mGy/d	Xdrat30	9.6E-04						=Xgrat*24*fts30/1000	
Internal plus external	mGy/d	tdrat30	4.5E-03						=SUM(Idrat30)+Xdrat30	
Absorbed Doses - Sandpiper - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad31	4.49E-05	7.45E-04	3.72E-03	5.55E-02	3.32E-02			
Internal dose rate	mGy/d	Idrat31	6.4E-06	4.9E-05	5.9E-04	3.3E-04	2.5E-03	3.4E-03	=Crad31*Idcf	
Fraction of time on site	-	fts31	1.00							
External dose rate	mGy/d	Xdrat31	9.6E-04						=Xgrat*24*fts31/1000	
Internal plus external	mGy/d	tdrat31	4.4E-03						=SUM(Idrat31)+Xdrat31	
Absorbed Doses - Sandpiper - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad32	4.56E-05	7.45E-04	3.74E-03	5.55E-02	3.34E-02			
Internal dose rate	mGy/d	Idrat32	6.5E-06	4.9E-05	5.9E-04	3.3E-04	2.5E-03	3.5E-03	=Crad32*Idcf	
Fraction of time on site	-	fts32	1.00							
External dose rate	mGy/d	Xdrat32	9.6E-04						=Xgrat*24*fts32/1000	
Internal plus external	mGy/d	tdrat32	4.4E-03						=SUM(Idrat32)+Xdrat32	
Absorbed Doses - Shrew - Rock Lake Watershed										
Concentration	Bq/g	Crad33	3.27E-05	1.90E-04	1.27E-03	1.12E-02	2.07E-03			
Internal dose rate	mGy/d	Idrat33	4.6E-06	1.3E-05	2.0E-04	6.8E-05	1.5E-04	4.4E-04	=Crad33*Idcf	
Fraction of time on site	-	fts33	1.00							
External dose rate	mGy/d	Xdrat33	9.6E-04						=Xgrat*24*fts33/1000	
Internal plus external	mGy/d	tdrat33	1.4E-03						=SUM(Idrat33)+Xdrat33	
Absorbed Doses - Shrew - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad34	3.58E-05	2.00E-04	1.37E-03	1.13E-02	2.12E-03			
Internal dose rate	mGy/d	Idrat34	5.1E-06	1.3E-05	2.2E-04	6.8E-05	1.6E-04	4.6E-04	=Crad34*Idcf	
Fraction of time on site	-	fts34	1.00							
External dose rate	mGy/d	Xdrat34	9.6E-04						=Xgrat*24*fts34/1000	
Internal plus external	mGy/d	tdrat34	1.4E-03						=SUM(Idrat34)+Xdrat34	
Absorbed Doses - Shrew - Kiggavik Camp										
Concentration	Bq/g	Crad35	3.13E-06	1.85E-04	1.18E-03	1.11E-02	2.05E-03			
Internal dose rate	mGy/d	Idrat35	4.4E-07	1.2E-05	1.9E-04	6.7E-05	1.5E-04	4.2E-04	=Crad35*Idcf	
Fraction of time on site	-	fts35	1.00							
External dose rate	mGy/d	Xdrat35	9.6E-04						=Xgrat*24*fts35/1000	
Internal plus external	mGy/d	tdrat35	1.4E-03						=SUM(Idrat35)+Xdrat35	
Absorbed Doses - Shrew - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad36	3.31E-05	1.91E-04	1.26E-03	1.12E-02	2.08E-03			
Internal dose rate	mGy/d	Idrat36	4.7E-06	1.3E-05	2.0E-04	6.8E-05	1.5E-04	4.4E-04	=Crad36*Idcf	
Fraction of time on site	-	fts36	1.00							

Table H.2-3
Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

External dose rate	mGy/d	Xdrat36	2.7E-04							=Xgrat*24*fts36/3600
Internal plus external	mGy/d	tdrat36	7.1E-04							=SUM(ldrat36)+Xdrat36
Absorbed Doses - Squirrel - Rock Lake Watershed										
Concentration	Bq/g	Crad37	2.70E-05	9.88E-04	1.48E-03	1.97E-02	2.34E-03			
Internal dose rate	mGy/d	ldrat37	3.8E-06	6.5E-05	2.4E-04	1.2E-04	1.7E-04	6.0E-04		=Crad37*ldcf
Fraction of time on site	-	fts37	1.00							
External dose rate	mGy/d	Xdrat37	9.6E-04							=Xgrat*24*fts37/1000
Internal plus external	mGy/d	tdrat37	1.6E-03							=SUM(ldrat37)+Xdrat37
Absorbed Doses - Squirrel - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad38	2.70E-05	9.88E-04	1.48E-03	1.97E-02	2.34E-03			
Internal dose rate	mGy/d	ldrat38	3.8E-06	6.5E-05	2.4E-04	1.2E-04	1.7E-04	6.0E-04		=Crad38*ldcf
Fraction of time on site	-	fts38	1.00							
External dose rate	mGy/d	Xdrat38	9.6E-04							=Xgrat*24*fts38/1000
Internal plus external	mGy/d	tdrat38	1.6E-03							=SUM(ldrat38)+Xdrat38
Absorbed Doses - Squirrel - Kiggavik Camp										
Concentration	Bq/g	Crad39	2.85E-05	9.98E-04	1.49E-03	1.98E-02	2.35E-03			
Internal dose rate	mGy/d	ldrat39	4.1E-06	6.6E-05	2.4E-04	1.2E-04	1.7E-04	6.0E-04		=Crad39*ldcf
Fraction of time on site	-	fts39	1.00							
External dose rate	mGy/d	Xdrat39	9.6E-04							=Xgrat*24*fts39/1000
Internal plus external	mGy/d	tdrat39	1.6E-03							=SUM(ldrat39)+Xdrat39

Table H.2-3

Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

Absorbed Doses - Squirrel - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad40	2.71E-05	9.88E-04	1.48E-03	1.97E-02	2.34E-03			
Internal dose rate	mGy/d	Idrat40	3.8E-06	6.5E-05	2.4E-04	1.2E-04	1.7E-04	6.0E-04	=Crad40*Idcf	
Fraction of time on site	-	fts40	1.00							
External dose rate	mGy/d	Xdrat40	9.6E-04						=Xgrat*24*fts40/1000	
Internal plus external	mGy/d	tdrat40	1.6E-03						=SUM(Idrat40)+Xdrat40	
Absorbed Doses - Wolf - LSA										
Concentration	Bq/g	Crad41	1.16E-05	9.61E-06	6.02E-06	3.68E-06	1.90E-03			
Internal dose rate	mGy/d	Idrat41	1.6E-06	6.3E-07	9.6E-07	2.2E-08	1.4E-04	1.4E-04	=Crad41*Idcf	
Fraction of time on site	-	fts41	1.00							
External dose rate	mGy/d	Xdrat41	9.6E-04						=Xgrat*24*fts41/1000	
Internal plus external	mGy/d	tdrat41	1.1E-03						=SUM(Idrat41)+Xdrat41	
Absorbed Doses - Wolf - RSA										
Concentration	Bq/g	Crad42	1.16E-05	9.60E-06	6.02E-06	3.68E-06	1.90E-03			
Internal dose rate	mGy/d	Idrat42	1.6E-06	6.3E-07	9.6E-07	2.2E-08	1.4E-04	1.4E-04	=Crad42*Idcf	
Fraction of time on site	-	fts42	1.00							
External dose rate	mGy/d	Xdrat42	9.6E-04						=Xgrat*24*fts42/1000	
Internal plus external	mGy/d	tdrat42	1.1E-03						=SUM(Idrat42)+Xdrat42	
Absorbed Doses - Wolverine - LSA										
Concentration	Bq/g	Crad43	1.56E-05	3.36E-05	5.34E-05	1.05E-04	4.77E-04			
Internal dose rate	mGy/d	Idrat43	2.2E-06	2.2E-06	8.5E-06	6.3E-07	3.5E-05	4.9E-05	=Crad43*Idcf	
Fraction of time on site	-	fts43	1.00							
External dose rate	mGy/d	Xdrat43	9.6E-04						=Xgrat*24*fts43/1000	
Internal plus external	mGy/d	tdrat43	1.0E-03						=SUM(Idrat43)+Xdrat43	
Absorbed Doses - Wolverine - RSA										
Concentration	Bq/g	Crad44	1.56E-05	3.37E-05	5.34E-05	1.05E-04	4.77E-04			
Internal dose rate	mGy/d	Idrat44	2.2E-06	2.2E-06	8.5E-06	6.4E-07	3.5E-05	4.9E-05	=Crad44*Idcf	
Fraction of time on site	-	fts44	1.00							
External dose rate	mGy/d	Xdrat44	9.6E-04						=Xgrat*24*fts44/1000	
Internal plus external	mGy/d	tdrat44	1.0E-03						=SUM(Idrat44)+Xdrat44	
Equivalent Doses - Bear - LSA										
RBE for alpha	Sv/Gy	RBE	40							
High LET dose rate	mSv/d	Hletdr	7.2E-05	8.8E-05	1.4E-04	3.2E-07	5.3E-03	5.6E-03	=Idrat*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr	9.6E-04						=Xdrat	
Total dose rate	mSv/d	tdr	6.6E-03						=SUM(Hletdr)+Lletdr	
Equivalent Doses - Caribou - LSA										
High LET dose rate	mSv/d	Hletdr2	1.7E-04	1.2E-04	5.5E-04	5.5E-06	7.1E-02	7.2E-02	=Idrat2*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr2	9.6E-04						=Xdrat2	
Total dose rate	mSv/d	tdr2	7.3E-02						=SUM(Hletdr2)+Lletdr2	
Equivalent Doses - Caribou - RSA										
High LET dose rate	mSv/d	Hletdr3	1.7E-04	1.2E-04	5.5E-04	5.5E-06	7.1E-02	7.2E-02	=Idrat3*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr3	9.6E-04						=Xdrat3	
Total dose rate	mSv/d	tdr3	7.3E-02						=SUM(Hletdr3)+Lletdr3	
Equivalent Doses - Falcon - LSA										
High LET dose rate	mSv/d	Hletdr4	2.2E-05	3.2E-04	2.5E-03	8.1E-04	4.3E-02	4.7E-02	=Idrat4*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr4	9.6E-04						=Xdrat4	
Total dose rate	mSv/d	tdr4	4.8E-02						=SUM(Hletdr4)+Lletdr4	
Equivalent Doses - Falcon - RSA										
High LET dose rate	mSv/d	Hletdr5	2.2E-05	3.2E-04	2.5E-03	8.1E-04	4.3E-02	4.7E-02	=Idrat5*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr5	9.6E-04						=Xdrat5	
Total dose rate	mSv/d	tdr5	4.8E-02						=SUM(Hletdr5)+Lletdr5	
Equivalent Doses - Fox - LSA										
High LET dose rate	mSv/d	Hletdr6	4.6E-05	6.5E-05	3.4E-04	7.8E-07	3.2E-03	3.7E-03	=Idrat6*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr6	9.6E-04						=Xdrat6	
Total dose rate	mSv/d	tdr6	4.6E-03						=SUM(Hletdr6)+Lletdr6	
Equivalent Doses - Lemming - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr7	1.8E-04	3.0E-03	1.4E-02	2.9E-04	1.8E-02	3.6E-02	=Idrat7*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr7	9.6E-04						=Xdrat7	
Total dose rate	mSv/d	tdr7	3.7E-02						=SUM(Hletdr7)+Lletdr7	
Equivalent Doses - Lemming - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr8	1.8E-04	3.0E-03	1.4E-02	2.9E-04	1.8E-02	3.6E-02	=Idrat8*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr8	9.6E-04						=Xdrat8	
Total dose rate	mSv/d	tdr8	3.7E-02						=SUM(Hletdr8)+Lletdr8	
Equivalent Doses - Lemming - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr9	1.9E-04	3.0E-03	1.4E-02	2.9E-04	1.8E-02	3.6E-02	=Idrat9*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr9	9.6E-04						=Xdrat9	
Total dose rate	mSv/d	tdr9	3.7E-02						=SUM(Hletdr9)+Lletdr9	
Equivalent Doses - Lemming - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr10	1.8E-04	3.0E-03	1.4E-02	2.9E-04	1.8E-02	3.6E-02	=Idrat10*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr10	9.6E-04						=Xdrat10	
Total dose rate	mSv/d	tdr10	3.7E-02						=SUM(Hletdr10)+Lletdr10	

Table H.2-3

Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

Equivalent Doses - Lapland Longspur - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr11	6.5E-05	2.0E-03	1.0E-02	2.1E-04	3.8E-02	5.0E-02	=Idrat11*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr11	9.6E-04						=Xdrat11	
Total dose rate	mSv/d	tdr11	5.1E-02						=SUM(Hletdr11)+Lletdr11	
Equivalent Doses - Lapland Longspur - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr12	7.0E-05	2.0E-03	1.0E-02	2.2E-04	3.9E-02	5.2E-02	=Idrat12*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr12	9.6E-04						=Xdrat12	
Total dose rate	mSv/d	tdr12	5.3E-02						=SUM(Hletdr12)+Lletdr12	
Equivalent Doses - Lapland Longspur - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr13	2.0E-05	2.0E-03	9.8E-03	2.1E-04	3.7E-02	4.9E-02	=Idrat13*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr13	9.6E-04						=Xdrat13	
Total dose rate	mSv/d	tdr13	5.0E-02						=SUM(Hletdr13)+Lletdr13	
Equivalent Doses - Lapland Longspur - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr14	6.6E-05	2.0E-03	1.0E-02	2.1E-04	3.8E-02	5.0E-02	=Idrat14*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr14	9.6E-04						=Xdrat14	
Total dose rate	mSv/d	tdr14	5.1E-02						=SUM(Hletdr14)+Lletdr14	
Equivalent Doses - Long-Tailed Duck - Rock Lake										
High LET dose rate	mSv/d	Hletdr15	1.1E-04	5.3E-04	1.5E-02	1.2E-04	4.6E-02	6.1E-02	=Idrat15*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr15	9.6E-04						=Xdrat15	
Total dose rate	mSv/d	tdr15	6.2E-02						=SUM(Hletdr15)+Lletdr15	
Equivalent Doses - Long-Tailed Duck - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr16	1.0E-04	5.1E-04	1.4E-02	1.2E-04	4.4E-02	5.9E-02	=Idrat16*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr16	9.6E-04						=Xdrat16	
Total dose rate	mSv/d	tdr16	6.0E-02						=SUM(Hletdr16)+Lletdr16	
Equivalent Doses - Long-Tailed Duck - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr17	1.0E-04	5.1E-04	1.4E-02	1.2E-04	4.4E-02	5.9E-02	=Idrat17*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr17	9.6E-04						=Xdrat17	
Total dose rate	mSv/d	tdr17	6.0E-02						=SUM(Hletdr17)+Lletdr17	
Equivalent Doses - Merganser - Rock Lake										
High LET dose rate	mSv/d	Hletdr18	1.3E-05	2.2E-04	7.9E-04	3.8E-05	6.3E-03	7.3E-03	=Idrat18*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr18	9.6E-04						=Xdrat18	
Total dose rate	mSv/d	tdr18	8.3E-03						=SUM(Hletdr18)+Lletdr18	
Equivalent Doses - Merganser - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr19	1.3E-05	2.1E-04	7.5E-04	3.7E-05	5.9E-03	6.9E-03	=Idrat19*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr19	9.6E-04						=Xdrat19	
Total dose rate	mSv/d	tdr19	7.9E-03						=SUM(Hletdr19)+Lletdr19	
Equivalent Doses - Merganser - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr20	1.3E-05	2.1E-04	7.5E-04	3.7E-05	6.0E-03	7.0E-03	=Idrat20*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr20	9.6E-04						=Xdrat20	
Total dose rate	mSv/d	tdr20	8.0E-03						=SUM(Hletdr20)+Lletdr20	
Equivalent Doses - Muskox - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr21	1.8E-04	1.3E-04	4.5E-04	1.3E-06	2.0E-02	2.1E-02	=Idrat21*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr21	9.6E-04						=Xdrat21	
Total dose rate	mSv/d	tdr21	2.2E-02						=SUM(Hletdr21)+Lletdr21	
Equivalent Doses - Muskox - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr22	6.6E-05	2.0E-03	1.0E-02	2.1E-04	3.8E-02	5.0E-02	=Idrat22*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr22	9.6E-04						=Xdrat22	
Total dose rate	mSv/d	tdr22	5.1E-02						=SUM(Hletdr22)+Lletdr22	
Equivalent Doses - Northern Pintail - Rock Lake										
High LET dose rate	mSv/d	Hletdr23	4.1E-05	3.0E-03	4.2E-03	3.2E-04	5.2E-02	6.0E-02	=Idrat23*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr23	9.6E-04						=Xdrat23	
Total dose rate	mSv/d	tdr23	6.1E-02						=SUM(Hletdr23)+Lletdr23	
Equivalent Doses - Northern Pintail - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr24	3.7E-05	2.9E-03	4.0E-03	3.0E-04	5.0E-02	5.7E-02	=Idrat24*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr24	9.6E-04						=Xdrat24	
Total dose rate	mSv/d	tdr24	5.8E-02						=SUM(Hletdr24)+Lletdr24	
Equivalent Doses - Northern Pintail - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr25	3.8E-05	2.9E-03	4.1E-03	3.1E-04	5.0E-02	5.8E-02	=Idrat25*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr25	9.6E-04						=Xdrat25	
Total dose rate	mSv/d	tdr25	5.8E-02						=SUM(Hletdr25)+Lletdr25	
Equivalent Doses - Ptarmigan - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr26	6.5E-05	5.9E-04	4.2E-03	8.3E-04	1.4E-01	1.5E-01	=Idrat26*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr26	9.6E-04						=Xdrat26	
Total dose rate	mSv/d	tdr26	1.5E-01						=SUM(Hletdr26)+Lletdr26	
Equivalent Doses - Ptarmigan - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr27	6.7E-05	6.0E-04	4.3E-03	8.3E-04	1.4E-01	1.5E-01	=Idrat27*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr27	9.6E-04						=Xdrat27	
Total dose rate	mSv/d	tdr27	1.5E-01						=SUM(Hletdr27)+Lletdr27	

Table H.2-3

Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

Equivalent Doses - Ptarmigan - Kiggavik Camp											
High LET dose rate	mSv/d	Hletdr28	5.3E-05	6.0E-04	4.2E-03	8.3E-04	1.4E-01	1.5E-01	=Idrat28*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr28	9.6E-04						=Xdrat28		
Total dose rate	mSv/d	tdr28	1.5E-01						=SUM(Hletdr28)+Lletdr28		
Equivalent Doses - Ptarmigan - JSL @ Sissons Discharge											
High LET dose rate	mSv/d	Hletdr29	6.6E-05	5.9E-04	4.2E-03	8.3E-04	1.4E-01	1.5E-01	=Idrat29*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr29	9.6E-04						=Xdrat29		
Total dose rate	mSv/d	tdr29	1.5E-01						=SUM(Hletdr29)+Lletdr29		
Equivalent Doses - Sandpiper - Rock Lake											
High LET dose rate	mSv/d	Hletdr30	2.8E-04	2.0E-03	2.5E-02	3.4E-04	1.0E-01	1.3E-01	=Idrat30*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr30	9.6E-04						=Xdrat30		
Total dose rate	mSv/d	tdr30	1.3E-01						=SUM(Hletdr30)+Lletdr30		
Equivalent Doses - Sandpiper - JSL @ Kiggavik Discharge											
High LET dose rate	mSv/d	Hletdr31	2.6E-04	2.0E-03	2.4E-02	3.3E-04	9.8E-02	1.2E-01	=Idrat31*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr31	9.6E-04						=Xdrat31		
Total dose rate	mSv/d	tdr31	1.3E-01						=SUM(Hletdr31)+Lletdr31		
Equivalent Doses - Sandpiper - JSL @ Sissons Discharge											
High LET dose rate	mSv/d	Hletdr32	2.6E-04	2.0E-03	2.4E-02	3.3E-04	9.9E-02	1.3E-01	=Idrat32*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr32	9.6E-04						=Xdrat32		
Total dose rate	mSv/d	tdr32	1.3E-01						=SUM(Hletdr32)+Lletdr32		
Equivalent Doses - Shrew - Rock Lake Watershed											
High LET dose rate	mSv/d	Hletdr33	1.9E-04	5.0E-04	8.1E-03	6.8E-05	6.1E-03	1.5E-02	=Idrat33*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr33	9.6E-04						=Xdrat33		
Total dose rate	mSv/d	tdr33	1.6E-02						=SUM(Hletdr33)+Lletdr33		
Equivalent Doses - Shrew - JSL @ Kiggavik Discharge											
High LET dose rate	mSv/d	Hletdr34	2.0E-04	5.3E-04	8.7E-03	6.8E-05	6.3E-03	1.6E-02	=Idrat34*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr34	9.6E-04						=Xdrat34		
Total dose rate	mSv/d	tdr34	1.7E-02						=SUM(Hletdr34)+Lletdr34		
Equivalent Doses - Shrew - Kiggavik Camp											
High LET dose rate	mSv/d	Hletdr35	1.8E-05	4.9E-04	7.5E-03	6.7E-05	6.1E-03	1.4E-02	=Idrat35*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr35	9.6E-04						=Xdrat35		
Total dose rate	mSv/d	tdr35	1.5E-02						=SUM(Hletdr35)+Lletdr35		
Equivalent Doses - Shrew - JSL @ Sissons Discharge											
High LET dose rate	mSv/d	Hletdr36	1.9E-04	5.0E-04	8.0E-03	6.8E-05	6.2E-03	1.5E-02	=Idrat36*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr36	2.7E-04						=Xdrat36		
Total dose rate	mSv/d	tdr36	1.5E-02						=SUM(Hletdr36)+Lletdr36		
Equivalent Doses - Squirrel - Rock Lake Watershed											
High LET dose rate	mSv/d	Hletdr37	1.5E-04	2.6E-03	9.4E-03	1.2E-04	6.9E-03	1.9E-02	=Idrat37*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr37	9.6E-04						=Xdrat37		
Total dose rate	mSv/d	tdr37	2.0E-02						=SUM(Hletdr37)+Lletdr37		
Equivalent Doses - Squirrel - JSL @ Kiggavik Discharge											
High LET dose rate	mSv/d	Hletdr38	1.5E-04	2.6E-03	9.4E-03	1.2E-04	6.9E-03	1.9E-02	=Idrat38*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr38	9.6E-04						=Xdrat38		
Total dose rate	mSv/d	tdr38	2.0E-02						=SUM(Hletdr38)+Lletdr38		
Equivalent Doses - Squirrel - Kiggavik Camp											
High LET dose rate	mSv/d	Hletdr39	1.6E-04	2.6E-03	9.5E-03	1.2E-04	7.0E-03	1.9E-02	=Idrat39*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr39	9.6E-04						=Xdrat39		
Total dose rate	mSv/d	tdr39	2.0E-02						=SUM(Hletdr39)+Lletdr39		
Equivalent Doses - Squirrel - JSL @ Sissons Discharge											
High LET dose rate	mSv/d	Hletdr40	1.5E-04	2.6E-03	9.4E-03	1.2E-04	6.9E-03	1.9E-02	=Idrat40*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr40	9.6E-04						=Xdrat40		
Total dose rate	mSv/d	tdr40	2.0E-02						=SUM(Hletdr40)+Lletdr40		
Equivalent Doses - Wolf - LSA											
High LET dose rate	mSv/d	Hletdr41	6.6E-05	2.5E-05	3.8E-05	2.2E-08	5.6E-03	5.8E-03	=Idrat41*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr41	9.6E-04						=Xdrat41		
Total dose rate	mSv/d	tdr41	6.7E-03						=SUM(Hletdr41)+Lletdr41		
Equivalent Doses - Wolf - RSA											
High LET dose rate	mSv/d	Hletdr42	6.6E-05	2.5E-05	3.8E-05	2.2E-08	5.6E-03	5.8E-03	=Idrat42*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr42	9.6E-04						=Xdrat42		
Total dose rate	mSv/d	tdr42	6.7E-03						=SUM(Hletdr42)+Lletdr42		
Equivalent Doses - Wolverine - LSA											
High LET dose rate	mSv/d	Hletdr43	8.9E-05	8.9E-05	3.4E-04	6.3E-07	1.4E-03	1.9E-03	=Idrat43*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr43	9.6E-04						=Xdrat43		
Total dose rate	mSv/d	tdr43	2.9E-03						=SUM(Hletdr43)+Lletdr43		
Equivalent Doses - Wolverine - RSA											
High LET dose rate	mSv/d	Hletdr44	8.9E-05	8.9E-05	3.4E-04	6.4E-07	1.4E-03	1.9E-03	=Idrat44*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr44	9.6E-04						=Xdrat44		
Total dose rate	mSv/d	tdr44	2.9E-03						=SUM(Hletdr44)+Lletdr44		

Table H.2-3
Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

SUMMARY

1 Screening Criterion in mGy/d	Total Absorbed Dose mGy/d	Total Equivalent Dose mSv/d	Index (Absorbed Dose)	Index (Equivalent Dose)
Bear - LSA	1.1E-03	6.6E-03	1.1E-03	6.6E-03
Caribou - LSA	2.8E-03	7.3E-02	2.8E-03	7.3E-02
Caribou - RSA	2.8E-03	7.3E-02	2.8E-03	7.3E-02
Falcon - LSA	2.9E-03	4.8E-02	2.9E-03	4.8E-02
Falcon - RSA	2.9E-03	4.8E-02	2.9E-03	4.8E-02
Fox - LSA	1.1E-03	4.6E-03	1.1E-03	4.6E-03
Lemming - Rock Lake Watershed	2.1E-03	3.7E-02	2.1E-03	3.7E-02
Lemming - JSL @ Kiggavik Discharge	2.1E-03	3.7E-02	2.1E-03	3.7E-02
Lemming - Kiggavik Camp	2.1E-03	3.7E-02	2.1E-03	3.7E-02
Lemming - JSL @ Sissons Discharge	2.1E-03	3.7E-02	2.1E-03	3.7E-02
Lapland Longspur - Rock Lake Watershed	2.4E-03	5.1E-02	2.4E-03	5.1E-02
Lapland Longspur - JSL @ Kiggavik Discharge	2.5E-03	5.3E-02	2.5E-03	5.3E-02
Lapland Longspur - Kiggavik Camp	2.4E-03	5.0E-02	2.4E-03	5.0E-02
Lapland Longspur - JSL @ Sissons Discharge	2.4E-03	5.1E-02	2.4E-03	5.1E-02
Long-Tailed Duck - Rock Lake	2.6E-03	6.2E-02	2.6E-03	6.2E-02
Long-Tailed Duck - JSL @ Kiggavik Discharge	2.5E-03	6.0E-02	2.5E-03	6.0E-02
Long-Tailed Duck - JSL @ Sissons Discharge	2.6E-03	6.0E-02	2.6E-03	6.0E-02
Merganser - Rock Lake	1.2E-03	8.3E-03	1.2E-03	8.3E-03
Merganser - JSL @ Kiggavik Discharge	1.2E-03	7.9E-03	1.2E-03	7.9E-03
Merganser - JSL @ Sissons Discharge	1.2E-03	8.0E-03	1.2E-03	8.0E-03
Muskox - JSL @ Kiggavik Discharge	1.5E-03	2.2E-02	1.5E-03	2.2E-02
Muskox - JSL @ Sissons Discharge	2.4E-03	5.1E-02	2.4E-03	5.1E-02
Northern Pintail - Rock Lake	2.8E-03	6.1E-02	2.8E-03	6.1E-02
Northern Pintail - JSL @ Kiggavik Discharge	2.7E-03	5.8E-02	2.7E-03	5.8E-02
Northern Pintail - JSL @ Sissons Discharge	2.7E-03	5.8E-02	2.7E-03	5.8E-02
Ptarmigan - Rock Lake Watershed	5.4E-03	1.5E-01	5.4E-03	1.5E-01
Ptarmigan - JSL @ Kiggavik Discharge	5.4E-03	1.5E-01	5.4E-03	1.5E-01
Ptarmigan - Kiggavik Camp	5.4E-03	1.5E-01	5.4E-03	1.5E-01
Ptarmigan - JSL @ Sissons Discharge	5.4E-03	1.5E-01	5.4E-03	1.5E-01
Sandpiper - Rock Lake	4.5E-03	1.3E-01	4.5E-03	1.3E-01
Sandpiper - JSL @ Kiggavik Discharge	4.4E-03	1.3E-01	4.4E-03	1.3E-01
Sandpiper - JSL @ Sissons Discharge	4.4E-03	1.3E-01	4.4E-03	1.3E-01
Shrew - Rock Lake Watershed	1.4E-03	1.6E-02	1.4E-03	1.6E-02
Shrew - JSL @ Kiggavik Discharge	1.4E-03	1.7E-02	1.4E-03	1.7E-02
Shrew - Kiggavik Camp	1.4E-03	1.5E-02	1.4E-03	1.5E-02
Shrew - JSL @ Sissons Discharge	7.1E-04	1.5E-02	7.1E-04	1.5E-02
Squirrel - Rock Lake Watershed	1.6E-03	2.0E-02	1.6E-03	2.0E-02
Squirrel - JSL @ Kiggavik Discharge	1.6E-03	2.0E-02	1.6E-03	2.0E-02
Squirrel - Kiggavik Camp	1.6E-03	2.0E-02	1.6E-03	2.0E-02
Squirrel - JSL @ Sissons Discharge	1.6E-03	2.0E-02	1.6E-03	2.0E-02
Wolf - LSA	1.1E-03	6.7E-03	1.1E-03	6.7E-03
Wolf - RSA	1.1E-03	6.7E-03	1.1E-03	6.7E-03
Wolverine - LSA	1.0E-03	2.9E-03	1.0E-03	2.9E-03
Wolverine - RSA	1.0E-03	2.9E-03	1.0E-03	2.9E-03

U-238+ Internal U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235
Ra-226+ Internal Ra-226 + 0.3* (Rn-222 + ...Po-214)
Pb-210+ Internal Pb-210 + Bi-210

Table H.2-3

Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

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DOSES TO SELECTED VECs - 95th Percentile Total Dose

		U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Absorbed Doses - Bear - LSA								
Concentration	Bq/g	Crad	3.88E-05	1.51E-04	6.99E-05	1.74E-04	6.45E-03	
Internal Dose Factor	mGy/d per Bq/g	ldcf	1.4E-01	6.6E-02	1.6E-01	6.0E-03	7.4E-02	
Internal dose rate	mGy/d	ldrat	5.5E-06	9.9E-06	1.1E-05	1.1E-06	4.8E-04	5.0E-04 =Crad*ldcf
External Gamma rate	uGy/h	Xgrat	0.04					
Fraction of time on site	-	fts	1.00					
External dose rate	mGy/d	Xdrat	9.6E-04					=Xgrat*24*fts/1000
Internal plus external	mGy/d	tdrat	1.5E-03					=SUM(ldrat)+Xdrat
Absorbed Doses - Caribou - LSA								
Concentration	Bq/g	Crad2	8.62E-05	1.33E-04	2.95E-04	2.53E-03	7.65E-02	
Internal dose rate	mGy/d	ldrat2	1.2E-05	8.7E-06	4.7E-05	1.5E-05	5.7E-03	=Crad2*ldcf
Fraction of time on site	-	fts2	1.00					
External dose rate	mGy/d	Xdrat2	9.6E-04					=Xgrat*24*fts2/1000
Internal plus external	mGy/d	tdrat2	6.7E-03					=SUM(ldrat2)+Xdrat2
Absorbed Doses - Caribou - RSA								
Concentration	Bq/g	Crad3	8.62E-05	1.33E-04	2.95E-04	2.53E-03	7.65E-02	
Internal dose rate	mGy/d	ldrat3	1.2E-05	8.7E-06	4.7E-05	1.5E-05	5.7E-03	=Crad3*ldcf
Fraction of time on site	-	fts3	1.00					
External dose rate	mGy/d	Xdrat3	9.6E-04					=Xgrat*24*fts3/1000
Internal plus external	mGy/d	tdrat3	6.7E-03					=SUM(ldrat3)+Xdrat3
Absorbed Doses - Falcon - LSA								
Concentration	Bq/g	Crad4	1.15E-05	3.57E-04	1.38E-03	4.40E-01	5.01E-02	
Internal dose rate	mGy/d	ldrat4	1.6E-06	2.3E-05	2.2E-04	2.7E-03	3.7E-03	6.6E-03 =Crad4*ldcf
Fraction of time on site	-	fts4	1.00					
External dose rate	mGy/d	Xdrat4	9.6E-04					=Xgrat*24*fts4/1000
Internal plus external	mGy/d	tdrat4	7.6E-03					=SUM(ldrat4)+Xdrat4
Absorbed Doses - Falcon - RSA								
Concentration	Bq/g	Crad5	1.14E-05	3.56E-04	1.38E-03	4.40E-01	5.00E-02	
Internal dose rate	mGy/d	ldrat5	1.6E-06	2.3E-05	2.2E-04	2.7E-03	3.7E-03	6.6E-03 =Crad5*ldcf
Fraction of time on site	-	fts5	1.00					
External dose rate	mGy/d	Xdrat5	9.6E-04					=Xgrat*24*fts5/1000
Internal plus external	mGy/d	tdrat5	7.6E-03					=SUM(ldrat5)+Xdrat5
Absorbed Doses - Fox - LSA								
Concentration	Bq/g	Crad6	2.01E-05	7.95E-05	1.30E-04	5.17E-04	3.67E-03	
Internal dose rate	mGy/d	ldrat6	2.9E-06	5.2E-06	2.1E-05	3.1E-06	2.7E-04	3.0E-04 =Crad6*ldcf
Fraction of time on site	-	fts6	1.00					
External dose rate	mGy/d	Xdrat6	9.6E-04					=Xgrat*24*fts6/1000
Internal plus external	mGy/d	tdrat6	1.3E-03					=SUM(ldrat6)+Xdrat6
Absorbed Doses - Lemming - Rock Lake Watershed								
Concentration	Bq/g	Crad7	1.50E-04	3.56E-03	6.36E-03	1.69E-01	2.09E-02	
Internal dose rate	mGy/d	ldrat7	2.1E-05	2.3E-04	1.0E-03	1.0E-03	1.5E-03	3.8E-03 =Crad7*ldcf
Fraction of time on site	-	fts7	1.00					
External dose rate	mGy/d	Xdrat7	9.6E-04					=Xgrat*24*fts7/1000
Internal plus external	mGy/d	tdrat7	4.8E-03					=SUM(ldrat7)+Xdrat7
Absorbed Doses - Lemming - JSL @ Kiggavik Discharge								
Concentration	Bq/g	Crad8	1.50E-04	3.56E-03	6.36E-03	1.69E-01	2.09E-02	
Internal dose rate	mGy/d	ldrat8	2.1E-05	2.3E-04	1.0E-03	1.0E-03	1.5E-03	3.8E-03 =Crad8*ldcf
Fraction of time on site	-	fts8	1.00					
External dose rate	mGy/d	Xdrat8	9.6E-04					=Xgrat*24*fts8/1000
Internal plus external	mGy/d	tdrat8	4.8E-03					=SUM(ldrat8)+Xdrat8
Absorbed Doses - Lemming - Kiggavik Camp								
Concentration	Bq/g	Crad9	1.53E-04	3.58E-03	6.37E-03	1.69E-01	2.09E-02	
Internal dose rate	mGy/d	ldrat9	2.2E-05	2.4E-04	1.0E-03	1.0E-03	1.5E-03	3.8E-03 =Crad9*ldcf
Fraction of time on site	-	fts9	1.00					
External dose rate	mGy/d	Xdrat9	9.6E-04					=Xgrat*24*fts9/1000
Internal plus external	mGy/d	tdrat9	4.8E-03					=SUM(ldrat9)+Xdrat9
Absorbed Doses - Lemming - JSL @ Sissons Discharge								
Concentration	Bq/g	Crad10	1.50E-04	3.56E-03	6.36E-03	1.69E-01	2.09E-02	
Internal dose rate	mGy/d	ldrat10	2.1E-05	2.3E-04	1.0E-03	1.0E-03	1.5E-03	3.8E-03 =Crad10*ldcf
Fraction of time on site	-	fts10	1.00					
External dose rate	mGy/d	Xdrat10	9.6E-04					=Xgrat*24*fts10/1000
Internal plus external	mGy/d	tdrat10	4.8E-03					=SUM(ldrat10)+Xdrat10
Absorbed Doses - Lapland Longspur - Rock Lake Watershed								
Concentration	Bq/g	Crad11	4.07E-05	3.37E-03	5.24E-03	1.35E-01	3.62E-02	
Internal dose rate	mGy/d	ldrat11	5.8E-06	2.2E-04	8.3E-04	8.1E-04	2.7E-03	4.6E-03 =Crad11*ldcf
Fraction of time on site	-	fts11	1.00					
External dose rate	mGy/d	Xdrat11	9.6E-04					=Xgrat*24*fts11/1000
Internal plus external	mGy/d	tdrat11	5.5E-03					=SUM(ldrat11)+Xdrat11

Table H.2-3

Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

Absorbed Doses - Lapland Longspur - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad12	4.32E-05	3.38E-03	5.39E-03	1.36E-01	3.72E-02			
Internal dose rate	mGy/d	ldrat12	6.1E-06	2.2E-04	8.6E-04	8.2E-04	2.8E-03	4.7E-03	=Crad12*ldcf	
Fraction of time on site	-	fts12	1.00							
External dose rate	mGy/d	Xdrat12	9.6E-04						=Xgrat*24*fts12/1000	
Internal plus external	mGy/d	tdrat12	5.6E-03						=SUM(ldrat12)+Xdrat12	
Absorbed Doses - Lapland Longspur - Kiggavik Camp										
Concentration	Bq/g	Crad13	1.30E-05	3.38E-03	5.10E-03	1.34E-01	3.57E-02			
Internal dose rate	mGy/d	ldrat13	1.8E-06	2.2E-04	8.1E-04	8.1E-04	2.6E-03	4.5E-03	=Crad13*ldcf	
Fraction of time on site	-	fts13	1.00							
External dose rate	mGy/d	Xdrat13	9.6E-04						=Xgrat*24*fts13/1000	
Internal plus external	mGy/d	tdrat13	5.4E-03						=SUM(ldrat13)+Xdrat13	
Absorbed Doses - Lapland Longspur - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad14	4.07E-05	3.37E-03	5.22E-03	1.35E-01	3.64E-02			
Internal dose rate	mGy/d	ldrat14	5.8E-06	2.2E-04	8.3E-04	8.1E-04	2.7E-03	4.6E-03	=Crad14*ldcf	
Fraction of time on site	-	fts14	1.00							
External dose rate	mGy/d	Xdrat14	9.6E-04						=Xgrat*24*fts14/1000	
Internal plus external	mGy/d	tdrat14	5.5E-03						=SUM(ldrat14)+Xdrat14	
Absorbed Doses - Long-Tailed Duck - Rock Lake										
Concentration	Bq/g	Crad15	5.55E-05	6.03E-04	9.26E-03	6.39E-02	5.78E-02			
Internal dose rate	mGy/d	ldrat15	7.9E-06	4.0E-05	1.5E-03	3.9E-04	4.3E-03	6.2E-03	=Crad15*ldcf	
Fraction of time on site	-	fts15	1.00							
External dose rate	mGy/d	Xdrat15	9.6E-04						=Xgrat*24*fts15/1000	
Internal plus external	mGy/d	tdrat15	7.1E-03						=SUM(ldrat15)+Xdrat15	
Absorbed Doses - Long-Tailed Duck - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad16	4.99E-05	5.82E-04	8.89E-03	6.15E-02	5.54E-02			
Internal dose rate	mGy/d	ldrat16	7.1E-06	3.8E-05	1.4E-03	3.7E-04	4.1E-03	5.9E-03	=Crad16*ldcf	
Fraction of time on site	-	fts16	1.00							
External dose rate	mGy/d	Xdrat16	9.6E-04						=Xgrat*24*fts16/1000	
Internal plus external	mGy/d	tdrat16	6.9E-03						=SUM(ldrat16)+Xdrat16	
Absorbed Doses - Long-Tailed Duck - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad17	5.11E-05	5.85E-04	8.94E-03	6.18E-02	5.58E-02			
Internal dose rate	mGy/d	ldrat17	7.2E-06	3.9E-05	1.4E-03	3.7E-04	4.1E-03	6.0E-03	=Crad17*ldcf	
Fraction of time on site	-	fts17	1.00							
External dose rate	mGy/d	Xdrat17	9.6E-04						=Xgrat*24*fts17/1000	
Internal plus external	mGy/d	tdrat17	6.9E-03						=SUM(ldrat17)+Xdrat17	
Absorbed Doses - Merganser - Rock Lake										
Concentration	Bq/g	Crad18	7.69E-06	3.15E-04	3.99E-04	1.98E-02	7.05E-03			
Internal dose rate	mGy/d	ldrat18	1.1E-06	2.1E-05	6.3E-05	1.2E-04	5.2E-04	7.3E-04	=Crad18*ldcf	
Fraction of time on site	-	fts18	1.00							
External dose rate	mGy/d	Xdrat18	9.6E-04						=Xgrat*24*fts18/1000	
Internal plus external	mGy/d	tdrat18	1.7E-03						=SUM(ldrat18)+Xdrat18	
Absorbed Doses - Merganser - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad19	7.65E-06	3.08E-04	3.71E-04	1.97E-02	6.67E-03			
Internal dose rate	mGy/d	ldrat19	1.1E-06	2.0E-05	5.9E-05	1.2E-04	4.9E-04	6.9E-04	=Crad19*ldcf	
Fraction of time on site	-	fts19	1.00							
External dose rate	mGy/d	Xdrat19	9.6E-04						=Xgrat*24*fts19/1000	
Internal plus external	mGy/d	tdrat19	1.7E-03						=SUM(ldrat19)+Xdrat19	
Absorbed Doses - Merganser - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad20	7.64E-06	3.09E-04	3.73E-04	1.97E-02	6.68E-03			
Internal dose rate	mGy/d	ldrat20	1.1E-06	2.0E-05	5.9E-05	1.2E-04	4.9E-04	6.9E-04	=Crad20*ldcf	
Fraction of time on site	-	fts20	1.00							
External dose rate	mGy/d	Xdrat20	9.6E-04						=Xgrat*24*fts20/1000	
Internal plus external	mGy/d	tdrat20	1.7E-03						=SUM(ldrat20)+Xdrat20	
Absorbed Doses - Muskox - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad21	1.18E-04	1.86E-04	2.87E-04	6.77E-04	2.04E-02			
Internal dose rate	mGy/d	ldrat21	1.7E-05	1.2E-05	4.6E-05	4.1E-06	1.5E-03	1.6E-03	=Crad21*ldcf	
Fraction of time on site	-	fts21	1.00							
External dose rate	mGy/d	Xdrat21	9.6E-04						=Xgrat*24*fts21/1000	
Internal plus external	mGy/d	tdrat21	2.6E-03						=SUM(ldrat21)+Xdrat21	
Absorbed Doses - Muskox - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad22	4.07E-05	3.37E-03	5.22E-03	1.35E-01	3.64E-02			
Internal dose rate	mGy/d	ldrat22	5.8E-06	2.2E-04	8.3E-04	8.1E-04	2.7E-03	4.6E-03	=Crad22*ldcf	
Fraction of time on site	-	fts22	1.00							
External dose rate	mGy/d	Xdrat22	9.6E-04						=Xgrat*24*fts22/1000	
Internal plus external	mGy/d	tdrat22	5.5E-03						=SUM(ldrat22)+Xdrat22	
Absorbed Doses - Northern Pintail - Rock Lake										
Concentration	Bq/g	Crad23	2.34E-05	4.59E-03	2.26E-03	1.68E-01	6.11E-02			
Internal dose rate	mGy/d	ldrat23	3.3E-06	3.0E-04	3.6E-04	1.0E-03	4.5E-03	6.2E-03	=Crad23*ldcf	
Fraction of time on site	-	fts23	1.00							
External dose rate	mGy/d	Xdrat23	9.6E-04						=Xgrat*24*fts23/1000	
Internal plus external	mGy/d	tdrat23	7.2E-03						=SUM(ldrat23)+Xdrat23	

Table H.2-3
Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

Absorbed Doses - Northern Pintail - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad24	2.11E-05	4.42E-03	2.17E-03	1.62E-01	5.85E-02			
Internal dose rate	mGy/d	Idrat24	3.0E-06	2.9E-04	3.5E-04	9.8E-04	4.3E-03	5.9E-03	=Crad24*Idcf	
Fraction of time on site	-	fts24	1.00							
External dose rate	mGy/d	Xdrat24	9.6E-04						=Xgrat*24*fts24/1000	
Internal plus external	mGy/d	tdrat24	6.9E-03						=SUM(Idrat24)+Xdrat24	
Absorbed Doses - Northern Pintail - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad25	2.14E-05	4.45E-03	2.18E-03	1.63E-01	5.90E-02			
Internal dose rate	mGy/d	Idrat25	3.0E-06	2.9E-04	3.5E-04	9.8E-04	4.4E-03	6.0E-03	=Crad25*Idcf	
Fraction of time on site	-	fts25	1.00							
External dose rate	mGy/d	Xdrat25	9.6E-04						=Xgrat*24*fts25/1000	
Internal plus external	mGy/d	tdrat25	6.9E-03						=SUM(Idrat25)+Xdrat25	
Absorbed Doses - Ptarmigan - Rock Lake Watershed										
Concentration	Bq/g	Crad26	4.26E-05	9.02E-04	2.17E-03	3.89E-01	1.43E-01			
Internal dose rate	mGy/d	Idrat26	6.0E-06	5.9E-05	3.5E-04	2.3E-03	1.1E-02	1.3E-02	=Crad26*Idcf	
Fraction of time on site	-	fts26	1.00							
External dose rate	mGy/d	Xdrat26	9.6E-04						=Xgrat*24*fts26/1000	
Internal plus external	mGy/d	tdrat26	1.4E-02						=SUM(Idrat26)+Xdrat26	
Absorbed Doses - Ptarmigan - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad27	4.32E-05	9.03E-04	2.21E-03	3.89E-01	1.43E-01			
Internal dose rate	mGy/d	Idrat27	6.1E-06	5.9E-05	3.5E-04	2.3E-03	1.1E-02	1.3E-02	=Crad27*Idcf	
Fraction of time on site	-	fts27	1.00							
External dose rate	mGy/d	Xdrat27	9.6E-04						=Xgrat*24*fts27/1000	
Internal plus external	mGy/d	tdrat27	1.4E-02						=SUM(Idrat27)+Xdrat27	
Absorbed Doses - Ptarmigan - Kiggavik Camp										
Concentration	Bq/g	Crad28	3.52E-05	9.07E-04	2.10E-03	3.89E-01	1.44E-01			
Internal dose rate	mGy/d	Idrat28	5.0E-06	6.0E-05	3.3E-04	2.3E-03	1.1E-02	1.3E-02	=Crad28*Idcf	
Fraction of time on site	-	fts28	1.00							
External dose rate	mGy/d	Xdrat28	9.6E-04						=Xgrat*24*fts28/1000	
Internal plus external	mGy/d	tdrat28	1.4E-02						=SUM(Idrat28)+Xdrat28	
Absorbed Doses - Ptarmigan - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad29	4.27E-05	9.02E-04	2.16E-03	3.89E-01	1.43E-01			
Internal dose rate	mGy/d	Idrat29	6.1E-06	5.9E-05	3.4E-04	2.3E-03	1.1E-02	1.3E-02	=Crad29*Idcf	
Fraction of time on site	-	fts29	1.00							
External dose rate	mGy/d	Xdrat29	9.6E-04						=Xgrat*24*fts29/1000	
Internal plus external	mGy/d	tdrat29	1.4E-02						=SUM(Idrat29)+Xdrat29	
Absorbed Doses - Sandpiper - Rock Lake										
Concentration	Bq/g	Crad30	1.96E-04	2.14E-03	1.53E-02	1.83E-01	1.19E-01			
Internal dose rate	mGy/d	Idrat30	2.8E-05	1.4E-04	2.4E-03	1.1E-03	8.8E-03	1.3E-02	=Crad30*Idcf	
Fraction of time on site	-	fts30	1.00							
External dose rate	mGy/d	Xdrat30	9.6E-04						=Xgrat*24*fts30/1000	
Internal plus external	mGy/d	tdrat30	1.3E-02						=SUM(Idrat30)+Xdrat30	
Absorbed Doses - Sandpiper - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad31	1.81E-04	2.11E-03	1.47E-02	1.78E-01	1.14E-01			
Internal dose rate	mGy/d	Idrat31	2.6E-05	1.4E-04	2.3E-03	1.1E-03	8.5E-03	1.2E-02	=Crad31*Idcf	
Fraction of time on site	-	fts31	1.00							
External dose rate	mGy/d	Xdrat31	9.6E-04						=Xgrat*24*fts31/1000	
Internal plus external	mGy/d	tdrat31	1.3E-02						=SUM(Idrat31)+Xdrat31	
Absorbed Doses - Sandpiper - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad32	1.84E-04	2.10E-03	1.48E-02	1.78E-01	1.15E-01			
Internal dose rate	mGy/d	Idrat32	2.6E-05	1.4E-04	2.4E-03	1.1E-03	8.5E-03	1.2E-02	=Crad32*Idcf	
Fraction of time on site	-	fts32	1.00							
External dose rate	mGy/d	Xdrat32	9.6E-04						=Xgrat*24*fts32/1000	
Internal plus external	mGy/d	tdrat32	1.3E-02						=SUM(Idrat32)+Xdrat32	
Absorbed Doses - Shrew - Rock Lake Watershed										
Concentration	Bq/g	Crad33	1.03E-04	6.31E-04	4.02E-03	3.64E-02	5.70E-03			
Internal dose rate	mGy/d	Idrat33	1.5E-05	4.2E-05	6.4E-04	2.2E-04	4.2E-04	1.3E-03	=Crad33*Idcf	
Fraction of time on site	-	fts33	1.00							
External dose rate	mGy/d	Xdrat33	9.6E-04						=Xgrat*24*fts33/1000	
Internal plus external	mGy/d	tdrat33	2.3E-03						=SUM(Idrat33)+Xdrat33	
Absorbed Doses - Shrew - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad34	1.13E-04	6.72E-04	4.37E-03	3.68E-02	5.88E-03			
Internal dose rate	mGy/d	Idrat34	1.6E-05	4.4E-05	6.9E-04	2.2E-04	4.4E-04	1.4E-03	=Crad34*Idcf	
Fraction of time on site	-	fts34	1.00							
External dose rate	mGy/d	Xdrat34	9.6E-04						=Xgrat*24*fts34/1000	
Internal plus external	mGy/d	tdrat34	2.4E-03						=SUM(Idrat34)+Xdrat34	
Absorbed Doses - Shrew - Kiggavik Camp										
Concentration	Bq/g	Crad35	9.48E-06	6.01E-04	3.72E-03	3.61E-02	5.69E-03			
Internal dose rate	mGy/d	Idrat35	1.3E-06	4.0E-05	5.9E-04	2.2E-04	4.2E-04	1.3E-03	=Crad35*Idcf	
Fraction of time on site	-	fts35	1.00							
External dose rate	mGy/d	Xdrat35	9.6E-04						=Xgrat*24*fts35/1000	
Internal plus external	mGy/d	tdrat35	2.2E-03						=SUM(Idrat35)+Xdrat35	
Absorbed Doses - Shrew - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad36	1.04E-04	6.31E-04	4.01E-03	3.64E-02	5.72E-03			
Internal dose rate	mGy/d	Idrat36	1.5E-05	4.2E-05	6.4E-04	2.2E-04	4.2E-04	1.3E-03	=Crad36*Idcf	
Fraction of time on site	-	fts36	1.00							

Table H.2-3

Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

External dose rate	mGy/d	Xdrat36	2.7E-04							=Xgrat*24*fts36/3600
Internal plus external	mGy/d	tdrat36	1.6E-03							=SUM(ldrat36)+Xdrat36
Absorbed Doses - Squirrel - Rock Lake Watershed										
Concentration	Bq/g	Crad37	8.97E-05	3.42E-03	6.40E-03	8.34E-02	1.01E-02			
Internal dose rate	mGy/d	ldrat37	1.3E-05	2.3E-04	1.0E-03	5.0E-04	7.5E-04	2.5E-03		=Crad37*ldcf
Fraction of time on site	-	fts37	1.00							
External dose rate	mGy/d	Xdrat37	9.6E-04							=Xgrat*24*fts37/1000
Internal plus external	mGy/d	tdrat37	3.5E-03							=SUM(ldrat37)+Xdrat37
Absorbed Doses - Squirrel - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad38	8.96E-05	3.42E-03	6.40E-03	8.34E-02	1.01E-02			
Internal dose rate	mGy/d	ldrat38	1.3E-05	2.3E-04	1.0E-03	5.0E-04	7.5E-04	2.5E-03		=Crad38*ldcf
Fraction of time on site	-	fts38	1.00							
External dose rate	mGy/d	Xdrat38	9.6E-04							=Xgrat*24*fts38/1000
Internal plus external	mGy/d	tdrat38	3.5E-03							=SUM(ldrat38)+Xdrat38
Absorbed Doses - Squirrel - Kiggavik Camp										
Concentration	Bq/g	Crad39	9.30E-05	3.45E-03	6.44E-03	8.35E-02	1.01E-02			
Internal dose rate	mGy/d	ldrat39	1.3E-05	2.3E-04	1.0E-03	5.0E-04	7.5E-04	2.5E-03		=Crad39*ldcf
Fraction of time on site	-	fts39	1.00							
External dose rate	mGy/d	Xdrat39	9.6E-04							=Xgrat*24*fts39/1000
Internal plus external	mGy/d	tdrat39	3.5E-03							=SUM(ldrat39)+Xdrat39

Table H.2-3

Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

Absorbed Doses - Squirrel - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad40	8.97E-05	3.42E-03	6.40E-03	8.34E-02	1.01E-02			
Internal dose rate	mGy/d	Idrat40	1.3E-05	2.3E-04	1.0E-03	5.0E-04	7.5E-04	2.5E-03	=Crad40*Idcf	
Fraction of time on site	-	fts40	1.00							
External dose rate	mGy/d	Xdrat40	9.6E-04						=Xgrat*24*fts40/1000	
Internal plus external	mGy/d	tdrat40	3.5E-03						=SUM(Idrat40)+Xdrat40	
Absorbed Doses - Wolf - LSA										
Concentration	Bq/g	Crad41	4.16E-05	2.94E-05	2.20E-05	1.44E-05	7.66E-03			
Internal dose rate	mGy/d	Idrat41	5.9E-06	1.9E-06	3.5E-06	8.7E-08	5.7E-04	5.8E-04	=Crad41*Idcf	
Fraction of time on site	-	fts41	1.00							
External dose rate	mGy/d	Xdrat41	9.6E-04						=Xgrat*24*fts41/1000	
Internal plus external	mGy/d	tdrat41	1.5E-03						=SUM(Idrat41)+Xdrat41	
Absorbed Doses - Wolf - RSA										
Concentration	Bq/g	Crad42	4.16E-05	2.94E-05	2.20E-05	1.44E-05	7.66E-03			
Internal dose rate	mGy/d	Idrat42	5.9E-06	1.9E-06	3.5E-06	8.7E-08	5.7E-04	5.8E-04	=Crad42*Idcf	
Fraction of time on site	-	fts42	1.00							
External dose rate	mGy/d	Xdrat42	9.6E-04						=Xgrat*24*fts42/1000	
Internal plus external	mGy/d	tdrat42	1.5E-03						=SUM(Idrat42)+Xdrat42	
Absorbed Doses - Wolverine - LSA										
Concentration	Bq/g	Crad43	5.82E-05	1.16E-04	2.13E-04	4.70E-04	1.79E-03			
Internal dose rate	mGy/d	Idrat43	8.3E-06	7.6E-06	3.4E-05	2.8E-06	1.3E-04	1.9E-04	=Crad43*Idcf	
Fraction of time on site	-	fts43	1.00							
External dose rate	mGy/d	Xdrat43	9.6E-04						=Xgrat*24*fts43/1000	
Internal plus external	mGy/d	tdrat43	1.1E-03						=SUM(Idrat43)+Xdrat43	
Absorbed Doses - Wolverine - RSA										
Concentration	Bq/g	Crad44	5.82E-05	1.16E-04	2.13E-04	4.70E-04	1.80E-03			
Internal dose rate	mGy/d	Idrat44	8.3E-06	7.6E-06	3.4E-05	2.8E-06	1.3E-04	1.9E-04	=Crad44*Idcf	
Fraction of time on site	-	fts44	1.00							
External dose rate	mGy/d	Xdrat44	9.6E-04						=Xgrat*24*fts44/1000	
Internal plus external	mGy/d	tdrat44	1.1E-03						=SUM(Idrat44)+Xdrat44	
Equivalent Doses - Bear - LSA										
RBE for alpha	Sv/Gy	RBE	40							
High LET dose rate	mSv/d	Hletdr	2.2E-04	4.0E-04	4.4E-04	1.1E-06	1.9E-02	2.0E-02	=Idrat*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr	9.6E-04						=Xdrat	
Total dose rate	mSv/d	tdr	2.1E-02						=SUM(Hletdr)+Lletdr	
Equivalent Doses - Caribou - LSA										
High LET dose rate	mSv/d	Hletdr2	4.9E-04	3.5E-04	1.9E-03	1.5E-05	2.3E-01	2.3E-01	=Idrat2*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr2	9.6E-04						=Xdrat2	
Total dose rate	mSv/d	tdr2	2.3E-01						=SUM(Hletdr2)+Lletdr2	
Equivalent Doses - Caribou - RSA										
High LET dose rate	mSv/d	Hletdr3	4.9E-04	3.5E-04	1.9E-03	1.5E-05	2.3E-01	2.3E-01	=Idrat3*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr3	9.6E-04						=Xdrat3	
Total dose rate	mSv/d	tdr3	2.3E-01						=SUM(Hletdr3)+Lletdr3	
Equivalent Doses - Falcon - LSA										
High LET dose rate	mSv/d	Hletdr4	6.5E-05	9.4E-04	8.8E-03	2.7E-03	1.5E-01	1.6E-01	=Idrat4*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr4	9.6E-04						=Xdrat4	
Total dose rate	mSv/d	tdr4	1.6E-01						=SUM(Hletdr4)+Lletdr4	
Equivalent Doses - Falcon - RSA										
High LET dose rate	mSv/d	Hletdr5	6.5E-05	9.4E-04	8.8E-03	2.7E-03	1.5E-01	1.6E-01	=Idrat5*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr5	9.6E-04						=Xdrat5	
Total dose rate	mSv/d	tdr5	1.6E-01						=SUM(Hletdr5)+Lletdr5	
Equivalent Doses - Fox - LSA										
High LET dose rate	mSv/d	Hletdr6	1.1E-04	2.1E-04	8.3E-04	3.1E-06	1.1E-02	1.2E-02	=Idrat6*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr6	9.6E-04						=Xdrat6	
Total dose rate	mSv/d	tdr6	1.3E-02						=SUM(Hletdr6)+Lletdr6	
Equivalent Doses - Lemming - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr7	8.5E-04	9.4E-03	4.0E-02	1.0E-03	6.2E-02	1.1E-01	=Idrat7*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr7	9.6E-04						=Xdrat7	
Total dose rate	mSv/d	tdr7	1.1E-01						=SUM(Hletdr7)+Lletdr7	
Equivalent Doses - Lemming - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr8	8.5E-04	9.4E-03	4.0E-02	1.0E-03	6.2E-02	1.1E-01	=Idrat8*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr8	9.6E-04						=Xdrat8	
Total dose rate	mSv/d	tdr8	1.1E-01						=SUM(Hletdr8)+Lletdr8	
Equivalent Doses - Lemming - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr9	8.7E-04	9.4E-03	4.1E-02	1.0E-03	6.2E-02	1.1E-01	=Idrat9*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr9	9.6E-04						=Xdrat9	
Total dose rate	mSv/d	tdr9	1.1E-01						=SUM(Hletdr9)+Lletdr9	
Equivalent Doses - Lemming - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr10	8.5E-04	9.4E-03	4.0E-02	1.0E-03	6.2E-02	1.1E-01	=Idrat10*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr10	9.6E-04						=Xdrat10	
Total dose rate	mSv/d	tdr10	1.1E-01						=SUM(Hletdr10)+Lletdr10	

Table H.2-3

Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

Equivalent Doses - Lapland Longspur - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr11	2.3E-04	8.9E-03	3.3E-02	8.1E-04	1.1E-01	1.5E-01	=Idrat11*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr11	9.6E-04						=Xdrat11	
Total dose rate	mSv/d	tdr11	1.5E-01						=SUM(Hletdr11)+Lletdr11	
Equivalent Doses - Lapland Longspur - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr12	2.5E-04	8.9E-03	3.4E-02	8.2E-04	1.1E-01	1.5E-01	=Idrat12*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr12	9.6E-04						=Xdrat12	
Total dose rate	mSv/d	tdr12	1.6E-01						=SUM(Hletdr12)+Lletdr12	
Equivalent Doses - Lapland Longspur - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr13	7.4E-05	8.9E-03	3.2E-02	8.1E-04	1.1E-01	1.5E-01	=Idrat13*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr13	9.6E-04						=Xdrat13	
Total dose rate	mSv/d	tdr13	1.5E-01						=SUM(Hletdr13)+Lletdr13	
Equivalent Doses - Lapland Longspur - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr14	2.3E-04	8.9E-03	3.3E-02	8.1E-04	1.1E-01	1.5E-01	=Idrat14*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr14	9.6E-04						=Xdrat14	
Total dose rate	mSv/d	tdr14	1.5E-01						=SUM(Hletdr14)+Lletdr14	
Equivalent Doses - Long-Tailed Duck - Rock Lake										
High LET dose rate	mSv/d	Hletdr15	3.2E-04	1.6E-03	5.9E-02	3.9E-04	1.7E-01	2.3E-01	=Idrat15*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr15	9.6E-04						=Xdrat15	
Total dose rate	mSv/d	tdr15	2.3E-01						=SUM(Hletdr15)+Lletdr15	
Equivalent Doses - Long-Tailed Duck - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr16	2.8E-04	1.5E-03	5.7E-02	3.7E-04	1.6E-01	2.2E-01	=Idrat16*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr16	9.6E-04						=Xdrat16	
Total dose rate	mSv/d	tdr16	2.2E-01						=SUM(Hletdr16)+Lletdr16	
Equivalent Doses - Long-Tailed Duck - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr17	2.9E-04	1.5E-03	5.7E-02	3.7E-04	1.7E-01	2.2E-01	=Idrat17*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr17	9.6E-04						=Xdrat17	
Total dose rate	mSv/d	tdr17	2.3E-01						=SUM(Hletdr17)+Lletdr17	
Equivalent Doses - Merganser - Rock Lake										
High LET dose rate	mSv/d	Hletdr18	4.4E-05	8.3E-04	2.5E-03	1.2E-04	2.1E-02	2.4E-02	=Idrat18*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr18	9.6E-04						=Xdrat18	
Total dose rate	mSv/d	tdr18	2.5E-02						=SUM(Hletdr18)+Lletdr18	
Equivalent Doses - Merganser - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr19	4.3E-05	8.1E-04	2.4E-03	1.2E-04	2.0E-02	2.3E-02	=Idrat19*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr19	9.6E-04						=Xdrat19	
Total dose rate	mSv/d	tdr19	2.4E-02						=SUM(Hletdr19)+Lletdr19	
Equivalent Doses - Merganser - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr20	4.3E-05	8.1E-04	2.4E-03	1.2E-04	2.0E-02	2.3E-02	=Idrat20*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr20	9.6E-04						=Xdrat20	
Total dose rate	mSv/d	tdr20	2.4E-02						=SUM(Hletdr20)+Lletdr20	
Equivalent Doses - Muskox - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr21	6.7E-04	4.9E-04	1.8E-03	4.1E-06	6.1E-02	6.4E-02	=Idrat21*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr21	9.6E-04						=Xdrat21	
Total dose rate	mSv/d	tdr21	6.4E-02						=SUM(Hletdr21)+Lletdr21	
Equivalent Doses - Muskox - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr22	2.3E-04	8.9E-03	3.3E-02	8.1E-04	1.1E-01	1.5E-01	=Idrat22*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr22	9.6E-04						=Xdrat22	
Total dose rate	mSv/d	tdr22	1.5E-01						=SUM(Hletdr22)+Lletdr22	
Equivalent Doses - Northern Pintail - Rock Lake										
High LET dose rate	mSv/d	Hletdr23	1.3E-04	1.2E-02	1.4E-02	1.0E-03	1.8E-01	2.1E-01	=Idrat23*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr23	9.6E-04						=Xdrat23	
Total dose rate	mSv/d	tdr23	2.1E-01						=SUM(Hletdr23)+Lletdr23	
Equivalent Doses - Northern Pintail - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr24	1.2E-04	1.2E-02	1.4E-02	9.8E-04	1.7E-01	2.0E-01	=Idrat24*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr24	9.6E-04						=Xdrat24	
Total dose rate	mSv/d	tdr24	2.0E-01						=SUM(Hletdr24)+Lletdr24	
Equivalent Doses - Northern Pintail - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr25	1.2E-04	1.2E-02	1.4E-02	9.8E-04	1.7E-01	2.0E-01	=Idrat25*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr25	9.6E-04						=Xdrat25	
Total dose rate	mSv/d	tdr25	2.0E-01						=SUM(Hletdr25)+Lletdr25	
Equivalent Doses - Ptarmigan - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr26	2.4E-04	2.4E-03	1.4E-02	2.3E-03	4.2E-01	4.4E-01	=Idrat26*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr26	9.6E-04						=Xdrat26	
Total dose rate	mSv/d	tdr26	4.4E-01						=SUM(Hletdr26)+Lletdr26	
Equivalent Doses - Ptarmigan - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr27	2.5E-04	2.4E-03	1.4E-02	2.3E-03	4.2E-01	4.4E-01	=Idrat27*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr27	9.6E-04						=Xdrat27	
Total dose rate	mSv/d	tdr27	4.4E-01						=SUM(Hletdr27)+Lletdr27	

Table H.2-3

Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

Equivalent Doses - Ptarmigan - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr28	2.0E-04	2.4E-03	1.3E-02	2.3E-03	4.3E-01	4.4E-01	=Idrat28*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr28	9.6E-04						=Xdrat28	
Total dose rate	mSv/d	tdr28	4.5E-01						=SUM(Hletdr28)+Lletdr28	
Equivalent Doses - Ptarmigan - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr29	2.4E-04	2.4E-03	1.4E-02	2.3E-03	4.2E-01	4.4E-01	=Idrat29*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr29	9.6E-04						=Xdrat29	
Total dose rate	mSv/d	tdr29	4.4E-01						=SUM(Hletdr29)+Lletdr29	
Equivalent Doses - Sandpiper - Rock Lake										
High LET dose rate	mSv/d	Hletdr30	1.1E-03	5.6E-03	9.7E-02	1.1E-03	3.5E-01	4.6E-01	=Idrat30*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr30	9.6E-04						=Xdrat30	
Total dose rate	mSv/d	tdr30	4.6E-01						=SUM(Hletdr30)+Lletdr30	
Equivalent Doses - Sandpiper - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr31	1.0E-03	5.5E-03	9.4E-02	1.1E-03	3.4E-01	4.4E-01	=Idrat31*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr31	9.6E-04						=Xdrat31	
Total dose rate	mSv/d	tdr31	4.4E-01						=SUM(Hletdr31)+Lletdr31	
Equivalent Doses - Sandpiper - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr32	1.0E-03	5.5E-03	9.4E-02	1.1E-03	3.4E-01	4.4E-01	=Idrat32*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr32	9.6E-04						=Xdrat32	
Total dose rate	mSv/d	tdr32	4.4E-01						=SUM(Hletdr32)+Lletdr32	
Equivalent Doses - Shrew - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr33	5.9E-04	1.7E-03	2.6E-02	2.2E-04	1.7E-02	4.5E-02	=Idrat33*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr33	9.6E-04						=Xdrat33	
Total dose rate	mSv/d	tdr33	4.6E-02						=SUM(Hletdr33)+Lletdr33	
Equivalent Doses - Shrew - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr34	6.4E-04	1.8E-03	2.8E-02	2.2E-04	1.7E-02	4.8E-02	=Idrat34*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr34	9.6E-04						=Xdrat34	
Total dose rate	mSv/d	tdr34	4.9E-02						=SUM(Hletdr34)+Lletdr34	
Equivalent Doses - Shrew - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr35	5.4E-05	1.6E-03	2.4E-02	2.2E-04	1.7E-02	4.2E-02	=Idrat35*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr35	9.6E-04						=Xdrat35	
Total dose rate	mSv/d	tdr35	4.3E-02						=SUM(Hletdr35)+Lletdr35	
Equivalent Doses - Shrew - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr36	5.9E-04	1.7E-03	2.5E-02	2.2E-04	1.7E-02	4.5E-02	=Idrat36*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr36	2.7E-04						=Xdrat36	
Total dose rate	mSv/d	tdr36	4.5E-02						=SUM(Hletdr36)+Lletdr36	
Equivalent Doses - Squirrel - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr37	5.1E-04	9.0E-03	4.1E-02	5.0E-04	3.0E-02	8.1E-02	=Idrat37*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr37	9.6E-04						=Xdrat37	
Total dose rate	mSv/d	tdr37	8.2E-02						=SUM(Hletdr37)+Lletdr37	
Equivalent Doses - Squirrel - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr38	5.1E-04	9.0E-03	4.1E-02	5.0E-04	3.0E-02	8.1E-02	=Idrat38*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr38	9.6E-04						=Xdrat38	
Total dose rate	mSv/d	tdr38	8.2E-02						=SUM(Hletdr38)+Lletdr38	
Equivalent Doses - Squirrel - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr39	5.3E-04	9.1E-03	4.1E-02	5.0E-04	3.0E-02	8.1E-02	=Idrat39*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr39	9.6E-04						=Xdrat39	
Total dose rate	mSv/d	tdr39	8.2E-02						=SUM(Hletdr39)+Lletdr39	
Equivalent Doses - Squirrel - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr40	5.1E-04	9.0E-03	4.1E-02	5.0E-04	3.0E-02	8.1E-02	=Idrat40*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr40	9.6E-04						=Xdrat40	
Total dose rate	mSv/d	tdr40	8.2E-02						=SUM(Hletdr40)+Lletdr40	
Equivalent Doses - Wolf - LSA										
High LET dose rate	mSv/d	Hletdr41	2.4E-04	7.7E-05	1.4E-04	8.7E-08	2.3E-02	2.3E-02	=Idrat41*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr41	9.6E-04						=Xdrat41	
Total dose rate	mSv/d	tdr41	2.4E-02						=SUM(Hletdr41)+Lletdr41	
Equivalent Doses - Wolf - RSA										
High LET dose rate	mSv/d	Hletdr42	2.4E-04	7.7E-05	1.4E-04	8.7E-08	2.3E-02	2.3E-02	=Idrat42*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr42	9.6E-04						=Xdrat42	
Total dose rate	mSv/d	tdr42	2.4E-02						=SUM(Hletdr42)+Lletdr42	
Equivalent Doses - Wolverine - LSA										
High LET dose rate	mSv/d	Hletdr43	3.3E-04	3.0E-04	1.4E-03	2.8E-06	5.3E-03	7.3E-03	=Idrat43*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr43	9.6E-04						=Xdrat43	
Total dose rate	mSv/d	tdr43	8.3E-03						=SUM(Hletdr43)+Lletdr43	
Equivalent Doses - Wolverine - RSA										
High LET dose rate	mSv/d	Hletdr44	3.3E-04	3.0E-04	1.4E-03	2.8E-06	5.3E-03	7.3E-03	=Idrat44*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr44	9.6E-04						=Xdrat44	
Total dose rate	mSv/d	tdr44	8.3E-03						=SUM(Hletdr44)+Lletdr44	

Table H.2-3

Terrestrial Dose Calculations RBE 40 and Dose Limit of 1 mGy/d

SUMMARY

1 Screening Criterion in mGy/d	Total Absorbed Dose mGy/d	Total Equivalent Dose mSv/d	Index (Absorbed Dose)	Index (Equivalent Dose)
Bear - LSA	1.5E-03	2.1E-02	1.5E-03	2.1E-02
Caribou - LSA	6.7E-03	2.3E-01	6.7E-03	2.3E-01
Caribou - RSA	6.7E-03	2.3E-01	6.7E-03	2.3E-01
Falcon - LSA	7.6E-03	1.6E-01	7.6E-03	1.6E-01
Falcon - RSA	7.6E-03	1.6E-01	7.6E-03	1.6E-01
Fox - LSA	1.3E-03	1.3E-02	1.3E-03	1.3E-02
Lemming - Rock Lake Watershed	4.8E-03	1.1E-01	4.8E-03	1.1E-01
Lemming - JSL @ Kiggavik Discharge	4.8E-03	1.1E-01	4.8E-03	1.1E-01
Lemming - Kiggavik Camp	4.8E-03	1.1E-01	4.8E-03	1.1E-01
Lemming - JSL @ Sissons Discharge	4.8E-03	1.1E-01	4.8E-03	1.1E-01
Lapland Longspur - Rock Lake Watershed	5.5E-03	1.5E-01	5.5E-03	1.5E-01
Lapland Longspur - JSL @ Kiggavik Discharge	5.6E-03	1.6E-01	5.6E-03	1.6E-01
Lapland Longspur - Kiggavik Camp	5.4E-03	1.5E-01	5.4E-03	1.5E-01
Lapland Longspur - JSL @ Sissons Discharge	5.5E-03	1.5E-01	5.5E-03	1.5E-01
Long-Tailed Duck - Rock Lake	7.1E-03	2.3E-01	7.1E-03	2.3E-01
Long-Tailed Duck - JSL @ Kiggavik Discharge	6.9E-03	2.2E-01	6.9E-03	2.2E-01
Long-Tailed Duck - JSL @ Sissons Discharge	6.9E-03	2.3E-01	6.9E-03	2.3E-01
Merganser - Rock Lake	1.7E-03	2.5E-02	1.7E-03	2.5E-02
Merganser - JSL @ Kiggavik Discharge	1.7E-03	2.4E-02	1.7E-03	2.4E-02
Merganser - JSL @ Sissons Discharge	1.7E-03	2.4E-02	1.7E-03	2.4E-02
Muskox - JSL @ Kiggavik Discharge	2.6E-03	6.4E-02	2.6E-03	6.4E-02
Muskox - JSL @ Sissons Discharge	5.5E-03	1.5E-01	5.5E-03	1.5E-01
Northern Pintail - Rock Lake	7.2E-03	2.1E-01	7.2E-03	2.1E-01
Northern Pintail - JSL @ Kiggavik Discharge	6.9E-03	2.0E-01	6.9E-03	2.0E-01
Northern Pintail - JSL @ Sissons Discharge	6.9E-03	2.0E-01	6.9E-03	2.0E-01
Ptarmigan - Rock Lake Watershed	1.4E-02	4.4E-01	1.4E-02	4.4E-01
Ptarmigan - JSL @ Kiggavik Discharge	1.4E-02	4.4E-01	1.4E-02	4.4E-01
Ptarmigan - Kiggavik Camp	1.4E-02	4.5E-01	1.4E-02	4.5E-01
Ptarmigan - JSL @ Sissons Discharge	1.4E-02	4.4E-01	1.4E-02	4.4E-01
Sandpiper - Rock Lake	1.3E-02	4.6E-01	1.3E-02	4.6E-01
Sandpiper - JSL @ Kiggavik Discharge	1.3E-02	4.4E-01	1.3E-02	4.4E-01
Sandpiper - JSL @ Sissons Discharge	1.3E-02	4.4E-01	1.3E-02	4.4E-01
Shrew - Rock Lake Watershed	2.3E-03	4.6E-02	2.3E-03	4.6E-02
Shrew - JSL @ Kiggavik Discharge	2.4E-03	4.9E-02	2.4E-03	4.9E-02
Shrew - Kiggavik Camp	2.2E-03	4.3E-02	2.2E-03	4.3E-02
Shrew - JSL @ Sissons Discharge	1.6E-03	4.5E-02	1.6E-03	4.5E-02
Squirrel - Rock Lake Watershed	3.5E-03	8.2E-02	3.5E-03	8.2E-02
Squirrel - JSL @ Kiggavik Discharge	3.5E-03	8.2E-02	3.5E-03	8.2E-02
Squirrel - Kiggavik Camp	3.5E-03	8.2E-02	3.5E-03	8.2E-02
Squirrel - JSL @ Sissons Discharge	3.5E-03	8.2E-02	3.5E-03	8.2E-02
Wolf - LSA	1.5E-03	2.4E-02	1.5E-03	2.4E-02
Wolf - RSA	1.5E-03	2.4E-02	1.5E-03	2.4E-02
Wolverine - LSA	1.1E-03	8.3E-03	1.1E-03	8.3E-03
Wolverine - RSA	1.1E-03	8.3E-03	1.1E-03	8.3E-03

U-238+ Internal U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235
Ra-226+ Internal Ra-226 + 0.3* (Rn-222 + ...Po-214)
Pb-210+ Internal Pb-210 + Bi-210

Table H.2-4

Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

2010

DOSES TO SELECTED VECs - Average Total Dose

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Absorbed Doses - Bear - LSA									
Concentration	Bq/g	Crad	1.26E-05	3.35E-05	2.28E-05	5.30E-05	1.79E-03		
Internal Dose Factor	mGy/d per Bq/g	ldcf	1.4E-01	6.6E-02	1.6E-01	6.0E-03	7.4E-02		
Internal dose rate	mGy/d	ldrat	1.8E-06	2.2E-06	3.6E-06	3.2E-07	1.3E-04	1.4E-04	=Crad*ldcf
External Gamma rate	uGy/h	Xgrat	0.04						
Fraction of time on site	-	fts	1.00						
External dose rate	mGy/d	Xdrat	9.6E-04						=Xgrat*24*fts/1000
Internal plus external	mGy/d	tdrat	1.1E-03						=SUM(ldrat)+Xdrat
Absorbed Doses - Caribou - LSA									
Concentration	Bq/g	Crad2	2.99E-05	4.43E-05	8.68E-05	9.05E-04	2.39E-02		
Internal dose rate	mGy/d	ldrat2	4.3E-06	2.9E-06	1.4E-05	5.5E-06	1.8E-03	1.8E-03	=Crad2*ldcf
Fraction of time on site	-	fts2	1.00						
External dose rate	mGy/d	Xdrat2	9.6E-04						=Xgrat*24*fts2/1000
Internal plus external	mGy/d	tdrat2	2.8E-03						=SUM(ldrat2)+Xdrat2
Absorbed Doses - Caribou - RSA									
Concentration	Bq/g	Crad3	2.99E-05	4.43E-05	8.68E-05	9.05E-04	2.39E-02		
Internal dose rate	mGy/d	ldrat3	4.3E-06	2.9E-06	1.4E-05	5.5E-06	1.8E-03	1.8E-03	=Crad3*ldcf
Fraction of time on site	-	fts3	1.00						
External dose rate	mGy/d	Xdrat3	9.6E-04						=Xgrat*24*fts3/1000
Internal plus external	mGy/d	tdrat3	2.8E-03						=SUM(ldrat3)+Xdrat3
Absorbed Doses - Falcon - LSA									
Concentration	Bq/g	Crad4	3.79E-06	1.20E-04	3.99E-04	1.34E-01	1.46E-02		
Internal dose rate	mGy/d	ldrat4	5.4E-07	7.9E-06	6.3E-05	8.1E-04	1.1E-03	2.0E-03	=Crad4*ldcf
Fraction of time on site	-	fts4	1.00						
External dose rate	mGy/d	Xdrat4	9.6E-04						=Xgrat*24*fts4/1000
Internal plus external	mGy/d	tdrat4	2.9E-03						=SUM(ldrat4)+Xdrat4
Absorbed Doses - Falcon - RSA									
Concentration	Bq/g	Crad5	3.78E-06	1.20E-04	3.98E-04	1.34E-01	1.46E-02		
Internal dose rate	mGy/d	ldrat5	5.4E-07	7.9E-06	6.3E-05	8.1E-04	1.1E-03	2.0E-03	=Crad5*ldcf
Fraction of time on site	-	fts5	1.00						
External dose rate	mGy/d	Xdrat5	9.6E-04						=Xgrat*24*fts5/1000
Internal plus external	mGy/d	tdrat5	2.9E-03						=SUM(ldrat5)+Xdrat5
Absorbed Doses - Fox - LSA									
Concentration	Bq/g	Crad6	8.13E-06	2.47E-05	5.34E-05	1.28E-04	1.08E-03		
Internal dose rate	mGy/d	ldrat6	1.2E-06	1.6E-06	8.5E-06	7.7E-07	8.0E-05	9.2E-05	=Crad6*ldcf
Fraction of time on site	-	fts6	1.00						
External dose rate	mGy/d	Xdrat6	9.6E-04						=Xgrat*24*fts6/1000
Internal plus external	mGy/d	tdrat6	1.1E-03						=SUM(ldrat6)+Xdrat6
Absorbed Doses - Lemming - Rock Lake Watershed									
Concentration	Bq/g	Crad7	3.22E-05	1.14E-03	2.26E-03	4.72E-02	6.00E-03		
Internal dose rate	mGy/d	ldrat7	4.6E-06	7.5E-05	3.6E-04	2.8E-04	4.4E-04	1.2E-03	=Crad7*ldcf
Fraction of time on site	-	fts7	1.00						
External dose rate	mGy/d	Xdrat7	9.6E-04						=Xgrat*24*fts7/1000
Internal plus external	mGy/d	tdrat7	2.1E-03						=SUM(ldrat7)+Xdrat7
Absorbed Doses - Lemming - JSL @ Kiggavik Discharge									
Concentration	Bq/g	Crad8	3.22E-05	1.14E-03	2.26E-03	4.72E-02	6.00E-03		
Internal dose rate	mGy/d	ldrat8	4.6E-06	7.5E-05	3.6E-04	2.8E-04	4.4E-04	1.2E-03	=Crad8*ldcf
Fraction of time on site	-	fts8	1.00						
External dose rate	mGy/d	Xdrat8	9.6E-04						=Xgrat*24*fts8/1000
Internal plus external	mGy/d	tdrat8	2.1E-03						=SUM(ldrat8)+Xdrat8
Absorbed Doses - Lemming - Kiggavik Camp									
Concentration	Bq/g	Crad9	3.22E-05	1.14E-03	2.26E-03	4.72E-02	6.00E-03		
Internal dose rate	mGy/d	ldrat9	4.6E-06	7.5E-05	3.6E-04	2.8E-04	4.4E-04	1.2E-03	=Crad9*ldcf
Fraction of time on site	-	fts9	1.00						
External dose rate	mGy/d	Xdrat9	9.6E-04						=Xgrat*24*fts9/1000
Internal plus external	mGy/d	tdrat9	2.1E-03						=SUM(ldrat9)+Xdrat9
Absorbed Doses - Lemming - JSL @ Sissons Discharge									
Concentration	Bq/g	Crad10	3.22E-05	1.14E-03	2.26E-03	4.72E-02	6.00E-03		
Internal dose rate	mGy/d	ldrat10	4.6E-06	7.5E-05	3.6E-04	2.8E-04	4.4E-04	1.2E-03	=Crad10*ldcf
Fraction of time on site	-	fts10	1.00						
External dose rate	mGy/d	Xdrat10	9.6E-04						=Xgrat*24*fts10/1000
Internal plus external	mGy/d	tdrat10	2.1E-03						=SUM(ldrat10)+Xdrat10
Absorbed Doses - Lapland Longspur - Rock Lake Watershed									
Concentration	Bq/g	Crad11	1.15E-05	7.43E-04	1.58E-03	3.56E-02	1.28E-02		
Internal dose rate	mGy/d	ldrat11	1.6E-06	4.9E-05	2.5E-04	2.1E-04	9.5E-04	1.5E-03	=Crad11*ldcf
Fraction of time on site	-	fts11	1.00						
External dose rate	mGy/d	Xdrat11	9.6E-04						=Xgrat*24*fts11/1000
Internal plus external	mGy/d	tdrat11	2.4E-03						=SUM(ldrat11)+Xdrat11

Table H.2-4

Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

Absorbed Doses - Lapland Longspur - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad12	1.24E-05	7.45E-04	1.62E-03	3.59E-02	1.32E-02			
Internal dose rate	mGy/d	ldrat12	1.8E-06	4.9E-05	2.6E-04	2.2E-04	9.8E-04	1.5E-03	=Crad12*ldcf	
Fraction of time on site	-	fts12	1.00							
External dose rate	mGy/d	Xdrat12	9.6E-04						=Xgrat*24*fts12/1000	
Internal plus external	mGy/d	tdrat12	2.5E-03						=SUM(ldrat12)+Xdrat12	
Absorbed Doses - Lapland Longspur - Kiggavik Camp										
Concentration	Bq/g	Crad13	3.49E-06	7.42E-04	1.55E-03	3.54E-02	1.26E-02			
Internal dose rate	mGy/d	ldrat13	5.0E-07	4.9E-05	2.5E-04	2.1E-04	9.4E-04	1.4E-03	=Crad13*ldcf	
Fraction of time on site	-	fts13	1.00							
External dose rate	mGy/d	Xdrat13	9.6E-04						=Xgrat*24*fts13/1000	
Internal plus external	mGy/d	tdrat13	2.4E-03						=SUM(ldrat13)+Xdrat13	
Absorbed Doses - Lapland Longspur - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad14	1.17E-05	7.43E-04	1.58E-03	3.56E-02	1.29E-02			
Internal dose rate	mGy/d	ldrat14	1.7E-06	4.9E-05	2.5E-04	2.1E-04	9.5E-04	1.5E-03	=Crad14*ldcf	
Fraction of time on site	-	fts14	1.00							
External dose rate	mGy/d	Xdrat14	9.6E-04						=Xgrat*24*fts14/1000	
Internal plus external	mGy/d	tdrat14	2.4E-03						=SUM(ldrat14)+Xdrat14	
Absorbed Doses - Long-Tailed Duck - Rock Lake										
Concentration	Bq/g	Crad15	1.95E-05	2.00E-04	2.29E-03	1.99E-02	1.55E-02			
Internal dose rate	mGy/d	ldrat15	2.8E-06	1.3E-05	3.6E-04	1.2E-04	1.1E-03	1.6E-03	=Crad15*ldcf	
Fraction of time on site	-	fts15	1.00							
External dose rate	mGy/d	Xdrat15	9.6E-04						=Xgrat*24*fts15/1000	
Internal plus external	mGy/d	tdrat15	2.6E-03						=SUM(ldrat15)+Xdrat15	
Absorbed Doses - Long-Tailed Duck - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad16	1.76E-05	1.94E-04	2.21E-03	1.92E-02	1.49E-02			
Internal dose rate	mGy/d	ldrat16	2.5E-06	1.3E-05	3.5E-04	1.2E-04	1.1E-03	1.6E-03	=Crad16*ldcf	
Fraction of time on site	-	fts16	1.00							
External dose rate	mGy/d	Xdrat16	9.6E-04						=Xgrat*24*fts16/1000	
Internal plus external	mGy/d	tdrat16	2.5E-03						=SUM(ldrat16)+Xdrat16	
Absorbed Doses - Long-Tailed Duck - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad17	1.79E-05	1.95E-04	2.22E-03	1.93E-02	1.50E-02			
Internal dose rate	mGy/d	ldrat17	2.5E-06	1.3E-05	3.5E-04	1.2E-04	1.1E-03	1.6E-03	=Crad17*ldcf	
Fraction of time on site	-	fts17	1.00							
External dose rate	mGy/d	Xdrat17	9.6E-04						=Xgrat*24*fts17/1000	
Internal plus external	mGy/d	tdrat17	2.6E-03						=SUM(ldrat17)+Xdrat17	
Absorbed Doses - Merganser - Rock Lake										
Concentration	Bq/g	Crad18	2.29E-06	8.25E-05	1.24E-04	6.28E-03	2.11E-03			
Internal dose rate	mGy/d	ldrat18	3.3E-07	5.4E-06	2.0E-05	3.8E-05	1.6E-04	2.2E-04	=Crad18*ldcf	
Fraction of time on site	-	fts18	1.00							
External dose rate	mGy/d	Xdrat18	9.6E-04						=Xgrat*24*fts18/1000	
Internal plus external	mGy/d	tdrat18	1.2E-03						=SUM(ldrat18)+Xdrat18	
Absorbed Doses - Merganser - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad19	2.29E-06	7.94E-05	1.17E-04	6.08E-03	2.00E-03			
Internal dose rate	mGy/d	ldrat19	3.2E-07	5.2E-06	1.9E-05	3.7E-05	1.5E-04	2.1E-04	=Crad19*ldcf	
Fraction of time on site	-	fts19	1.00							
External dose rate	mGy/d	Xdrat19	9.6E-04						=Xgrat*24*fts19/1000	
Internal plus external	mGy/d	tdrat19	1.2E-03						=SUM(ldrat19)+Xdrat19	
Absorbed Doses - Merganser - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad20	2.29E-06	7.98E-05	1.18E-04	6.10E-03	2.02E-03			
Internal dose rate	mGy/d	ldrat20	3.2E-07	5.3E-06	1.9E-05	3.7E-05	1.5E-04	2.1E-04	=Crad20*ldcf	
Fraction of time on site	-	fts20	1.00							
External dose rate	mGy/d	Xdrat20	9.6E-04						=Xgrat*24*fts20/1000	
Internal plus external	mGy/d	tdrat20	1.2E-03						=SUM(ldrat20)+Xdrat20	
Absorbed Doses - Muskox - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad21	3.12E-05	5.03E-05	7.12E-05	2.22E-04	6.91E-03			
Internal dose rate	mGy/d	ldrat21	4.4E-06	3.3E-06	1.1E-05	1.3E-06	5.1E-04	5.3E-04	=Crad21*ldcf	
Fraction of time on site	-	fts21	1.00							
External dose rate	mGy/d	Xdrat21	9.6E-04						=Xgrat*24*fts21/1000	
Internal plus external	mGy/d	tdrat21	1.5E-03						=SUM(ldrat21)+Xdrat21	
Absorbed Doses - Muskox - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad22	1.17E-05	7.43E-04	1.58E-03	3.56E-02	1.29E-02			
Internal dose rate	mGy/d	ldrat22	1.7E-06	4.9E-05	2.5E-04	2.1E-04	9.5E-04	1.5E-03	=Crad22*ldcf	
Fraction of time on site	-	fts22	1.00							
External dose rate	mGy/d	Xdrat22	9.6E-04						=Xgrat*24*fts22/1000	
Internal plus external	mGy/d	tdrat22	2.4E-03						=SUM(ldrat22)+Xdrat22	
Absorbed Doses - Northern Pintail - Rock Lake										
Concentration	Bq/g	Crad23	7.17E-06	1.15E-03	6.59E-04	5.23E-02	1.76E-02			
Internal dose rate	mGy/d	ldrat23	1.0E-06	7.5E-05	1.0E-04	3.2E-04	1.3E-03	1.8E-03	=Crad23*ldcf	
Fraction of time on site	-	fts23	1.00							
External dose rate	mGy/d	Xdrat23	9.6E-04						=Xgrat*24*fts23/1000	
Internal plus external	mGy/d	tdrat23	2.8E-03						=SUM(ldrat23)+Xdrat23	

Table H.2-4

Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

Absorbed Doses - Northern Pintail - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad24	6.58E-06	1.10E-03	6.35E-04	5.03E-02	1.68E-02			
Internal dose rate	mGy/d	Idrat24	9.3E-07	7.2E-05	1.0E-04	3.0E-04	1.2E-03	1.7E-03	=Crad24*Idcf	
Fraction of time on site	-	fts24	1.00							
External dose rate	mGy/d	Xdrat24	9.6E-04						=Xgrat*24*fts24/1000	
Internal plus external	mGy/d	tdrat24	2.7E-03						=SUM(Idrat24)+Xdrat24	
Absorbed Doses - Northern Pintail - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad25	6.68E-06	1.11E-03	6.38E-04	5.06E-02	1.70E-02			
Internal dose rate	mGy/d	Idrat25	9.5E-07	7.3E-05	1.0E-04	3.1E-04	1.3E-03	1.7E-03	=Crad25*Idcf	
Fraction of time on site	-	fts25	1.00							
External dose rate	mGy/d	Xdrat25	9.6E-04						=Xgrat*24*fts25/1000	
Internal plus external	mGy/d	tdrat25	2.7E-03						=SUM(Idrat25)+Xdrat25	
Absorbed Doses - Ptarmigan - Rock Lake Watershed										
Concentration	Bq/g	Crad26	1.15E-05	2.25E-04	6.65E-04	1.38E-01	4.73E-02			
Internal dose rate	mGy/d	Idrat26	1.6E-06	1.5E-05	1.1E-04	8.3E-04	3.5E-03	4.5E-03	=Crad26*Idcf	
Fraction of time on site	-	fts26	1.00							
External dose rate	mGy/d	Xdrat26	9.6E-04						=Xgrat*24*fts26/1000	
Internal plus external	mGy/d	tdrat26	5.4E-03						=SUM(Idrat26)+Xdrat26	
Absorbed Doses - Ptarmigan - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad27	1.18E-05	2.26E-04	6.77E-04	1.38E-01	4.75E-02			
Internal dose rate	mGy/d	Idrat27	1.7E-06	1.5E-05	1.1E-04	8.3E-04	3.5E-03	4.5E-03	=Crad27*Idcf	
Fraction of time on site	-	fts27	1.00							
External dose rate	mGy/d	Xdrat27	9.6E-04						=Xgrat*24*fts27/1000	
Internal plus external	mGy/d	tdrat27	5.4E-03						=SUM(Idrat27)+Xdrat27	
Absorbed Doses - Ptarmigan - Kiggavik Camp										
Concentration	Bq/g	Crad28	8.86E-06	2.25E-04	6.54E-04	1.37E-01	4.73E-02			
Internal dose rate	mGy/d	Idrat28	1.3E-06	1.5E-05	1.0E-04	8.3E-04	3.5E-03	4.4E-03	=Crad28*Idcf	
Fraction of time on site	-	fts28	1.00							
External dose rate	mGy/d	Xdrat28	9.6E-04						=Xgrat*24*fts28/1000	
Internal plus external	mGy/d	tdrat28	5.4E-03						=SUM(Idrat28)+Xdrat28	
Absorbed Doses - Ptarmigan - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad29	1.15E-05	2.25E-04	6.64E-04	1.38E-01	4.74E-02			
Internal dose rate	mGy/d	Idrat29	1.6E-06	1.5E-05	1.1E-04	8.3E-04	3.5E-03	4.5E-03	=Crad29*Idcf	
Fraction of time on site	-	fts29	1.00							
External dose rate	mGy/d	Xdrat29	9.6E-04						=Xgrat*24*fts29/1000	
Internal plus external	mGy/d	tdrat29	5.4E-03						=SUM(Idrat29)+Xdrat29	
Absorbed Doses - Sandpiper - Rock Lake										
Concentration	Bq/g	Crad30	4.84E-05	7.53E-04	3.86E-03	5.67E-02	3.46E-02			
Internal dose rate	mGy/d	Idrat30	6.9E-06	5.0E-05	6.1E-04	3.4E-04	2.6E-03	3.6E-03	=Crad30*Idcf	
Fraction of time on site	-	fts30	1.00							
External dose rate	mGy/d	Xdrat30	9.6E-04						=Xgrat*24*fts30/1000	
Internal plus external	mGy/d	tdrat30	4.5E-03						=SUM(Idrat30)+Xdrat30	
Absorbed Doses - Sandpiper - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad31	4.49E-05	7.43E-04	3.72E-03	5.54E-02	3.32E-02			
Internal dose rate	mGy/d	Idrat31	6.4E-06	4.9E-05	5.9E-04	3.3E-04	2.5E-03	3.4E-03	=Crad31*Idcf	
Fraction of time on site	-	fts31	1.00							
External dose rate	mGy/d	Xdrat31	9.6E-04						=Xgrat*24*fts31/1000	
Internal plus external	mGy/d	tdrat31	4.4E-03						=SUM(Idrat31)+Xdrat31	
Absorbed Doses - Sandpiper - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad32	4.55E-05	7.43E-04	3.73E-03	5.55E-02	3.34E-02			
Internal dose rate	mGy/d	Idrat32	6.5E-06	4.9E-05	5.9E-04	3.3E-04	2.5E-03	3.5E-03	=Crad32*Idcf	
Fraction of time on site	-	fts32	1.00							
External dose rate	mGy/d	Xdrat32	9.6E-04						=Xgrat*24*fts32/1000	
Internal plus external	mGy/d	tdrat32	4.4E-03						=SUM(Idrat32)+Xdrat32	
Absorbed Doses - Shrew - Rock Lake Watershed										
Concentration	Bq/g	Crad33	3.26E-05	1.90E-04	1.27E-03	1.12E-02	2.07E-03			
Internal dose rate	mGy/d	Idrat33	4.6E-06	1.3E-05	2.0E-04	6.8E-05	1.5E-04	4.4E-04	=Crad33*Idcf	
Fraction of time on site	-	fts33	1.00							
External dose rate	mGy/d	Xdrat33	9.6E-04						=Xgrat*24*fts33/1000	
Internal plus external	mGy/d	tdrat33	1.4E-03						=SUM(Idrat33)+Xdrat33	
Absorbed Doses - Shrew - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad34	3.58E-05	2.00E-04	1.37E-03	1.13E-02	2.12E-03			
Internal dose rate	mGy/d	Idrat34	5.1E-06	1.3E-05	2.2E-04	6.8E-05	1.6E-04	4.6E-04	=Crad34*Idcf	
Fraction of time on site	-	fts34	1.00							
External dose rate	mGy/d	Xdrat34	9.6E-04						=Xgrat*24*fts34/1000	
Internal plus external	mGy/d	tdrat34	1.4E-03						=SUM(Idrat34)+Xdrat34	
Absorbed Doses - Shrew - Kiggavik Camp										
Concentration	Bq/g	Crad35	2.99E-06	1.84E-04	1.18E-03	1.11E-02	2.05E-03			
Internal dose rate	mGy/d	Idrat35	4.2E-07	1.2E-05	1.9E-04	6.7E-05	1.5E-04	4.2E-04	=Crad35*Idcf	
Fraction of time on site	-	fts35	1.00							
External dose rate	mGy/d	Xdrat35	9.6E-04						=Xgrat*24*fts35/1000	
Internal plus external	mGy/d	tdrat35	1.4E-03						=SUM(Idrat35)+Xdrat35	
Absorbed Doses - Shrew - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad36	3.31E-05	1.91E-04	1.26E-03	1.12E-02	2.08E-03			
Internal dose rate	mGy/d	Idrat36	4.7E-06	1.3E-05	2.0E-04	6.8E-05	1.5E-04	4.4E-04	=Crad36*Idcf	
Fraction of time on site	-	fts36	1.00							

Table H.2-4
Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

External dose rate	mGy/d	Xdrat36	2.7E-04							=Xgrat*24*fts36/3600
Internal plus external	mGy/d	tdrat36	7.1E-04							=SUM(ldrat36)+Xdrat36
Absorbed Doses - Squirrel - Rock Lake Watershed										
Concentration	Bq/g	Crad37	2.69E-05	9.87E-04	1.48E-03	1.96E-02	2.33E-03			
Internal dose rate	mGy/d	ldrat37	3.8E-06	6.5E-05	2.4E-04	1.2E-04	1.7E-04	6.0E-04		=Crad37*ldcf
Fraction of time on site	-	fts37	1.00							
External dose rate	mGy/d	Xdrat37	9.6E-04							=Xgrat*24*fts37/1000
Internal plus external	mGy/d	tdrat37	1.6E-03							=SUM(ldrat37)+Xdrat37
Absorbed Doses - Squirrel - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad38	2.69E-05	9.87E-04	1.48E-03	1.96E-02	2.33E-03			
Internal dose rate	mGy/d	ldrat38	3.8E-06	6.5E-05	2.4E-04	1.2E-04	1.7E-04	6.0E-04		=Crad38*ldcf
Fraction of time on site	-	fts38	1.00							
External dose rate	mGy/d	Xdrat38	9.6E-04							=Xgrat*24*fts38/1000
Internal plus external	mGy/d	tdrat38	1.6E-03							=SUM(ldrat38)+Xdrat38
Absorbed Doses - Squirrel - Kiggavik Camp										
Concentration	Bq/g	Crad39	2.69E-05	9.87E-04	1.48E-03	1.96E-02	2.33E-03			
Internal dose rate	mGy/d	ldrat39	3.8E-06	6.5E-05	2.4E-04	1.2E-04	1.7E-04	6.0E-04		=Crad39*ldcf
Fraction of time on site	-	fts39	1.00							
External dose rate	mGy/d	Xdrat39	9.6E-04							=Xgrat*24*fts39/1000
Internal plus external	mGy/d	tdrat39	1.6E-03							=SUM(ldrat39)+Xdrat39

Table H.2-4

Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

Absorbed Doses - Squirrel - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad40	2.69E-05	9.87E-04	1.48E-03	1.96E-02	2.33E-03			
Internal dose rate	mGy/d	Idrat40	3.8E-06	6.5E-05	2.4E-04	1.2E-04	1.7E-04	6.0E-04	=Crad40*Idcf	
Fraction of time on site	-	fts40	1.00							
External dose rate	mGy/d	Xdrat40	9.6E-04						=Xgrat*24*fts40/1000	
Internal plus external	mGy/d	tdrat40	1.6E-03						=SUM(Idrat40)+Xdrat40	
Absorbed Doses - Wolf - LSA										
Concentration	Bq/g	Crad41	1.16E-05	9.61E-06	6.02E-06	3.68E-06	1.90E-03			
Internal dose rate	mGy/d	Idrat41	1.6E-06	6.3E-07	9.6E-07	2.2E-08	1.4E-04	1.4E-04	=Crad41*Idcf	
Fraction of time on site	-	fts41	1.00							
External dose rate	mGy/d	Xdrat41	9.6E-04						=Xgrat*24*fts41/1000	
Internal plus external	mGy/d	tdrat41	1.1E-03						=SUM(Idrat41)+Xdrat41	
Absorbed Doses - Wolf - RSA										
Concentration	Bq/g	Crad42	1.16E-05	9.60E-06	6.02E-06	3.68E-06	1.90E-03			
Internal dose rate	mGy/d	Idrat42	1.6E-06	6.3E-07	9.6E-07	2.2E-08	1.4E-04	1.4E-04	=Crad42*Idcf	
Fraction of time on site	-	fts42	1.00							
External dose rate	mGy/d	Xdrat42	9.6E-04						=Xgrat*24*fts42/1000	
Internal plus external	mGy/d	tdrat42	1.1E-03						=SUM(Idrat42)+Xdrat42	
Absorbed Doses - Wolverine - LSA										
Concentration	Bq/g	Crad43	1.56E-05	3.36E-05	5.34E-05	1.05E-04	4.76E-04			
Internal dose rate	mGy/d	Idrat43	2.2E-06	2.2E-06	8.5E-06	6.3E-07	3.5E-05	4.9E-05	=Crad43*Idcf	
Fraction of time on site	-	fts43	1.00							
External dose rate	mGy/d	Xdrat43	9.6E-04						=Xgrat*24*fts43/1000	
Internal plus external	mGy/d	tdrat43	1.0E-03						=SUM(Idrat43)+Xdrat43	
Absorbed Doses - Wolverine - RSA										
Concentration	Bq/g	Crad44	1.56E-05	3.37E-05	5.34E-05	1.05E-04	4.76E-04			
Internal dose rate	mGy/d	Idrat44	2.2E-06	2.2E-06	8.5E-06	6.3E-07	3.5E-05	4.9E-05	=Crad44*Idcf	
Fraction of time on site	-	fts44	1.00							
External dose rate	mGy/d	Xdrat44	9.6E-04						=Xgrat*24*fts44/1000	
Internal plus external	mGy/d	tdrat44	1.0E-03						=SUM(Idrat44)+Xdrat44	
Equivalent Doses - Bear - LSA										
RBE for alpha	Sv/Gy	RBE	40							
High LET dose rate	mSv/d	Hletdr	7.2E-05	8.8E-05	1.4E-04	3.2E-07	5.3E-03	5.6E-03	=Idrat*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr	9.6E-04						=Xdrat	
Total dose rate	mSv/d	tdr	6.6E-03						=SUM(Hletdr)+Lletdr	
Equivalent Doses - Caribou - LSA										
High LET dose rate	mSv/d	Hletdr2	1.7E-04	1.2E-04	5.5E-04	5.5E-06	7.1E-02	7.2E-02	=Idrat2*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr2	9.6E-04						=Xdrat2	
Total dose rate	mSv/d	tdr2	7.3E-02						=SUM(Hletdr2)+Lletdr2	
Equivalent Doses - Caribou - RSA										
High LET dose rate	mSv/d	Hletdr3	1.7E-04	1.2E-04	5.5E-04	5.5E-06	7.1E-02	7.2E-02	=Idrat3*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr3	9.6E-04						=Xdrat3	
Total dose rate	mSv/d	tdr3	7.3E-02						=SUM(Hletdr3)+Lletdr3	
Equivalent Doses - Falcon - LSA										
High LET dose rate	mSv/d	Hletdr4	2.2E-05	3.2E-04	2.5E-03	8.1E-04	4.3E-02	4.7E-02	=Idrat4*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr4	9.6E-04						=Xdrat4	
Total dose rate	mSv/d	tdr4	4.8E-02						=SUM(Hletdr4)+Lletdr4	
Equivalent Doses - Falcon - RSA										
High LET dose rate	mSv/d	Hletdr5	2.1E-05	3.1E-04	2.5E-03	8.1E-04	4.3E-02	4.7E-02	=Idrat5*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr5	9.6E-04						=Xdrat5	
Total dose rate	mSv/d	tdr5	4.8E-02						=SUM(Hletdr5)+Lletdr5	
Equivalent Doses - Fox - LSA										
High LET dose rate	mSv/d	Hletdr6	4.6E-05	6.5E-05	3.4E-04	7.7E-07	3.2E-03	3.7E-03	=Idrat6*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr6	9.6E-04						=Xdrat6	
Total dose rate	mSv/d	tdr6	4.6E-03						=SUM(Hletdr6)+Lletdr6	
Equivalent Doses - Lemming - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr7	1.8E-04	3.0E-03	1.4E-02	2.8E-04	1.8E-02	3.6E-02	=Idrat7*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr7	9.6E-04						=Xdrat7	
Total dose rate	mSv/d	tdr7	3.7E-02						=SUM(Hletdr7)+Lletdr7	
Equivalent Doses - Lemming - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr8	1.8E-04	3.0E-03	1.4E-02	2.8E-04	1.8E-02	3.6E-02	=Idrat8*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr8	9.6E-04						=Xdrat8	
Total dose rate	mSv/d	tdr8	3.7E-02						=SUM(Hletdr8)+Lletdr8	
Equivalent Doses - Lemming - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr9	1.8E-04	3.0E-03	1.4E-02	2.8E-04	1.8E-02	3.6E-02	=Idrat9*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr9	9.6E-04						=Xdrat9	
Total dose rate	mSv/d	tdr9	3.7E-02						=SUM(Hletdr9)+Lletdr9	
Equivalent Doses - Lemming - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr10	1.8E-04	3.0E-03	1.4E-02	2.8E-04	1.8E-02	3.6E-02	=Idrat10*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr10	9.6E-04						=Xdrat10	
Total dose rate	mSv/d	tdr10	3.7E-02						=SUM(Hletdr10)+Lletdr10	

Table H.2-4

Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

Equivalent Doses - Lapland Longspur - Rock Lake Watershed									
High LET dose rate	mSv/d	Hletdr11	6.5E-05	2.0E-03	1.0E-02	2.1E-04	3.8E-02	5.0E-02	=Idrat11*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr11	9.6E-04						=Xdrat11
Total dose rate	mSv/d	tdr11	5.1E-02						=SUM(Hletdr11)+Lletdr11
Equivalent Doses - Lapland Longspur - JSL @ Kiggavik Discharge									
High LET dose rate	mSv/d	Hletdr12	7.0E-05	2.0E-03	1.0E-02	2.2E-04	3.9E-02	5.2E-02	=Idrat12*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr12	9.6E-04						=Xdrat12
Total dose rate	mSv/d	tdr12	5.3E-02						=SUM(Hletdr12)+Lletdr12
Equivalent Doses - Lapland Longspur - Kiggavik Camp									
High LET dose rate	mSv/d	Hletdr13	2.0E-05	2.0E-03	9.8E-03	2.1E-04	3.7E-02	4.9E-02	=Idrat13*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr13	9.6E-04						=Xdrat13
Total dose rate	mSv/d	tdr13	5.0E-02						=SUM(Hletdr13)+Lletdr13
Equivalent Doses - Lapland Longspur - JSL @ Sissons Discharge									
High LET dose rate	mSv/d	Hletdr14	6.6E-05	2.0E-03	1.0E-02	2.1E-04	3.8E-02	5.0E-02	=Idrat14*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr14	9.6E-04						=Xdrat14
Total dose rate	mSv/d	tdr14	5.1E-02						=SUM(Hletdr14)+Lletdr14
Equivalent Doses - Long-Tailed Duck - Rock Lake									
High LET dose rate	mSv/d	Hletdr15	1.1E-04	5.3E-04	1.5E-02	1.2E-04	4.6E-02	6.1E-02	=Idrat15*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr15	9.6E-04						=Xdrat15
Total dose rate	mSv/d	tdr15	6.2E-02						=SUM(Hletdr15)+Lletdr15
Equivalent Doses - Long-Tailed Duck - JSL @ Kiggavik Discharge									
High LET dose rate	mSv/d	Hletdr16	1.0E-04	5.1E-04	1.4E-02	1.2E-04	4.4E-02	5.9E-02	=Idrat16*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr16	9.6E-04						=Xdrat16
Total dose rate	mSv/d	tdr16	6.0E-02						=SUM(Hletdr16)+Lletdr16
Equivalent Doses - Long-Tailed Duck - JSL @ Sissons Discharge									
High LET dose rate	mSv/d	Hletdr17	1.0E-04	5.1E-04	1.4E-02	1.2E-04	4.4E-02	5.9E-02	=Idrat17*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr17	9.6E-04						=Xdrat17
Total dose rate	mSv/d	tdr17	6.0E-02						=SUM(Hletdr17)+Lletdr17
Equivalent Doses - Merganser - Rock Lake									
High LET dose rate	mSv/d	Hletdr18	1.3E-05	2.2E-04	7.9E-04	3.8E-05	6.3E-03	7.3E-03	=Idrat18*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr18	9.6E-04						=Xdrat18
Total dose rate	mSv/d	tdr18	8.3E-03						=SUM(Hletdr18)+Lletdr18
Equivalent Doses - Merganser - JSL @ Kiggavik Discharge									
High LET dose rate	mSv/d	Hletdr19	1.3E-05	2.1E-04	7.4E-04	3.7E-05	5.9E-03	6.9E-03	=Idrat19*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr19	9.6E-04						=Xdrat19
Total dose rate	mSv/d	tdr19	7.9E-03						=SUM(Hletdr19)+Lletdr19
Equivalent Doses - Merganser - JSL @ Sissons Discharge									
High LET dose rate	mSv/d	Hletdr20	1.3E-05	2.1E-04	7.5E-04	3.7E-05	6.0E-03	7.0E-03	=Idrat20*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr20	9.6E-04						=Xdrat20
Total dose rate	mSv/d	tdr20	8.0E-03						=SUM(Hletdr20)+Lletdr20
Equivalent Doses - Muskox - JSL @ Kiggavik Discharge									
High LET dose rate	mSv/d	Hletdr21	1.8E-04	1.3E-04	4.5E-04	1.3E-06	2.0E-02	2.1E-02	=Idrat21*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr21	9.6E-04						=Xdrat21
Total dose rate	mSv/d	tdr21	2.2E-02						=SUM(Hletdr21)+Lletdr21
Equivalent Doses - Muskox - JSL @ Sissons Discharge									
High LET dose rate	mSv/d	Hletdr22	6.6E-05	2.0E-03	1.0E-02	2.1E-04	3.8E-02	5.0E-02	=Idrat22*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr22	9.6E-04						=Xdrat22
Total dose rate	mSv/d	tdr22	5.1E-02						=SUM(Hletdr22)+Lletdr22
Equivalent Doses - Northern Pintail - Rock Lake									
High LET dose rate	mSv/d	Hletdr23	4.1E-05	3.0E-03	4.2E-03	3.2E-04	5.2E-02	6.0E-02	=Idrat23*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr23	9.6E-04						=Xdrat23
Total dose rate	mSv/d	tdr23	6.1E-02						=SUM(Hletdr23)+Lletdr23
Equivalent Doses - Northern Pintail - JSL @ Kiggavik Discharge									
High LET dose rate	mSv/d	Hletdr24	3.7E-05	2.9E-03	4.0E-03	3.0E-04	5.0E-02	5.7E-02	=Idrat24*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr24	9.6E-04						=Xdrat24
Total dose rate	mSv/d	tdr24	5.8E-02						=SUM(Hletdr24)+Lletdr24
Equivalent Doses - Northern Pintail - JSL @ Sissons Discharge									
High LET dose rate	mSv/d	Hletdr25	3.8E-05	2.9E-03	4.1E-03	3.1E-04	5.0E-02	5.8E-02	=Idrat25*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr25	9.6E-04						=Xdrat25
Total dose rate	mSv/d	tdr25	5.8E-02						=SUM(Hletdr25)+Lletdr25
Equivalent Doses - Ptarmigan - Rock Lake Watershed									
High LET dose rate	mSv/d	Hletdr26	6.5E-05	5.9E-04	4.2E-03	8.3E-04	1.4E-01	1.5E-01	=Idrat26*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr26	9.6E-04						=Xdrat26
Total dose rate	mSv/d	tdr26	1.5E-01						=SUM(Hletdr26)+Lletdr26
Equivalent Doses - Ptarmigan - JSL @ Kiggavik Discharge									
High LET dose rate	mSv/d	Hletdr27	6.7E-05	6.0E-04	4.3E-03	8.3E-04	1.4E-01	1.5E-01	=Idrat27*RBE , except Pb-210
Low LET dose rate	mSv/d	Lletdr27	9.6E-04						=Xdrat27
Total dose rate	mSv/d	tdr27	1.5E-01						=SUM(Hletdr27)+Lletdr27

Table H.2-4

Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

Equivalent Doses - Ptarmigan - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr28	5.0E-05	5.9E-04	4.2E-03	8.3E-04	1.4E-01	1.5E-01	=Idrat28*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr28	9.6E-04						=Xdrat28	
Total dose rate	mSv/d	tdr28	1.5E-01						=SUM(Hletdr28)+Lletdr28	
Equivalent Doses - Ptarmigan - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr29	6.5E-05	5.9E-04	4.2E-03	8.3E-04	1.4E-01	1.5E-01	=Idrat29*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr29	9.6E-04						=Xdrat29	
Total dose rate	mSv/d	tdr29	1.5E-01						=SUM(Hletdr29)+Lletdr29	
Equivalent Doses - Sandpiper - Rock Lake										
High LET dose rate	mSv/d	Hletdr30	2.8E-04	2.0E-03	2.5E-02	3.4E-04	1.0E-01	1.3E-01	=Idrat30*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr30	9.6E-04						=Xdrat30	
Total dose rate	mSv/d	tdr30	1.3E-01						=SUM(Hletdr30)+Lletdr30	
Equivalent Doses - Sandpiper - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr31	2.6E-04	2.0E-03	2.4E-02	3.3E-04	9.8E-02	1.2E-01	=Idrat31*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr31	9.6E-04						=Xdrat31	
Total dose rate	mSv/d	tdr31	1.3E-01						=SUM(Hletdr31)+Lletdr31	
Equivalent Doses - Sandpiper - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr32	2.6E-04	2.0E-03	2.4E-02	3.3E-04	9.9E-02	1.3E-01	=Idrat32*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr32	9.6E-04						=Xdrat32	
Total dose rate	mSv/d	tdr32	1.3E-01						=SUM(Hletdr32)+Lletdr32	
Equivalent Doses - Shrew - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr33	1.9E-04	5.0E-04	8.1E-03	6.8E-05	6.1E-03	1.5E-02	=Idrat33*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr33	9.6E-04						=Xdrat33	
Total dose rate	mSv/d	tdr33	1.6E-02						=SUM(Hletdr33)+Lletdr33	
Equivalent Doses - Shrew - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr34	2.0E-04	5.3E-04	8.7E-03	6.8E-05	6.3E-03	1.6E-02	=Idrat34*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr34	9.6E-04						=Xdrat34	
Total dose rate	mSv/d	tdr34	1.7E-02						=SUM(Hletdr34)+Lletdr34	
Equivalent Doses - Shrew - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr35	1.7E-05	4.8E-04	7.5E-03	6.7E-05	6.1E-03	1.4E-02	=Idrat35*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr35	9.6E-04						=Xdrat35	
Total dose rate	mSv/d	tdr35	1.5E-02						=SUM(Hletdr35)+Lletdr35	
Equivalent Doses - Shrew - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr36	1.9E-04	5.0E-04	8.0E-03	6.8E-05	6.2E-03	1.5E-02	=Idrat36*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr36	2.7E-04						=Xdrat36	
Total dose rate	mSv/d	tdr36	1.5E-02						=SUM(Hletdr36)+Lletdr36	
Equivalent Doses - Squirrel - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr37	1.5E-04	2.6E-03	9.4E-03	1.2E-04	6.9E-03	1.9E-02	=Idrat37*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr37	9.6E-04						=Xdrat37	
Total dose rate	mSv/d	tdr37	2.0E-02						=SUM(Hletdr37)+Lletdr37	
Equivalent Doses - Squirrel - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr38	1.5E-04	2.6E-03	9.4E-03	1.2E-04	6.9E-03	1.9E-02	=Idrat38*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr38	9.6E-04						=Xdrat38	
Total dose rate	mSv/d	tdr38	2.0E-02						=SUM(Hletdr38)+Lletdr38	
Equivalent Doses - Squirrel - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr39	1.5E-04	2.6E-03	9.4E-03	1.2E-04	6.9E-03	1.9E-02	=Idrat39*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr39	9.6E-04						=Xdrat39	
Total dose rate	mSv/d	tdr39	2.0E-02						=SUM(Hletdr39)+Lletdr39	
Equivalent Doses - Squirrel - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr40	1.5E-04	2.6E-03	9.4E-03	1.2E-04	6.9E-03	1.9E-02	=Idrat40*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr40	9.6E-04						=Xdrat40	
Total dose rate	mSv/d	tdr40	2.0E-02						=SUM(Hletdr40)+Lletdr40	
Equivalent Doses - Wolf - LSA										
High LET dose rate	mSv/d	Hletdr41	6.6E-05	2.5E-05	3.8E-05	2.2E-08	5.6E-03	5.8E-03	=Idrat41*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr41	9.6E-04						=Xdrat41	
Total dose rate	mSv/d	tdr41	6.7E-03						=SUM(Hletdr41)+Lletdr41	
Equivalent Doses - Wolf - RSA										
High LET dose rate	mSv/d	Hletdr42	6.6E-05	2.5E-05	3.8E-05	2.2E-08	5.6E-03	5.8E-03	=Idrat42*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr42	9.6E-04						=Xdrat42	
Total dose rate	mSv/d	tdr42	6.7E-03						=SUM(Hletdr42)+Lletdr42	
Equivalent Doses - Wolverine - LSA										
High LET dose rate	mSv/d	Hletdr43	8.9E-05	8.8E-05	3.4E-04	6.3E-07	1.4E-03	1.9E-03	=Idrat43*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr43	9.6E-04						=Xdrat43	
Total dose rate	mSv/d	tdr43	2.9E-03						=SUM(Hletdr43)+Lletdr43	
Equivalent Doses - Wolverine - RSA										
High LET dose rate	mSv/d	Hletdr44	8.9E-05	8.9E-05	3.4E-04	6.3E-07	1.4E-03	1.9E-03	=Idrat44*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr44	9.6E-04						=Xdrat44	
Total dose rate	mSv/d	tdr44	2.9E-03						=SUM(Hletdr44)+Lletdr44	

Table H.2-4
Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

SUMMARY

3 Screening Criterion in mGy/d	Total Absorbed Dose mGy/d	Total Equivalent Dose mSv/d	Index (Absorbed Dose)	Index (Equivalent Dose)
Bear - LSA	1.1E-03	6.6E-03	3.7E-04	2.2E-03
Caribou - LSA	2.8E-03	7.3E-02	9.2E-04	2.4E-02
Caribou - RSA	2.8E-03	7.3E-02	9.2E-04	2.4E-02
Falcon - LSA	2.9E-03	4.8E-02	9.7E-04	1.6E-02
Falcon - RSA	2.9E-03	4.8E-02	9.7E-04	1.6E-02
Fox - LSA	1.1E-03	4.6E-03	3.5E-04	1.5E-03
Lemming - Rock Lake Watershed	2.1E-03	3.7E-02	7.1E-04	1.2E-02
Lemming - JSL @ Kiggavik Discharge	2.1E-03	3.7E-02	7.1E-04	1.2E-02
Lemming - Kiggavik Camp	2.1E-03	3.7E-02	7.1E-04	1.2E-02
Lemming - JSL @ Sissons Discharge	2.1E-03	3.7E-02	7.1E-04	1.2E-02
Lapland Longspur - Rock Lake Watershed	2.4E-03	5.1E-02	8.1E-04	1.7E-02
Lapland Longspur - JSL @ Kiggavik Discharge	2.5E-03	5.3E-02	8.2E-04	1.8E-02
Lapland Longspur - Kiggavik Camp	2.4E-03	5.0E-02	8.0E-04	1.7E-02
Lapland Longspur - JSL @ Sissons Discharge	2.4E-03	5.1E-02	8.1E-04	1.7E-02
Long-Tailed Duck - Rock Lake	2.6E-03	6.2E-02	8.7E-04	2.1E-02
Long-Tailed Duck - JSL @ Kiggavik Discharge	2.5E-03	6.0E-02	8.5E-04	2.0E-02
Long-Tailed Duck - JSL @ Sissons Discharge	2.6E-03	6.0E-02	8.5E-04	2.0E-02
Merganser - Rock Lake	1.2E-03	8.3E-03	3.9E-04	2.8E-03
Merganser - JSL @ Kiggavik Discharge	1.2E-03	7.9E-03	3.9E-04	2.6E-03
Merganser - JSL @ Sissons Discharge	1.2E-03	8.0E-03	3.9E-04	2.7E-03
Muskox - JSL @ Kiggavik Discharge	1.5E-03	2.2E-02	5.0E-04	7.4E-03
Muskox - JSL @ Sissons Discharge	2.4E-03	5.1E-02	8.1E-04	1.7E-02
Northern Pintail - Rock Lake	2.8E-03	6.1E-02	9.2E-04	2.0E-02
Northern Pintail - JSL @ Kiggavik Discharge	2.7E-03	5.8E-02	8.9E-04	1.9E-02
Northern Pintail - JSL @ Sissons Discharge	2.7E-03	5.8E-02	9.0E-04	1.9E-02
Ptarmigan - Rock Lake Watershed	5.4E-03	1.5E-01	1.8E-03	4.9E-02
Ptarmigan - JSL @ Kiggavik Discharge	5.4E-03	1.5E-01	1.8E-03	4.9E-02
Ptarmigan - Kiggavik Camp	5.4E-03	1.5E-01	1.8E-03	4.9E-02
Ptarmigan - JSL @ Sissons Discharge	5.4E-03	1.5E-01	1.8E-03	4.9E-02
Sandpiper - Rock Lake	4.5E-03	1.3E-01	1.5E-03	4.4E-02
Sandpiper - JSL @ Kiggavik Discharge	4.4E-03	1.3E-01	1.5E-03	4.2E-02
Sandpiper - JSL @ Sissons Discharge	4.4E-03	1.3E-01	1.5E-03	4.2E-02
Shrew - Rock Lake Watershed	1.4E-03	1.6E-02	4.7E-04	5.3E-03
Shrew - JSL @ Kiggavik Discharge	1.4E-03	1.7E-02	4.7E-04	5.6E-03
Shrew - Kiggavik Camp	1.4E-03	1.5E-02	4.6E-04	5.0E-03
Shrew - JSL @ Sissons Discharge	7.1E-04	1.5E-02	2.4E-04	5.1E-03
Squirrel - Rock Lake Watershed	1.6E-03	2.0E-02	5.2E-04	6.7E-03
Squirrel - JSL @ Kiggavik Discharge	1.6E-03	2.0E-02	5.2E-04	6.7E-03
Squirrel - Kiggavik Camp	1.6E-03	2.0E-02	5.2E-04	6.7E-03
Squirrel - JSL @ Sissons Discharge	1.6E-03	2.0E-02	5.2E-04	6.7E-03
Wolf - LSA	1.1E-03	6.7E-03	3.7E-04	2.2E-03
Wolf - RSA	1.1E-03	6.7E-03	3.7E-04	2.2E-03
Wolverine - LSA	1.0E-03	2.9E-03	3.4E-04	9.6E-04
Wolverine - RSA	1.0E-03	2.9E-03	3.4E-04	9.6E-04

U-238+ Internal U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235
Ra-226+ Internal Ra-226 + 0.3* (Rn-222 + ...Po-214)
Pb-210+ Internal Pb-210 + Bi-210

Table H.2-4

Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

2010

DOSES TO SELECTED VECs - 95th Percentile Total Dose

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals		
Absorbed Doses - Bear - LSA										
Concentration	Bq/g	Crad	3.85E-05	1.50E-04	6.99E-05	1.74E-04	6.41E-03			
Internal Dose Factor	mGy/d per Bq/g	ldcf	1.4E-01	6.6E-02	1.6E-01	6.0E-03	7.4E-02			
Internal dose rate	mGy/d	ldrat	5.5E-06	9.9E-06	1.1E-05	1.0E-06	4.7E-04	5.0E-04	=Crad*ldcf	
External Gamma rate	uGy/h	Xgrat	0.04							
Fraction of time on site	-	fts	1.00							
External dose rate	mGy/d	Xdrat	9.6E-04						=Xgrat*24*fts/1000	
Internal plus external	mGy/d	tdrat	1.5E-03						=SUM(ldrat)+Xdrat	
Absorbed Doses - Caribou - LSA										
Concentration	Bq/g	Crad2	8.62E-05	1.33E-04	2.95E-04	2.53E-03	7.65E-02			
Internal dose rate	mGy/d	ldrat2	1.2E-05	8.7E-06	4.7E-05	1.5E-05	5.7E-03	5.7E-03	=Crad2*ldcf	
Fraction of time on site	-	fts2	1.00							
External dose rate	mGy/d	Xdrat2	9.6E-04						=Xgrat*24*fts2/1000	
Internal plus external	mGy/d	tdrat2	6.7E-03						=SUM(ldrat2)+Xdrat2	
Absorbed Doses - Caribou - RSA										
Concentration	Bq/g	Crad3	8.62E-05	1.33E-04	2.95E-04	2.53E-03	7.65E-02			
Internal dose rate	mGy/d	ldrat3	1.2E-05	8.7E-06	4.7E-05	1.5E-05	5.7E-03	5.7E-03	=Crad3*ldcf	
Fraction of time on site	-	fts3	1.00							
External dose rate	mGy/d	Xdrat3	9.6E-04						=Xgrat*24*fts3/1000	
Internal plus external	mGy/d	tdrat3	6.7E-03						=SUM(ldrat3)+Xdrat3	
Absorbed Doses - Falcon - LSA										
Concentration	Bq/g	Crad4	1.14E-05	3.57E-04	1.38E-03	4.40E-01	5.01E-02			
Internal dose rate	mGy/d	ldrat4	1.6E-06	2.3E-05	2.2E-04	2.7E-03	3.7E-03	6.6E-03	=Crad4*ldcf	
Fraction of time on site	-	fts4	1.00							
External dose rate	mGy/d	Xdrat4	9.6E-04						=Xgrat*24*fts4/1000	
Internal plus external	mGy/d	tdrat4	7.6E-03						=SUM(ldrat4)+Xdrat4	
Absorbed Doses - Falcon - RSA										
Concentration	Bq/g	Crad5	1.14E-05	3.56E-04	1.38E-03	4.40E-01	5.00E-02			
Internal dose rate	mGy/d	ldrat5	1.6E-06	2.3E-05	2.2E-04	2.7E-03	3.7E-03	6.6E-03	=Crad5*ldcf	
Fraction of time on site	-	fts5	1.00							
External dose rate	mGy/d	Xdrat5	9.6E-04						=Xgrat*24*fts5/1000	
Internal plus external	mGy/d	tdrat5	7.6E-03						=SUM(ldrat5)+Xdrat5	
Absorbed Doses - Fox - LSA										
Concentration	Bq/g	Crad6	2.00E-05	7.94E-05	1.30E-04	5.15E-04	3.65E-03			
Internal dose rate	mGy/d	ldrat6	2.8E-06	5.2E-06	2.1E-05	3.1E-06	2.7E-04	3.0E-04	=Crad6*ldcf	
Fraction of time on site	-	fts6	1.00							
External dose rate	mGy/d	Xdrat6	9.6E-04						=Xgrat*24*fts6/1000	
Internal plus external	mGy/d	tdrat6	1.3E-03						=SUM(ldrat6)+Xdrat6	
Absorbed Doses - Lemming - Rock Lake Watershed										
Concentration	Bq/g	Crad7	1.49E-04	3.56E-03	6.36E-03	1.69E-01	2.09E-02			
Internal dose rate	mGy/d	ldrat7	2.1E-05	2.3E-04	1.0E-03	1.0E-03	1.5E-03	3.8E-03	=Crad7*ldcf	
Fraction of time on site	-	fts7	1.00							
External dose rate	mGy/d	Xdrat7	9.6E-04						=Xgrat*24*fts7/1000	
Internal plus external	mGy/d	tdrat7	4.8E-03						=SUM(ldrat7)+Xdrat7	
Absorbed Doses - Lemming - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad8	1.49E-04	3.56E-03	6.36E-03	1.69E-01	2.09E-02			
Internal dose rate	mGy/d	ldrat8	2.1E-05	2.3E-04	1.0E-03	1.0E-03	1.5E-03	3.8E-03	=Crad8*ldcf	
Fraction of time on site	-	fts8	1.00							
External dose rate	mGy/d	Xdrat8	9.6E-04						=Xgrat*24*fts8/1000	
Internal plus external	mGy/d	tdrat8	4.8E-03						=SUM(ldrat8)+Xdrat8	
Absorbed Doses - Lemming - Kiggavik Camp										
Concentration	Bq/g	Crad9	1.49E-04	3.56E-03	6.36E-03	1.69E-01	2.09E-02			
Internal dose rate	mGy/d	ldrat9	2.1E-05	2.3E-04	1.0E-03	1.0E-03	1.5E-03	3.8E-03	=Crad9*ldcf	
Fraction of time on site	-	fts9	1.00							
External dose rate	mGy/d	Xdrat9	9.6E-04						=Xgrat*24*fts9/1000	
Internal plus external	mGy/d	tdrat9	4.8E-03						=SUM(ldrat9)+Xdrat9	
Absorbed Doses - Lemming - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad10	1.49E-04	3.56E-03	6.36E-03	1.69E-01	2.09E-02			
Internal dose rate	mGy/d	ldrat10	2.1E-05	2.3E-04	1.0E-03	1.0E-03	1.5E-03	3.8E-03	=Crad10*ldcf	
Fraction of time on site	-	fts10	1.00							
External dose rate	mGy/d	Xdrat10	9.6E-04						=Xgrat*24*fts10/1000	
Internal plus external	mGy/d	tdrat10	4.8E-03						=SUM(ldrat10)+Xdrat10	
Absorbed Doses - Lapland Longspur - Rock Lake Watershed										
Concentration	Bq/g	Crad11	4.06E-05	3.37E-03	5.23E-03	1.35E-01	3.62E-02			
Internal dose rate	mGy/d	ldrat11	5.8E-06	2.2E-04	8.3E-04	8.1E-04	2.7E-03	4.6E-03	=Crad11*ldcf	
Fraction of time on site	-	fts11	1.00							
External dose rate	mGy/d	Xdrat11	9.6E-04						=Xgrat*24*fts11/1000	
Internal plus external	mGy/d	tdrat11	5.5E-03						=SUM(ldrat11)+Xdrat11	

Table H.2-4

Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

Absorbed Doses - Lapland Longspur - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad12	4.32E-05	3.38E-03	5.39E-03	1.36E-01	3.72E-02			
Internal dose rate	mGy/d	ldrat12	6.1E-06	2.2E-04	8.6E-04	8.2E-04	2.8E-03	4.7E-03	=Crad12*ldcf	
Fraction of time on site	-	fts12	1.00							
External dose rate	mGy/d	Xdrat12	9.6E-04						=Xgrat*24*fts12/1000	
Internal plus external	mGy/d	tdrat12	5.6E-03						=SUM(ldrat12)+Xdrat12	
Absorbed Doses - Lapland Longspur - Kiggavik Camp										
Concentration	Bq/g	Crad13	1.27E-05	3.37E-03	5.10E-03	1.34E-01	3.57E-02			
Internal dose rate	mGy/d	ldrat13	1.8E-06	2.2E-04	8.1E-04	8.1E-04	2.6E-03	4.5E-03	=Crad13*ldcf	
Fraction of time on site	-	fts13	1.00							
External dose rate	mGy/d	Xdrat13	9.6E-04						=Xgrat*24*fts13/1000	
Internal plus external	mGy/d	tdrat13	5.4E-03						=SUM(ldrat13)+Xdrat13	
Absorbed Doses - Lapland Longspur - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad14	4.06E-05	3.37E-03	5.22E-03	1.35E-01	3.64E-02			
Internal dose rate	mGy/d	ldrat14	5.8E-06	2.2E-04	8.3E-04	8.1E-04	2.7E-03	4.6E-03	=Crad14*ldcf	
Fraction of time on site	-	fts14	1.00							
External dose rate	mGy/d	Xdrat14	9.6E-04						=Xgrat*24*fts14/1000	
Internal plus external	mGy/d	tdrat14	5.5E-03						=SUM(ldrat14)+Xdrat14	
Absorbed Doses - Long-Tailed Duck - Rock Lake										
Concentration	Bq/g	Crad15	5.55E-05	6.02E-04	9.25E-03	6.39E-02	5.78E-02			
Internal dose rate	mGy/d	ldrat15	7.9E-06	4.0E-05	1.5E-03	3.9E-04	4.3E-03	6.2E-03	=Crad15*ldcf	
Fraction of time on site	-	fts15	1.00							
External dose rate	mGy/d	Xdrat15	9.6E-04						=Xgrat*24*fts15/1000	
Internal plus external	mGy/d	tdrat15	7.1E-03						=SUM(ldrat15)+Xdrat15	
Absorbed Doses - Long-Tailed Duck - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad16	4.99E-05	5.82E-04	8.89E-03	6.14E-02	5.54E-02			
Internal dose rate	mGy/d	ldrat16	7.1E-06	3.8E-05	1.4E-03	3.7E-04	4.1E-03	5.9E-03	=Crad16*ldcf	
Fraction of time on site	-	fts16	1.00							
External dose rate	mGy/d	Xdrat16	9.6E-04						=Xgrat*24*fts16/1000	
Internal plus external	mGy/d	tdrat16	6.9E-03						=SUM(ldrat16)+Xdrat16	
Absorbed Doses - Long-Tailed Duck - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad17	5.11E-05	5.85E-04	8.94E-03	6.18E-02	5.58E-02			
Internal dose rate	mGy/d	ldrat17	7.2E-06	3.9E-05	1.4E-03	3.7E-04	4.1E-03	6.0E-03	=Crad17*ldcf	
Fraction of time on site	-	fts17	1.00							
External dose rate	mGy/d	Xdrat17	9.6E-04						=Xgrat*24*fts17/1000	
Internal plus external	mGy/d	tdrat17	6.9E-03						=SUM(ldrat17)+Xdrat17	
Absorbed Doses - Merganser - Rock Lake										
Concentration	Bq/g	Crad18	7.67E-06	3.15E-04	3.98E-04	1.98E-02	7.05E-03			
Internal dose rate	mGy/d	ldrat18	1.1E-06	2.1E-05	6.3E-05	1.2E-04	5.2E-04	7.3E-04	=Crad18*ldcf	
Fraction of time on site	-	fts18	1.00							
External dose rate	mGy/d	Xdrat18	9.6E-04						=Xgrat*24*fts18/1000	
Internal plus external	mGy/d	tdrat18	1.7E-03						=SUM(ldrat18)+Xdrat18	
Absorbed Doses - Merganser - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad19	7.65E-06	3.07E-04	3.70E-04	1.97E-02	6.67E-03			
Internal dose rate	mGy/d	ldrat19	1.1E-06	2.0E-05	5.9E-05	1.2E-04	4.9E-04	6.9E-04	=Crad19*ldcf	
Fraction of time on site	-	fts19	1.00							
External dose rate	mGy/d	Xdrat19	9.6E-04						=Xgrat*24*fts19/1000	
Internal plus external	mGy/d	tdrat19	1.7E-03						=SUM(ldrat19)+Xdrat19	
Absorbed Doses - Merganser - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad20	7.64E-06	3.09E-04	3.73E-04	1.97E-02	6.68E-03			
Internal dose rate	mGy/d	ldrat20	1.1E-06	2.0E-05	5.9E-05	1.2E-04	4.9E-04	6.9E-04	=Crad20*ldcf	
Fraction of time on site	-	fts20	1.00							
External dose rate	mGy/d	Xdrat20	9.6E-04						=Xgrat*24*fts20/1000	
Internal plus external	mGy/d	tdrat20	1.7E-03						=SUM(ldrat20)+Xdrat20	
Absorbed Doses - Muskox - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad21	1.18E-04	1.86E-04	2.87E-04	6.76E-04	2.04E-02			
Internal dose rate	mGy/d	ldrat21	1.7E-05	1.2E-05	4.6E-05	4.1E-06	1.5E-03	1.6E-03	=Crad21*ldcf	
Fraction of time on site	-	fts21	1.00							
External dose rate	mGy/d	Xdrat21	9.6E-04						=Xgrat*24*fts21/1000	
Internal plus external	mGy/d	tdrat21	2.6E-03						=SUM(ldrat21)+Xdrat21	
Absorbed Doses - Muskox - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad22	4.06E-05	3.37E-03	5.22E-03	1.35E-01	3.64E-02			
Internal dose rate	mGy/d	ldrat22	5.8E-06	2.2E-04	8.3E-04	8.1E-04	2.7E-03	4.6E-03	=Crad22*ldcf	
Fraction of time on site	-	fts22	1.00							
External dose rate	mGy/d	Xdrat22	9.6E-04						=Xgrat*24*fts22/1000	
Internal plus external	mGy/d	tdrat22	5.5E-03						=SUM(ldrat22)+Xdrat22	
Absorbed Doses - Northern Pintail - Rock Lake										
Concentration	Bq/g	Crad23	2.33E-05	4.59E-03	2.26E-03	1.68E-01	6.11E-02			
Internal dose rate	mGy/d	ldrat23	3.3E-06	3.0E-04	3.6E-04	1.0E-03	4.5E-03	6.2E-03	=Crad23*ldcf	
Fraction of time on site	-	fts23	1.00							
External dose rate	mGy/d	Xdrat23	9.6E-04						=Xgrat*24*fts23/1000	
Internal plus external	mGy/d	tdrat23	7.2E-03						=SUM(ldrat23)+Xdrat23	

Table H.2-4
Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

Absorbed Doses - Northern Pintail - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad24	2.11E-05	4.42E-03	2.17E-03	1.62E-01	5.85E-02			
Internal dose rate	mGy/d	Idrat24	3.0E-06	2.9E-04	3.5E-04	9.8E-04	4.3E-03	5.9E-03	=Crad24*Idcf	
Fraction of time on site	-	fts24	1.00							
External dose rate	mGy/d	Xdrat24	9.6E-04						=Xgrat*24*fts24/1000	
Internal plus external	mGy/d	tdrat24	6.9E-03						=SUM(Idrat24)+Xdrat24	
Absorbed Doses - Northern Pintail - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad25	2.14E-05	4.45E-03	2.18E-03	1.63E-01	5.90E-02			
Internal dose rate	mGy/d	Idrat25	3.0E-06	2.9E-04	3.5E-04	9.8E-04	4.4E-03	6.0E-03	=Crad25*Idcf	
Fraction of time on site	-	fts25	1.00							
External dose rate	mGy/d	Xdrat25	9.6E-04						=Xgrat*24*fts25/1000	
Internal plus external	mGy/d	tdrat25	6.9E-03						=SUM(Idrat25)+Xdrat25	
Absorbed Doses - Ptarmigan - Rock Lake Watershed										
Concentration	Bq/g	Crad26	4.26E-05	9.01E-04	2.17E-03	3.88E-01	1.42E-01			
Internal dose rate	mGy/d	Idrat26	6.0E-06	5.9E-05	3.5E-04	2.3E-03	1.1E-02	1.3E-02	=Crad26*Idcf	
Fraction of time on site	-	fts26	1.00							
External dose rate	mGy/d	Xdrat26	9.6E-04						=Xgrat*24*fts26/1000	
Internal plus external	mGy/d	tdrat26	1.4E-02						=SUM(Idrat26)+Xdrat26	
Absorbed Doses - Ptarmigan - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad27	4.32E-05	9.03E-04	2.21E-03	3.88E-01	1.42E-01			
Internal dose rate	mGy/d	Idrat27	6.1E-06	5.9E-05	3.5E-04	2.3E-03	1.1E-02	1.3E-02	=Crad27*Idcf	
Fraction of time on site	-	fts27	1.00							
External dose rate	mGy/d	Xdrat27	9.6E-04						=Xgrat*24*fts27/1000	
Internal plus external	mGy/d	tdrat27	1.4E-02						=SUM(Idrat27)+Xdrat27	
Absorbed Doses - Ptarmigan - Kiggavik Camp										
Concentration	Bq/g	Crad28	3.38E-05	9.00E-04	2.10E-03	3.88E-01	1.42E-01			
Internal dose rate	mGy/d	Idrat28	4.8E-06	5.9E-05	3.3E-04	2.3E-03	1.1E-02	1.3E-02	=Crad28*Idcf	
Fraction of time on site	-	fts28	1.00							
External dose rate	mGy/d	Xdrat28	9.6E-04						=Xgrat*24*fts28/1000	
Internal plus external	mGy/d	tdrat28	1.4E-02						=SUM(Idrat28)+Xdrat28	
Absorbed Doses - Ptarmigan - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad29	4.27E-05	9.01E-04	2.16E-03	3.88E-01	1.42E-01			
Internal dose rate	mGy/d	Idrat29	6.1E-06	5.9E-05	3.4E-04	2.3E-03	1.1E-02	1.3E-02	=Crad29*Idcf	
Fraction of time on site	-	fts29	1.00							
External dose rate	mGy/d	Xdrat29	9.6E-04						=Xgrat*24*fts29/1000	
Internal plus external	mGy/d	tdrat29	1.4E-02						=SUM(Idrat29)+Xdrat29	
Absorbed Doses - Sandpiper - Rock Lake										
Concentration	Bq/g	Crad30	1.96E-04	2.12E-03	1.52E-02	1.82E-01	1.19E-01			
Internal dose rate	mGy/d	Idrat30	2.8E-05	1.4E-04	2.4E-03	1.1E-03	8.8E-03	1.3E-02	=Crad30*Idcf	
Fraction of time on site	-	fts30	1.00							
External dose rate	mGy/d	Xdrat30	9.6E-04						=Xgrat*24*fts30/1000	
Internal plus external	mGy/d	tdrat30	1.3E-02						=SUM(Idrat30)+Xdrat30	
Absorbed Doses - Sandpiper - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad31	1.81E-04	2.10E-03	1.47E-02	1.78E-01	1.14E-01			
Internal dose rate	mGy/d	Idrat31	2.6E-05	1.4E-04	2.3E-03	1.1E-03	8.5E-03	1.2E-02	=Crad31*Idcf	
Fraction of time on site	-	fts31	1.00							
External dose rate	mGy/d	Xdrat31	9.6E-04						=Xgrat*24*fts31/1000	
Internal plus external	mGy/d	tdrat31	1.3E-02						=SUM(Idrat31)+Xdrat31	
Absorbed Doses - Sandpiper - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad32	1.84E-04	2.10E-03	1.48E-02	1.78E-01	1.15E-01			
Internal dose rate	mGy/d	Idrat32	2.6E-05	1.4E-04	2.4E-03	1.1E-03	8.5E-03	1.2E-02	=Crad32*Idcf	
Fraction of time on site	-	fts32	1.00							
External dose rate	mGy/d	Xdrat32	9.6E-04						=Xgrat*24*fts32/1000	
Internal plus external	mGy/d	tdrat32	1.3E-02						=SUM(Idrat32)+Xdrat32	
Absorbed Doses - Shrew - Rock Lake Watershed										
Concentration	Bq/g	Crad33	1.03E-04	6.30E-04	4.01E-03	3.64E-02	5.70E-03			
Internal dose rate	mGy/d	Idrat33	1.5E-05	4.1E-05	6.4E-04	2.2E-04	4.2E-04	1.3E-03	=Crad33*Idcf	
Fraction of time on site	-	fts33	1.00							
External dose rate	mGy/d	Xdrat33	9.6E-04						=Xgrat*24*fts33/1000	
Internal plus external	mGy/d	tdrat33	2.3E-03						=SUM(Idrat33)+Xdrat33	
Absorbed Doses - Shrew - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad34	1.13E-04	6.72E-04	4.37E-03	3.68E-02	5.88E-03			
Internal dose rate	mGy/d	Idrat34	1.6E-05	4.4E-05	6.9E-04	2.2E-04	4.4E-04	1.4E-03	=Crad34*Idcf	
Fraction of time on site	-	fts34	1.00							
External dose rate	mGy/d	Xdrat34	9.6E-04						=Xgrat*24*fts34/1000	
Internal plus external	mGy/d	tdrat34	2.4E-03						=SUM(Idrat34)+Xdrat34	
Absorbed Doses - Shrew - Kiggavik Camp										
Concentration	Bq/g	Crad35	9.18E-06	5.99E-04	3.72E-03	3.61E-02	5.69E-03			
Internal dose rate	mGy/d	Idrat35	1.3E-06	3.9E-05	5.9E-04	2.2E-04	4.2E-04	1.3E-03	=Crad35*Idcf	
Fraction of time on site	-	fts35	1.00							
External dose rate	mGy/d	Xdrat35	9.6E-04						=Xgrat*24*fts35/1000	
Internal plus external	mGy/d	tdrat35	2.2E-03						=SUM(Idrat35)+Xdrat35	
Absorbed Doses - Shrew - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad36	1.04E-04	6.31E-04	4.01E-03	3.64E-02	5.72E-03			
Internal dose rate	mGy/d	Idrat36	1.5E-05	4.2E-05	6.4E-04	2.2E-04	4.2E-04	1.3E-03	=Crad36*Idcf	
Fraction of time on site	-	fts36	1.00							

Table H.2-4

Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

External dose rate	mGy/d	Xdrat36	2.7E-04							=Xgrat*24*fts36/3600
Internal plus external	mGy/d	tdrat36	1.6E-03							=SUM(ldrat36)+Xdrat36
Absorbed Doses - Squirrel - Rock Lake Watershed										
Concentration	Bq/g	Crad37	8.95E-05	3.42E-03	6.40E-03	8.30E-02	1.01E-02			
Internal dose rate	mGy/d	ldrat37	1.3E-05	2.2E-04	1.0E-03	5.0E-04	7.5E-04	2.5E-03		=Crad37*ldcf
Fraction of time on site	-	fts37	1.00							
External dose rate	mGy/d	Xdrat37	9.6E-04							=Xgrat*24*fts37/1000
Internal plus external	mGy/d	tdrat37	3.5E-03							=SUM(ldrat37)+Xdrat37
Absorbed Doses - Squirrel - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad38	8.95E-05	3.42E-03	6.40E-03	8.30E-02	1.01E-02			
Internal dose rate	mGy/d	ldrat38	1.3E-05	2.2E-04	1.0E-03	5.0E-04	7.5E-04	2.5E-03		=Crad38*ldcf
Fraction of time on site	-	fts38	1.00							
External dose rate	mGy/d	Xdrat38	9.6E-04							=Xgrat*24*fts38/1000
Internal plus external	mGy/d	tdrat38	3.5E-03							=SUM(ldrat38)+Xdrat38
Absorbed Doses - Squirrel - Kiggavik Camp										
Concentration	Bq/g	Crad39	8.94E-05	3.42E-03	6.40E-03	8.30E-02	1.01E-02			
Internal dose rate	mGy/d	ldrat39	1.3E-05	2.2E-04	1.0E-03	5.0E-04	7.5E-04	2.5E-03		=Crad39*ldcf
Fraction of time on site	-	fts39	1.00							
External dose rate	mGy/d	Xdrat39	9.6E-04							=Xgrat*24*fts39/1000
Internal plus external	mGy/d	tdrat39	3.5E-03							=SUM(ldrat39)+Xdrat39

Table H.2-4

Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

Absorbed Doses - Squirrel - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad40	8.95E-05	3.42E-03	6.40E-03	8.30E-02	1.01E-02			
Internal dose rate	mGy/d	Idrat40	1.3E-05	2.2E-04	1.0E-03	5.0E-04	7.5E-04	2.5E-03	=Crad40*Idcf	
Fraction of time on site	-	fts40	1.00							
External dose rate	mGy/d	Xdrat40	9.6E-04						=Xgrat*24*fts40/1000	
Internal plus external	mGy/d	tdrat40	3.5E-03						=SUM(Idrat40)+Xdrat40	
Absorbed Doses - Wolf - LSA										
Concentration	Bq/g	Crad41	4.14E-05	2.94E-05	2.20E-05	1.44E-05	7.66E-03			
Internal dose rate	mGy/d	Idrat41	5.9E-06	1.9E-06	3.5E-06	8.7E-08	5.7E-04	5.8E-04	=Crad41*Idcf	
Fraction of time on site	-	fts41	1.00							
External dose rate	mGy/d	Xdrat41	9.6E-04						=Xgrat*24*fts41/1000	
Internal plus external	mGy/d	tdrat41	1.5E-03						=SUM(Idrat41)+Xdrat41	
Absorbed Doses - Wolf - RSA										
Concentration	Bq/g	Crad42	4.15E-05	2.93E-05	2.20E-05	1.44E-05	7.66E-03			
Internal dose rate	mGy/d	Idrat42	5.9E-06	1.9E-06	3.5E-06	8.7E-08	5.7E-04	5.8E-04	=Crad42*Idcf	
Fraction of time on site	-	fts42	1.00							
External dose rate	mGy/d	Xdrat42	9.6E-04						=Xgrat*24*fts42/1000	
Internal plus external	mGy/d	tdrat42	1.5E-03						=SUM(Idrat42)+Xdrat42	
Absorbed Doses - Wolverine - LSA										
Concentration	Bq/g	Crad43	5.79E-05	1.16E-04	2.13E-04	4.70E-04	1.79E-03			
Internal dose rate	mGy/d	Idrat43	8.2E-06	7.6E-06	3.4E-05	2.8E-06	1.3E-04	1.9E-04	=Crad43*Idcf	
Fraction of time on site	-	fts43	1.00							
External dose rate	mGy/d	Xdrat43	9.6E-04						=Xgrat*24*fts43/1000	
Internal plus external	mGy/d	tdrat43	1.1E-03						=SUM(Idrat43)+Xdrat43	
Absorbed Doses - Wolverine - RSA										
Concentration	Bq/g	Crad44	5.81E-05	1.16E-04	2.13E-04	4.70E-04	1.79E-03			
Internal dose rate	mGy/d	Idrat44	8.2E-06	7.6E-06	3.4E-05	2.8E-06	1.3E-04	1.9E-04	=Crad44*Idcf	
Fraction of time on site	-	fts44	1.00							
External dose rate	mGy/d	Xdrat44	9.6E-04						=Xgrat*24*fts44/1000	
Internal plus external	mGy/d	tdrat44	1.1E-03						=SUM(Idrat44)+Xdrat44	
Equivalent Doses - Bear - LSA										
RBE for alpha	Sv/Gy	RBE	40							
High LET dose rate	mSv/d	Hletdr	2.2E-04	4.0E-04	4.4E-04	1.0E-06	1.9E-02	2.0E-02	=Idrat*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr	9.6E-04						=Xdrat	
Total dose rate	mSv/d	tdr	2.1E-02						=SUM(Hletdr)+Lletdr	
Equivalent Doses - Caribou - LSA										
High LET dose rate	mSv/d	Hletdr2	4.9E-04	3.5E-04	1.9E-03	1.5E-05	2.3E-01	2.3E-01	=Idrat2*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr2	9.6E-04						=Xdrat2	
Total dose rate	mSv/d	tdr2	2.3E-01						=SUM(Hletdr2)+Lletdr2	
Equivalent Doses - Caribou - RSA										
High LET dose rate	mSv/d	Hletdr3	4.9E-04	3.5E-04	1.9E-03	1.5E-05	2.3E-01	2.3E-01	=Idrat3*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr3	9.6E-04						=Xdrat3	
Total dose rate	mSv/d	tdr3	2.3E-01						=SUM(Hletdr3)+Lletdr3	
Equivalent Doses - Falcon - LSA										
High LET dose rate	mSv/d	Hletdr4	6.5E-05	9.4E-04	8.8E-03	2.7E-03	1.5E-01	1.6E-01	=Idrat4*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr4	9.6E-04						=Xdrat4	
Total dose rate	mSv/d	tdr4	1.6E-01						=SUM(Hletdr4)+Lletdr4	
Equivalent Doses - Falcon - RSA										
High LET dose rate	mSv/d	Hletdr5	6.5E-05	9.4E-04	8.8E-03	2.7E-03	1.5E-01	1.6E-01	=Idrat5*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr5	9.6E-04						=Xdrat5	
Total dose rate	mSv/d	tdr5	1.6E-01						=SUM(Hletdr5)+Lletdr5	
Equivalent Doses - Fox - LSA										
High LET dose rate	mSv/d	Hletdr6	1.1E-04	2.1E-04	8.3E-04	3.1E-06	1.1E-02	1.2E-02	=Idrat6*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr6	9.6E-04						=Xdrat6	
Total dose rate	mSv/d	tdr6	1.3E-02						=SUM(Hletdr6)+Lletdr6	
Equivalent Doses - Lemming - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr7	8.5E-04	9.4E-03	4.0E-02	1.0E-03	6.2E-02	1.1E-01	=Idrat7*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr7	9.6E-04						=Xdrat7	
Total dose rate	mSv/d	tdr7	1.1E-01						=SUM(Hletdr7)+Lletdr7	
Equivalent Doses - Lemming - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr8	8.5E-04	9.4E-03	4.0E-02	1.0E-03	6.2E-02	1.1E-01	=Idrat8*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr8	9.6E-04						=Xdrat8	
Total dose rate	mSv/d	tdr8	1.1E-01						=SUM(Hletdr8)+Lletdr8	
Equivalent Doses - Lemming - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr9	8.5E-04	9.4E-03	4.0E-02	1.0E-03	6.2E-02	1.1E-01	=Idrat9*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr9	9.6E-04						=Xdrat9	
Total dose rate	mSv/d	tdr9	1.1E-01						=SUM(Hletdr9)+Lletdr9	
Equivalent Doses - Lemming - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr10	8.5E-04	9.4E-03	4.0E-02	1.0E-03	6.2E-02	1.1E-01	=Idrat10*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr10	9.6E-04						=Xdrat10	
Total dose rate	mSv/d	tdr10	1.1E-01						=SUM(Hletdr10)+Lletdr10	

Table H.2-4

Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

Equivalent Doses - Lapland Longspur - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr11	2.3E-04	8.9E-03	3.3E-02	8.1E-04	1.1E-01	1.5E-01	=Idrat11*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr11	9.6E-04						=Xdrat11	
Total dose rate	mSv/d	tdr11	1.5E-01						=SUM(Hletdr11)+Lletdr11	
Equivalent Doses - Lapland Longspur - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr12	2.5E-04	8.9E-03	3.4E-02	8.2E-04	1.1E-01	1.5E-01	=Idrat12*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr12	9.6E-04						=Xdrat12	
Total dose rate	mSv/d	tdr12	1.6E-01						=SUM(Hletdr12)+Lletdr12	
Equivalent Doses - Lapland Longspur - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr13	7.2E-05	8.9E-03	3.2E-02	8.1E-04	1.1E-01	1.5E-01	=Idrat13*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr13	9.6E-04						=Xdrat13	
Total dose rate	mSv/d	tdr13	1.5E-01						=SUM(Hletdr13)+Lletdr13	
Equivalent Doses - Lapland Longspur - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr14	2.3E-04	8.9E-03	3.3E-02	8.1E-04	1.1E-01	1.5E-01	=Idrat14*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr14	9.6E-04						=Xdrat14	
Total dose rate	mSv/d	tdr14	1.5E-01						=SUM(Hletdr14)+Lletdr14	
Equivalent Doses - Long-Tailed Duck - Rock Lake										
High LET dose rate	mSv/d	Hletdr15	3.2E-04	1.6E-03	5.9E-02	3.9E-04	1.7E-01	2.3E-01	=Idrat15*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr15	9.6E-04						=Xdrat15	
Total dose rate	mSv/d	tdr15	2.3E-01						=SUM(Hletdr15)+Lletdr15	
Equivalent Doses - Long-Tailed Duck - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr16	2.8E-04	1.5E-03	5.7E-02	3.7E-04	1.6E-01	2.2E-01	=Idrat16*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr16	9.6E-04						=Xdrat16	
Total dose rate	mSv/d	tdr16	2.2E-01						=SUM(Hletdr16)+Lletdr16	
Equivalent Doses - Long-Tailed Duck - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr17	2.9E-04	1.5E-03	5.7E-02	3.7E-04	1.7E-01	2.2E-01	=Idrat17*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr17	9.6E-04						=Xdrat17	
Total dose rate	mSv/d	tdr17	2.3E-01						=SUM(Hletdr17)+Lletdr17	
Equivalent Doses - Merganser - Rock Lake										
High LET dose rate	mSv/d	Hletdr18	4.4E-05	8.3E-04	2.5E-03	1.2E-04	2.1E-02	2.4E-02	=Idrat18*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr18	9.6E-04						=Xdrat18	
Total dose rate	mSv/d	tdr18	2.5E-02						=SUM(Hletdr18)+Lletdr18	
Equivalent Doses - Merganser - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr19	4.3E-05	8.1E-04	2.4E-03	1.2E-04	2.0E-02	2.3E-02	=Idrat19*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr19	9.6E-04						=Xdrat19	
Total dose rate	mSv/d	tdr19	2.4E-02						=SUM(Hletdr19)+Lletdr19	
Equivalent Doses - Merganser - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr20	4.3E-05	8.1E-04	2.4E-03	1.2E-04	2.0E-02	2.3E-02	=Idrat20*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr20	9.6E-04						=Xdrat20	
Total dose rate	mSv/d	tdr20	2.4E-02						=SUM(Hletdr20)+Lletdr20	
Equivalent Doses - Muskox - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr21	6.7E-04	4.9E-04	1.8E-03	4.1E-06	6.0E-02	6.3E-02	=Idrat21*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr21	9.6E-04						=Xdrat21	
Total dose rate	mSv/d	tdr21	6.4E-02						=SUM(Hletdr21)+Lletdr21	
Equivalent Doses - Muskox - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr22	2.3E-04	8.9E-03	3.3E-02	8.1E-04	1.1E-01	1.5E-01	=Idrat22*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr22	9.6E-04						=Xdrat22	
Total dose rate	mSv/d	tdr22	1.5E-01						=SUM(Hletdr22)+Lletdr22	
Equivalent Doses - Northern Pintail - Rock Lake										
High LET dose rate	mSv/d	Hletdr23	1.3E-04	1.2E-02	1.4E-02	1.0E-03	1.8E-01	2.1E-01	=Idrat23*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr23	9.6E-04						=Xdrat23	
Total dose rate	mSv/d	tdr23	2.1E-01						=SUM(Hletdr23)+Lletdr23	
Equivalent Doses - Northern Pintail - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr24	1.2E-04	1.2E-02	1.4E-02	9.8E-04	1.7E-01	2.0E-01	=Idrat24*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr24	9.6E-04						=Xdrat24	
Total dose rate	mSv/d	tdr24	2.0E-01						=SUM(Hletdr24)+Lletdr24	
Equivalent Doses - Northern Pintail - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr25	1.2E-04	1.2E-02	1.4E-02	9.8E-04	1.7E-01	2.0E-01	=Idrat25*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr25	9.6E-04						=Xdrat25	
Total dose rate	mSv/d	tdr25	2.0E-01						=SUM(Hletdr25)+Lletdr25	
Equivalent Doses - Ptarmigan - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr26	2.4E-04	2.4E-03	1.4E-02	2.3E-03	4.2E-01	4.4E-01	=Idrat26*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr26	9.6E-04						=Xdrat26	
Total dose rate	mSv/d	tdr26	4.4E-01						=SUM(Hletdr26)+Lletdr26	
Equivalent Doses - Ptarmigan - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr27	2.5E-04	2.4E-03	1.4E-02	2.3E-03	4.2E-01	4.4E-01	=Idrat27*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr27	9.6E-04						=Xdrat27	
Total dose rate	mSv/d	tdr27	4.4E-01						=SUM(Hletdr27)+Lletdr27	

Table H.2-4

Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

Equivalent Doses - Ptarmigan - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr28	1.9E-04	2.4E-03	1.3E-02	2.3E-03	4.2E-01	4.4E-01	=Idrat28*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr28	9.6E-04						=Xdrat28	
Total dose rate	mSv/d	tdr28	4.4E-01						=SUM(Hletdr28)+Lletdr28	
Equivalent Doses - Ptarmigan - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr29	2.4E-04	2.4E-03	1.4E-02	2.3E-03	4.2E-01	4.4E-01	=Idrat29*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr29	9.6E-04						=Xdrat29	
Total dose rate	mSv/d	tdr29	4.4E-01						=SUM(Hletdr29)+Lletdr29	
Equivalent Doses - Sandpiper - Rock Lake										
High LET dose rate	mSv/d	Hletdr30	1.1E-03	5.6E-03	9.7E-02	1.1E-03	3.5E-01	4.6E-01	=Idrat30*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr30	9.6E-04						=Xdrat30	
Total dose rate	mSv/d	tdr30	4.6E-01						=SUM(Hletdr30)+Lletdr30	
Equivalent Doses - Sandpiper - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr31	1.0E-03	5.5E-03	9.4E-02	1.1E-03	3.4E-01	4.4E-01	=Idrat31*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr31	9.6E-04						=Xdrat31	
Total dose rate	mSv/d	tdr31	4.4E-01						=SUM(Hletdr31)+Lletdr31	
Equivalent Doses - Sandpiper - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr32	1.0E-03	5.5E-03	9.4E-02	1.1E-03	3.4E-01	4.4E-01	=Idrat32*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr32	9.6E-04						=Xdrat32	
Total dose rate	mSv/d	tdr32	4.4E-01						=SUM(Hletdr32)+Lletdr32	
Equivalent Doses - Shrew - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr33	5.8E-04	1.7E-03	2.5E-02	2.2E-04	1.7E-02	4.5E-02	=Idrat33*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr33	9.6E-04						=Xdrat33	
Total dose rate	mSv/d	tdr33	4.6E-02						=SUM(Hletdr33)+Lletdr33	
Equivalent Doses - Shrew - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr34	6.4E-04	1.8E-03	2.8E-02	2.2E-04	1.7E-02	4.8E-02	=Idrat34*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr34	9.6E-04						=Xdrat34	
Total dose rate	mSv/d	tdr34	4.9E-02						=SUM(Hletdr34)+Lletdr34	
Equivalent Doses - Shrew - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr35	5.2E-05	1.6E-03	2.4E-02	2.2E-04	1.7E-02	4.2E-02	=Idrat35*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr35	9.6E-04						=Xdrat35	
Total dose rate	mSv/d	tdr35	4.3E-02						=SUM(Hletdr35)+Lletdr35	
Equivalent Doses - Shrew - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr36	5.9E-04	1.7E-03	2.5E-02	2.2E-04	1.7E-02	4.5E-02	=Idrat36*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr36	2.7E-04						=Xdrat36	
Total dose rate	mSv/d	tdr36	4.5E-02						=SUM(Hletdr36)+Lletdr36	
Equivalent Doses - Squirrel - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr37	5.1E-04	9.0E-03	4.1E-02	5.0E-04	3.0E-02	8.1E-02	=Idrat37*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr37	9.6E-04						=Xdrat37	
Total dose rate	mSv/d	tdr37	8.2E-02						=SUM(Hletdr37)+Lletdr37	
Equivalent Doses - Squirrel - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr38	5.1E-04	9.0E-03	4.1E-02	5.0E-04	3.0E-02	8.1E-02	=Idrat38*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr38	9.6E-04						=Xdrat38	
Total dose rate	mSv/d	tdr38	8.2E-02						=SUM(Hletdr38)+Lletdr38	
Equivalent Doses - Squirrel - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr39	5.1E-04	9.0E-03	4.1E-02	5.0E-04	3.0E-02	8.1E-02	=Idrat39*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr39	9.6E-04						=Xdrat39	
Total dose rate	mSv/d	tdr39	8.2E-02						=SUM(Hletdr39)+Lletdr39	
Equivalent Doses - Squirrel - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr40	5.1E-04	9.0E-03	4.1E-02	5.0E-04	3.0E-02	8.1E-02	=Idrat40*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr40	9.6E-04						=Xdrat40	
Total dose rate	mSv/d	tdr40	8.2E-02						=SUM(Hletdr40)+Lletdr40	
Equivalent Doses - Wolf - LSA										
High LET dose rate	mSv/d	Hletdr41	2.4E-04	7.7E-05	1.4E-04	8.7E-08	2.3E-02	2.3E-02	=Idrat41*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr41	9.6E-04						=Xdrat41	
Total dose rate	mSv/d	tdr41	2.4E-02						=SUM(Hletdr41)+Lletdr41	
Equivalent Doses - Wolf - RSA										
High LET dose rate	mSv/d	Hletdr42	2.4E-04	7.7E-05	1.4E-04	8.7E-08	2.3E-02	2.3E-02	=Idrat42*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr42	9.6E-04						=Xdrat42	
Total dose rate	mSv/d	tdr42	2.4E-02						=SUM(Hletdr42)+Lletdr42	
Equivalent Doses - Wolverine - LSA										
High LET dose rate	mSv/d	Hletdr43	3.3E-04	3.0E-04	1.4E-03	2.8E-06	5.3E-03	7.3E-03	=Idrat43*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr43	9.6E-04						=Xdrat43	
Total dose rate	mSv/d	tdr43	8.3E-03						=SUM(Hletdr43)+Lletdr43	
Equivalent Doses - Wolverine - RSA										
High LET dose rate	mSv/d	Hletdr44	3.3E-04	3.0E-04	1.4E-03	2.8E-06	5.3E-03	7.3E-03	=Idrat44*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr44	9.6E-04						=Xdrat44	
Total dose rate	mSv/d	tdr44	8.3E-03						=SUM(Hletdr44)+Lletdr44	

Table H.2-4
Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

SUMMARY

3 Screening Criterion in mGy/d	Total Absorbed Dose mGy/d	Total Equivalent Dose mSv/d	Index (Absorbed Dose)	Index (Equivalent Dose)
Bear - LSA	1.5E-03	2.1E-02	4.9E-04	7.0E-03
Caribou - LSA	6.7E-03	2.3E-01	2.2E-03	7.7E-02
Caribou - RSA	6.7E-03	2.3E-01	2.2E-03	7.7E-02
Falcon - LSA	7.6E-03	1.6E-01	2.5E-03	5.4E-02
Falcon - RSA	7.6E-03	1.6E-01	2.5E-03	5.4E-02
Fox - LSA	1.3E-03	1.3E-02	4.2E-04	4.3E-03
Lemming - Rock Lake Watershed	4.8E-03	1.1E-01	1.6E-03	3.8E-02
Lemming - JSL @ Kiggavik Discharge	4.8E-03	1.1E-01	1.6E-03	3.8E-02
Lemming - Kiggavik Camp	4.8E-03	1.1E-01	1.6E-03	3.8E-02
Lemming - JSL @ Sissons Discharge	4.8E-03	1.1E-01	1.6E-03	3.8E-02
Lapland Longspur - Rock Lake Watershed	5.5E-03	1.5E-01	1.8E-03	5.0E-02
Lapland Longspur - JSL @ Kiggavik Discharge	5.6E-03	1.6E-01	1.9E-03	5.2E-02
Lapland Longspur - Kiggavik Camp	5.4E-03	1.5E-01	1.8E-03	5.0E-02
Lapland Longspur - JSL @ Sissons Discharge	5.5E-03	1.5E-01	1.8E-03	5.1E-02
Long-Tailed Duck - Rock Lake	7.1E-03	2.3E-01	2.4E-03	7.8E-02
Long-Tailed Duck - JSL @ Kiggavik Discharge	6.9E-03	2.2E-01	2.3E-03	7.5E-02
Long-Tailed Duck - JSL @ Sissons Discharge	6.9E-03	2.3E-01	2.3E-03	7.5E-02
Merganser - Rock Lake	1.7E-03	2.5E-02	5.6E-04	8.5E-03
Merganser - JSL @ Kiggavik Discharge	1.7E-03	2.4E-02	5.5E-04	8.0E-03
Merganser - JSL @ Sissons Discharge	1.7E-03	2.4E-02	5.5E-04	8.0E-03
Muskox - JSL @ Kiggavik Discharge	2.6E-03	6.4E-02	8.5E-04	2.1E-02
Muskox - JSL @ Sissons Discharge	5.5E-03	1.5E-01	1.8E-03	5.1E-02
Northern Pintail - Rock Lake	7.2E-03	2.1E-01	2.4E-03	7.0E-02
Northern Pintail - JSL @ Kiggavik Discharge	6.9E-03	2.0E-01	2.3E-03	6.7E-02
Northern Pintail - JSL @ Sissons Discharge	6.9E-03	2.0E-01	2.3E-03	6.7E-02
Ptarmigan - Rock Lake Watershed	1.4E-02	4.4E-01	4.7E-03	1.5E-01
Ptarmigan - JSL @ Kiggavik Discharge	1.4E-02	4.4E-01	4.8E-03	1.5E-01
Ptarmigan - Kiggavik Camp	1.4E-02	4.4E-01	4.7E-03	1.5E-01
Ptarmigan - JSL @ Sissons Discharge	1.4E-02	4.4E-01	4.7E-03	1.5E-01
Sandpiper - Rock Lake	1.3E-02	4.6E-01	4.5E-03	1.5E-01
Sandpiper - JSL @ Kiggavik Discharge	1.3E-02	4.4E-01	4.3E-03	1.5E-01
Sandpiper - JSL @ Sissons Discharge	1.3E-02	4.4E-01	4.4E-03	1.5E-01
Shrew - Rock Lake Watershed	2.3E-03	4.6E-02	7.6E-04	1.5E-02
Shrew - JSL @ Kiggavik Discharge	2.4E-03	4.9E-02	7.9E-04	1.6E-02
Shrew - Kiggavik Camp	2.2E-03	4.3E-02	7.4E-04	1.4E-02
Shrew - JSL @ Sissons Discharge	1.6E-03	4.5E-02	5.3E-04	1.5E-02
Squirrel - Rock Lake Watershed	3.5E-03	8.2E-02	1.2E-03	2.7E-02
Squirrel - JSL @ Kiggavik Discharge	3.5E-03	8.2E-02	1.2E-03	2.7E-02
Squirrel - Kiggavik Camp	3.5E-03	8.2E-02	1.2E-03	2.7E-02
Squirrel - JSL @ Sissons Discharge	3.5E-03	8.2E-02	1.2E-03	2.7E-02
Wolf - LSA	1.5E-03	2.4E-02	5.1E-04	8.0E-03
Wolf - RSA	1.5E-03	2.4E-02	5.1E-04	8.0E-03
Wolverine - LSA	1.1E-03	8.3E-03	3.8E-04	2.8E-03
Wolverine - RSA	1.1E-03	8.3E-03	3.8E-04	2.8E-03

U-238+ Internal U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235
Ra-226+ Internal Ra-226 + 0.3* (Rn-222 + ...Po-214)
Pb-210+ Internal Pb-210 + Bi-210

Table H.2-4

Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

2023

DOSES TO SELECTED VECs - Average Total Dose

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Absorbed Doses - Bear - LSA									
Concentration	Bq/g	Crad	1.72E-05	3.49E-05	2.39E-05	5.32E-05	1.80E-03		
Internal Dose Factor	mGy/d per Bq/g	ldcf	1.4E-01	6.6E-02	1.6E-01	6.0E-03	7.4E-02		
Internal dose rate	mGy/d	ldrat	2.4E-06	2.3E-06	3.8E-06	3.2E-07	1.3E-04	1.4E-04	=Crad*ldcf
External Gamma rate	uGy/h	Xgrat	0.04						
Fraction of time on site	-	fts	1.00						
External dose rate	mGy/d	Xdrat	9.6E-04						=Xgrat*24*fts/1000
Internal plus external	mGy/d	tdrat	1.1E-03						=SUM(ldrat)+Xdrat
Absorbed Doses - Caribou - LSA									
Concentration	Bq/g	Crad2	7.26E-05	4.61E-05	9.33E-05	9.07E-04	2.41E-02		
Internal dose rate	mGy/d	ldrat2	1.0E-05	3.0E-06	1.5E-05	5.5E-06	1.8E-03	1.8E-03	=Crad2*ldcf
Fraction of time on site	-	fts2	1.00						
External dose rate	mGy/d	Xdrat2	9.6E-04						=Xgrat*24*fts2/1000
Internal plus external	mGy/d	tdrat2	2.8E-03						=SUM(ldrat2)+Xdrat2
Absorbed Doses - Caribou - RSA									
Concentration	Bq/g	Crad3	4.76E-05	4.51E-05	8.95E-05	9.06E-04	2.40E-02		
Internal dose rate	mGy/d	ldrat3	6.8E-06	3.0E-06	1.4E-05	5.5E-06	1.8E-03	1.8E-03	=Crad3*ldcf
Fraction of time on site	-	fts3	1.00						
External dose rate	mGy/d	Xdrat3	9.6E-04						=Xgrat*24*fts3/1000
Internal plus external	mGy/d	tdrat3	2.8E-03						=SUM(ldrat3)+Xdrat3
Absorbed Doses - Falcon - LSA									
Concentration	Bq/g	Crad4	4.03E-06	1.21E-04	4.04E-04	1.34E-01	1.47E-02		
Internal dose rate	mGy/d	ldrat4	5.7E-07	8.0E-06	6.4E-05	8.1E-04	1.1E-03	2.0E-03	=Crad4*ldcf
Fraction of time on site	-	fts4	1.00						
External dose rate	mGy/d	Xdrat4	9.6E-04						=Xgrat*24*fts4/1000
Internal plus external	mGy/d	tdrat4	2.9E-03						=SUM(ldrat4)+Xdrat4
Absorbed Doses - Falcon - RSA									
Concentration	Bq/g	Crad5	3.90E-06	1.20E-04	3.99E-04	1.34E-01	1.47E-02		
Internal dose rate	mGy/d	ldrat5	5.5E-07	7.9E-06	6.3E-05	8.1E-04	1.1E-03	2.0E-03	=Crad5*ldcf
Fraction of time on site	-	fts5	1.00						
External dose rate	mGy/d	Xdrat5	9.6E-04						=Xgrat*24*fts5/1000
Internal plus external	mGy/d	tdrat5	2.9E-03						=SUM(ldrat5)+Xdrat5
Absorbed Doses - Fox - LSA									
Concentration	Bq/g	Crad6	1.81E-05	2.80E-05	6.26E-05	1.31E-04	1.16E-03		
Internal dose rate	mGy/d	ldrat6	2.6E-06	1.8E-06	9.9E-06	7.9E-07	8.5E-05	1.0E-04	=Crad6*ldcf
Fraction of time on site	-	fts6	1.00						
External dose rate	mGy/d	Xdrat6	9.6E-04						=Xgrat*24*fts6/1000
Internal plus external	mGy/d	tdrat6	1.1E-03						=SUM(ldrat6)+Xdrat6
Absorbed Doses - Lemming - Rock Lake Watershed									
Concentration	Bq/g	Crad7	1.41E-04	1.26E-03	2.61E-03	4.81E-02	6.66E-03		
Internal dose rate	mGy/d	ldrat7	2.0E-05	8.3E-05	4.2E-04	2.9E-04	4.9E-04	1.3E-03	=Crad7*ldcf
Fraction of time on site	-	fts7	1.00						
External dose rate	mGy/d	Xdrat7	9.6E-04						=Xgrat*24*fts7/1000
Internal plus external	mGy/d	tdrat7	2.3E-03						=SUM(ldrat7)+Xdrat7
Absorbed Doses - Lemming - JSL @ Kiggavik Discharge									
Concentration	Bq/g	Crad8	1.22E-04	1.24E-03	2.55E-03	4.80E-02	6.55E-03		
Internal dose rate	mGy/d	ldrat8	1.7E-05	8.2E-05	4.1E-04	2.9E-04	4.8E-04	1.3E-03	=Crad8*ldcf
Fraction of time on site	-	fts8	1.00						
External dose rate	mGy/d	Xdrat8	9.6E-04						=Xgrat*24*fts8/1000
Internal plus external	mGy/d	tdrat8	2.2E-03						=SUM(ldrat8)+Xdrat8
Absorbed Doses - Lemming - Kiggavik Camp									
Concentration	Bq/g	Crad9	2.05E-03	3.47E-03	8.82E-03	6.52E-02	1.82E-02		
Internal dose rate	mGy/d	ldrat9	2.9E-04	2.3E-04	1.4E-03	3.9E-04	1.3E-03	3.7E-03	=Crad9*ldcf
Fraction of time on site	-	fts9	1.00						
External dose rate	mGy/d	Xdrat9	9.6E-04						=Xgrat*24*fts9/1000
Internal plus external	mGy/d	tdrat9	4.6E-03						=SUM(ldrat9)+Xdrat9
Absorbed Doses - Lemming - JSL @ Sissons Discharge									
Concentration	Bq/g	Crad10	2.45E-04	1.38E-03	2.95E-03	4.91E-02	7.29E-03		
Internal dose rate	mGy/d	ldrat10	3.5E-05	9.1E-05	4.7E-04	3.0E-04	5.4E-04	1.4E-03	=Crad10*ldcf
Fraction of time on site	-	fts10	1.00						
External dose rate	mGy/d	Xdrat10	9.6E-04						=Xgrat*24*fts10/1000
Internal plus external	mGy/d	tdrat10	2.4E-03						=SUM(ldrat10)+Xdrat10
Absorbed Doses - Lapland Longspur - Rock Lake Watershed									
Concentration	Bq/g	Crad11	1.42E-05	7.56E-04	1.61E-03	3.59E-02	1.29E-02		
Internal dose rate	mGy/d	ldrat11	2.0E-06	5.0E-05	2.6E-04	2.2E-04	9.6E-04	1.5E-03	=Crad11*ldcf
Fraction of time on site	-	fts11	1.00						
External dose rate	mGy/d	Xdrat11	9.6E-04						=Xgrat*24*fts11/1000
Internal plus external	mGy/d	tdrat11	2.4E-03						=SUM(ldrat11)+Xdrat11

Table H.2-4

Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

Absorbed Doses - Lapland Longspur - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad12	1.97E-05	7.55E-04	1.65E-03	3.61E-02	1.34E-02			
Internal dose rate	mGy/d	ldrat12	2.8E-06	5.0E-05	2.6E-04	2.2E-04	9.9E-04	1.5E-03	=Crad12*ldcf	
Fraction of time on site	-	fts12	1.00							
External dose rate	mGy/d	Xdrat12	9.6E-04						=Xgrat*24*fts12/1000	
Internal plus external	mGy/d	tdrat12	2.5E-03						=SUM(ldrat12)+Xdrat12	
Absorbed Doses - Lapland Longspur - Kiggavik Camp										
Concentration	Bq/g	Crad13	4.69E-05	9.46E-04	2.03E-03	3.97E-02	1.41E-02			
Internal dose rate	mGy/d	ldrat13	6.7E-06	6.2E-05	3.2E-04	2.4E-04	1.0E-03	1.7E-03	=Crad13*ldcf	
Fraction of time on site	-	fts13	1.00							
External dose rate	mGy/d	Xdrat13	9.6E-04						=Xgrat*24*fts13/1000	
Internal plus external	mGy/d	tdrat13	2.6E-03						=SUM(ldrat13)+Xdrat13	
Absorbed Doses - Lapland Longspur - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad14	3.23E-05	7.65E-04	1.64E-03	3.62E-02	1.32E-02			
Internal dose rate	mGy/d	ldrat14	4.6E-06	5.0E-05	2.6E-04	2.2E-04	9.8E-04	1.5E-03	=Crad14*ldcf	
Fraction of time on site	-	fts14	1.00							
External dose rate	mGy/d	Xdrat14	9.6E-04						=Xgrat*24*fts14/1000	
Internal plus external	mGy/d	tdrat14	2.5E-03						=SUM(ldrat14)+Xdrat14	
Absorbed Doses - Long-Tailed Duck - Rock Lake										
Concentration	Bq/g	Crad15	1.95E-05	2.01E-04	2.30E-03	1.99E-02	1.55E-02			
Internal dose rate	mGy/d	ldrat15	2.8E-06	1.3E-05	3.6E-04	1.2E-04	1.1E-03	1.6E-03	=Crad15*ldcf	
Fraction of time on site	-	fts15	1.00							
External dose rate	mGy/d	Xdrat15	9.6E-04						=Xgrat*24*fts15/1000	
Internal plus external	mGy/d	tdrat15	2.6E-03						=SUM(ldrat15)+Xdrat15	
Absorbed Doses - Long-Tailed Duck - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad16	3.14E-05	1.96E-04	2.21E-03	1.93E-02	1.52E-02			
Internal dose rate	mGy/d	ldrat16	4.5E-06	1.3E-05	3.5E-04	1.2E-04	1.1E-03	1.6E-03	=Crad16*ldcf	
Fraction of time on site	-	fts16	1.00							
External dose rate	mGy/d	Xdrat16	9.6E-04						=Xgrat*24*fts16/1000	
Internal plus external	mGy/d	tdrat16	2.6E-03						=SUM(ldrat16)+Xdrat16	
Absorbed Doses - Long-Tailed Duck - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad17	4.73E-05	1.97E-04	2.24E-03	1.95E-02	1.52E-02			
Internal dose rate	mGy/d	ldrat17	6.7E-06	1.3E-05	3.6E-04	1.2E-04	1.1E-03	1.6E-03	=Crad17*ldcf	
Fraction of time on site	-	fts17	1.00							
External dose rate	mGy/d	Xdrat17	9.6E-04						=Xgrat*24*fts17/1000	
Internal plus external	mGy/d	tdrat17	2.6E-03						=SUM(ldrat17)+Xdrat17	
Absorbed Doses - Merganser - Rock Lake										
Concentration	Bq/g	Crad18	2.29E-06	8.27E-05	1.25E-04	6.29E-03	2.11E-03			
Internal dose rate	mGy/d	ldrat18	3.3E-07	5.4E-06	2.0E-05	3.8E-05	1.6E-04	2.2E-04	=Crad18*ldcf	
Fraction of time on site	-	fts18	1.00							
External dose rate	mGy/d	Xdrat18	9.6E-04						=Xgrat*24*fts18/1000	
Internal plus external	mGy/d	tdrat18	1.2E-03						=SUM(ldrat18)+Xdrat18	
Absorbed Doses - Merganser - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad19	2.31E-06	8.03E-05	1.18E-04	6.13E-03	2.04E-03			
Internal dose rate	mGy/d	ldrat19	3.3E-07	5.3E-06	1.9E-05	3.7E-05	1.5E-04	2.1E-04	=Crad19*ldcf	
Fraction of time on site	-	fts19	1.00							
External dose rate	mGy/d	Xdrat19	9.6E-04						=Xgrat*24*fts19/1000	
Internal plus external	mGy/d	tdrat19	1.2E-03						=SUM(ldrat19)+Xdrat19	
Absorbed Doses - Merganser - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad20	2.33E-06	8.08E-05	1.20E-04	6.18E-03	2.06E-03			
Internal dose rate	mGy/d	ldrat20	3.3E-07	5.3E-06	1.9E-05	3.7E-05	1.5E-04	2.1E-04	=Crad20*ldcf	
Fraction of time on site	-	fts20	1.00							
External dose rate	mGy/d	Xdrat20	9.6E-04						=Xgrat*24*fts20/1000	
Internal plus external	mGy/d	tdrat20	1.2E-03						=SUM(ldrat20)+Xdrat20	
Absorbed Doses - Muskox - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad21	3.13E-05	5.03E-05	7.12E-05	2.22E-04	6.91E-03			
Internal dose rate	mGy/d	ldrat21	4.4E-06	3.3E-06	1.1E-05	1.3E-06	5.1E-04	5.3E-04	=Crad21*ldcf	
Fraction of time on site	-	fts21	1.00							
External dose rate	mGy/d	Xdrat21	9.6E-04						=Xgrat*24*fts21/1000	
Internal plus external	mGy/d	tdrat21	1.5E-03						=SUM(ldrat21)+Xdrat21	
Absorbed Doses - Muskox - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad22	3.23E-05	7.65E-04	1.64E-03	3.62E-02	1.32E-02			
Internal dose rate	mGy/d	ldrat22	4.6E-06	5.0E-05	2.6E-04	2.2E-04	9.8E-04	1.5E-03	=Crad22*ldcf	
Fraction of time on site	-	fts22	1.00							
External dose rate	mGy/d	Xdrat22	9.6E-04						=Xgrat*24*fts22/1000	
Internal plus external	mGy/d	tdrat22	2.5E-03						=SUM(ldrat22)+Xdrat22	
Absorbed Doses - Northern Pintail - Rock Lake										
Concentration	Bq/g	Crad23	7.17E-06	1.15E-03	6.60E-04	5.23E-02	1.76E-02			
Internal dose rate	mGy/d	ldrat23	1.0E-06	7.5E-05	1.0E-04	3.2E-04	1.3E-03	1.8E-03	=Crad23*ldcf	
Fraction of time on site	-	fts23	1.00							
External dose rate	mGy/d	Xdrat23	9.6E-04						=Xgrat*24*fts23/1000	
Internal plus external	mGy/d	tdrat23	2.8E-03						=SUM(ldrat23)+Xdrat23	

Table H.2-4

Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

Absorbed Doses - Northern Pintail - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad24	1.07E-05	1.11E-03	6.38E-04	5.08E-02	1.71E-02			
Internal dose rate	mGy/d	Idrat24	1.5E-06	7.3E-05	1.0E-04	3.1E-04	1.3E-03	1.7E-03	=Crad24*Idcf	
Fraction of time on site	-	fts24	1.00							
External dose rate	mGy/d	Xdrat24	9.6E-04						=Xgrat*24*fts24/1000	
Internal plus external	mGy/d	tdrat24	2.7E-03						=SUM(Idrat24)+Xdrat24	
Absorbed Doses - Northern Pintail - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad25	1.56E-05	1.12E-03	6.43E-04	5.13E-02	1.72E-02			
Internal dose rate	mGy/d	Idrat25	2.2E-06	7.4E-05	1.0E-04	3.1E-04	1.3E-03	1.8E-03	=Crad25*Idcf	
Fraction of time on site	-	fts25	1.00							
External dose rate	mGy/d	Xdrat25	9.6E-04						=Xgrat*24*fts25/1000	
Internal plus external	mGy/d	tdrat25	2.7E-03						=SUM(Idrat25)+Xdrat25	
Absorbed Doses - Ptarmigan - Rock Lake Watershed										
Concentration	Bq/g	Crad26	1.21E-05	2.28E-04	6.70E-04	1.38E-01	4.74E-02			
Internal dose rate	mGy/d	Idrat26	1.7E-06	1.5E-05	1.1E-04	8.3E-04	3.5E-03	4.5E-03	=Crad26*Idcf	
Fraction of time on site	-	fts26	1.00							
External dose rate	mGy/d	Xdrat26	9.6E-04						=Xgrat*24*fts26/1000	
Internal plus external	mGy/d	tdrat26	5.4E-03						=SUM(Idrat26)+Xdrat26	
Absorbed Doses - Ptarmigan - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad27	1.40E-05	2.28E-04	6.81E-04	1.38E-01	4.76E-02			
Internal dose rate	mGy/d	Idrat27	2.0E-06	1.5E-05	1.1E-04	8.3E-04	3.5E-03	4.5E-03	=Crad27*Idcf	
Fraction of time on site	-	fts27	1.00							
External dose rate	mGy/d	Xdrat27	9.6E-04						=Xgrat*24*fts27/1000	
Internal plus external	mGy/d	tdrat27	5.4E-03						=SUM(Idrat27)+Xdrat27	
Absorbed Doses - Ptarmigan - Kiggavik Camp										
Concentration	Bq/g	Crad28	1.84E-05	2.62E-04	7.35E-04	1.39E-01	4.77E-02			
Internal dose rate	mGy/d	Idrat28	2.6E-06	1.7E-05	1.2E-04	8.4E-04	3.5E-03	4.5E-03	=Crad28*Idcf	
Fraction of time on site	-	fts28	1.00							
External dose rate	mGy/d	Xdrat28	9.6E-04						=Xgrat*24*fts28/1000	
Internal plus external	mGy/d	tdrat28	5.5E-03						=SUM(Idrat28)+Xdrat28	
Absorbed Doses - Ptarmigan - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad29	1.79E-05	2.30E-04	6.75E-04	1.38E-01	4.75E-02			
Internal dose rate	mGy/d	Idrat29	2.5E-06	1.5E-05	1.1E-04	8.3E-04	3.5E-03	4.5E-03	=Crad29*Idcf	
Fraction of time on site	-	fts29	1.00							
External dose rate	mGy/d	Xdrat29	9.6E-04						=Xgrat*24*fts29/1000	
Internal plus external	mGy/d	tdrat29	5.4E-03						=SUM(Idrat29)+Xdrat29	
Absorbed Doses - Sandpiper - Rock Lake										
Concentration	Bq/g	Crad30	4.85E-05	7.57E-04	3.86E-03	5.69E-02	3.46E-02			
Internal dose rate	mGy/d	Idrat30	6.9E-06	5.0E-05	6.1E-04	3.4E-04	2.6E-03	3.6E-03	=Crad30*Idcf	
Fraction of time on site	-	fts30	1.00							
External dose rate	mGy/d	Xdrat30	9.6E-04						=Xgrat*24*fts30/1000	
Internal plus external	mGy/d	tdrat30	4.5E-03						=SUM(Idrat30)+Xdrat30	
Absorbed Doses - Sandpiper - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad31	7.06E-05	7.48E-04	3.74E-03	5.58E-02	3.42E-02			
Internal dose rate	mGy/d	Idrat31	1.0E-05	4.9E-05	5.9E-04	3.4E-04	2.5E-03	3.5E-03	=Crad31*Idcf	
Fraction of time on site	-	fts31	1.00							
External dose rate	mGy/d	Xdrat31	9.6E-04						=Xgrat*24*fts31/1000	
Internal plus external	mGy/d	tdrat31	4.5E-03						=SUM(Idrat31)+Xdrat31	
Absorbed Doses - Sandpiper - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad32	1.07E-04	7.48E-04	3.77E-03	5.60E-02	3.41E-02			
Internal dose rate	mGy/d	Idrat32	1.5E-05	4.9E-05	6.0E-04	3.4E-04	2.5E-03	3.5E-03	=Crad32*Idcf	
Fraction of time on site	-	fts32	1.00							
External dose rate	mGy/d	Xdrat32	9.6E-04						=Xgrat*24*fts32/1000	
Internal plus external	mGy/d	tdrat32	4.5E-03						=SUM(Idrat32)+Xdrat32	
Absorbed Doses - Shrew - Rock Lake Watershed										
Concentration	Bq/g	Crad33	1.01E-04	2.60E-04	1.45E-03	1.17E-02	2.43E-03			
Internal dose rate	mGy/d	Idrat33	1.4E-05	1.7E-05	2.3E-04	7.0E-05	1.8E-04	5.1E-04	=Crad33*Idcf	
Fraction of time on site	-	fts33	1.00							
External dose rate	mGy/d	Xdrat33	9.6E-04						=Xgrat*24*fts33/1000	
Internal plus external	mGy/d	tdrat33	1.5E-03						=SUM(Idrat33)+Xdrat33	
Absorbed Doses - Shrew - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad34	1.12E-04	2.60E-04	1.52E-03	1.17E-02	2.43E-03			
Internal dose rate	mGy/d	Idrat34	1.6E-05	1.7E-05	2.4E-04	7.0E-05	1.8E-04	5.3E-04	=Crad34*Idcf	
Fraction of time on site	-	fts34	1.00							
External dose rate	mGy/d	Xdrat34	9.6E-04						=Xgrat*24*fts34/1000	
Internal plus external	mGy/d	tdrat34	1.5E-03						=SUM(Idrat34)+Xdrat34	
Absorbed Doses - Shrew - Kiggavik Camp										
Concentration	Bq/g	Crad35	1.27E-03	1.48E-03	4.44E-03	2.01E-02	8.75E-03			
Internal dose rate	mGy/d	Idrat35	1.8E-04	9.7E-05	7.1E-04	1.2E-04	6.5E-04	1.8E-03	=Crad35*Idcf	
Fraction of time on site	-	fts35	1.00							
External dose rate	mGy/d	Xdrat35	9.6E-04						=Xgrat*24*fts35/1000	
Internal plus external	mGy/d	tdrat35	2.7E-03						=SUM(Idrat35)+Xdrat35	
Absorbed Doses - Shrew - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad36	2.24E-04	3.32E-04	1.63E-03	1.22E-02	2.80E-03			
Internal dose rate	mGy/d	Idrat36	3.2E-05	2.2E-05	2.6E-04	7.3E-05	2.1E-04	5.9E-04	=Crad36*Idcf	
Fraction of time on site	-	fts36	1.00							

Table H.2-4

Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

External dose rate	mGy/d	Xdrat36	2.7E-04							=Xgrat*24*fts36/3600
Internal plus external	mGy/d	tdrat36	8.6E-04							=SUM(ldrat36)+Xdrat36
Absorbed Doses - Squirrel - Rock Lake Watershed										
Concentration	Bq/g	Crad37	2.87E-05	9.96E-04	1.50E-03	1.97E-02	2.34E-03			
Internal dose rate	mGy/d	ldrat37	4.1E-06	6.6E-05	2.4E-04	1.2E-04	1.7E-04	6.0E-04		=Crad37*ldcf
Fraction of time on site	-	fts37	1.00							
External dose rate	mGy/d	Xdrat37	9.6E-04							=Xgrat*24*fts37/1000
Internal plus external	mGy/d	tdrat37	1.6E-03							=SUM(ldrat37)+Xdrat37
Absorbed Doses - Squirrel - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad38	2.83E-05	9.94E-04	1.49E-03	1.97E-02	2.34E-03			
Internal dose rate	mGy/d	ldrat38	4.0E-06	6.5E-05	2.4E-04	1.2E-04	1.7E-04	6.0E-04		=Crad38*ldcf
Fraction of time on site	-	fts38	1.00							
External dose rate	mGy/d	Xdrat38	9.6E-04							=Xgrat*24*fts38/1000
Internal plus external	mGy/d	tdrat38	1.6E-03							=SUM(ldrat38)+Xdrat38
Absorbed Doses - Squirrel - Kiggavik Camp										
Concentration	Bq/g	Crad39	5.59E-05	1.14E-03	1.73E-03	1.99E-02	2.37E-03			
Internal dose rate	mGy/d	ldrat39	7.9E-06	7.5E-05	2.7E-04	1.2E-04	1.8E-04	6.5E-04		=Crad39*ldcf
Fraction of time on site	-	fts39	1.00							
External dose rate	mGy/d	Xdrat39	9.6E-04							=Xgrat*24*fts39/1000
Internal plus external	mGy/d	tdrat39	1.6E-03							=SUM(ldrat39)+Xdrat39

Table H.2-4

Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

Absorbed Doses - Squirrel - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad40	2.99E-05	1.00E-03	1.51E-03	1.97E-02	2.34E-03			
Internal dose rate	mGy/d	Idrat40	4.2E-06	6.6E-05	2.4E-04	1.2E-04	1.7E-04	6.0E-04	=Crad40*Idcf	
Fraction of time on site	-	fts40	1.00							
External dose rate	mGy/d	Xdrat40	9.6E-04						=Xgrat*24*fts40/1000	
Internal plus external	mGy/d	tdrat40	1.6E-03						=SUM(Idrat40)+Xdrat40	
Absorbed Doses - Wolf - LSA										
Concentration	Bq/g	Crad41	1.29E-05	9.62E-06	6.08E-06	3.68E-06	1.91E-03			
Internal dose rate	mGy/d	Idrat41	1.8E-06	6.3E-07	9.7E-07	2.2E-08	1.4E-04	1.4E-04	=Crad41*Idcf	
Fraction of time on site	-	fts41	1.00							
External dose rate	mGy/d	Xdrat41	9.6E-04						=Xgrat*24*fts41/1000	
Internal plus external	mGy/d	tdrat41	1.1E-03						=SUM(Idrat41)+Xdrat41	
Absorbed Doses - Wolf - RSA										
Concentration	Bq/g	Crad42	1.28E-05	9.62E-06	6.07E-06	3.68E-06	1.91E-03			
Internal dose rate	mGy/d	Idrat42	1.8E-06	6.3E-07	9.6E-07	2.2E-08	1.4E-04	1.4E-04	=Crad42*Idcf	
Fraction of time on site	-	fts42	1.00							
External dose rate	mGy/d	Xdrat42	9.6E-04						=Xgrat*24*fts42/1000	
Internal plus external	mGy/d	tdrat42	1.1E-03						=SUM(Idrat42)+Xdrat42	
Absorbed Doses - Wolverine - LSA										
Concentration	Bq/g	Crad43	2.15E-05	3.52E-05	5.82E-05	1.07E-04	5.04E-04			
Internal dose rate	mGy/d	Idrat43	3.1E-06	2.3E-06	9.3E-06	6.4E-07	3.7E-05	5.3E-05	=Crad43*Idcf	
Fraction of time on site	-	fts43	1.00							
External dose rate	mGy/d	Xdrat43	9.6E-04						=Xgrat*24*fts43/1000	
Internal plus external	mGy/d	tdrat43	1.0E-03						=SUM(Idrat43)+Xdrat43	
Absorbed Doses - Wolverine - RSA										
Concentration	Bq/g	Crad44	1.82E-05	3.43E-05	5.54E-05	1.06E-04	4.89E-04			
Internal dose rate	mGy/d	Idrat44	2.6E-06	2.3E-06	8.8E-06	6.4E-07	3.6E-05	5.0E-05	=Crad44*Idcf	
Fraction of time on site	-	fts44	1.00							
External dose rate	mGy/d	Xdrat44	9.6E-04						=Xgrat*24*fts44/1000	
Internal plus external	mGy/d	tdrat44	1.0E-03						=SUM(Idrat44)+Xdrat44	
Equivalent Doses - Bear - LSA										
RBE for alpha	Sv/Gy	RBE	40							
High LET dose rate	mSv/d	Hletdr	9.8E-05	9.2E-05	1.5E-04	3.2E-07	5.3E-03	5.7E-03	=Idrat*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr	9.6E-04						=Xdrat	
Total dose rate	mSv/d	tdr	6.6E-03						=SUM(Hletdr)+Lletdr	
Equivalent Doses - Caribou - LSA										
High LET dose rate	mSv/d	Hletdr2	4.1E-04	1.2E-04	5.9E-04	5.5E-06	7.1E-02	7.3E-02	=Idrat2*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr2	9.6E-04						=Xdrat2	
Total dose rate	mSv/d	tdr2	7.4E-02						=SUM(Hletdr2)+Lletdr2	
Equivalent Doses - Caribou - RSA										
High LET dose rate	mSv/d	Hletdr3	2.7E-04	1.2E-04	5.7E-04	5.5E-06	7.1E-02	7.2E-02	=Idrat3*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr3	9.6E-04						=Xdrat3	
Total dose rate	mSv/d	tdr3	7.3E-02						=SUM(Hletdr3)+Lletdr3	
Equivalent Doses - Falcon - LSA										
High LET dose rate	mSv/d	Hletdr4	2.3E-05	3.2E-04	2.6E-03	8.1E-04	4.4E-02	4.7E-02	=Idrat4*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr4	9.6E-04						=Xdrat4	
Total dose rate	mSv/d	tdr4	4.8E-02						=SUM(Hletdr4)+Lletdr4	
Equivalent Doses - Falcon - RSA										
High LET dose rate	mSv/d	Hletdr5	2.2E-05	3.2E-04	2.5E-03	8.1E-04	4.3E-02	4.7E-02	=Idrat5*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr5	9.6E-04						=Xdrat5	
Total dose rate	mSv/d	tdr5	4.8E-02						=SUM(Hletdr5)+Lletdr5	
Equivalent Doses - Fox - LSA										
High LET dose rate	mSv/d	Hletdr6	1.0E-04	7.4E-05	4.0E-04	7.9E-07	3.4E-03	4.0E-03	=Idrat6*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr6	9.6E-04						=Xdrat6	
Total dose rate	mSv/d	tdr6	5.0E-03						=SUM(Hletdr6)+Lletdr6	
Equivalent Doses - Lemming - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr7	8.0E-04	3.3E-03	1.7E-02	2.9E-04	2.0E-02	4.1E-02	=Idrat7*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr7	9.6E-04						=Xdrat7	
Total dose rate	mSv/d	tdr7	4.2E-02						=SUM(Hletdr7)+Lletdr7	
Equivalent Doses - Lemming - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr8	6.9E-04	3.3E-03	1.6E-02	2.9E-04	1.9E-02	4.0E-02	=Idrat8*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr8	9.6E-04						=Xdrat8	
Total dose rate	mSv/d	tdr8	4.1E-02						=SUM(Hletdr8)+Lletdr8	
Equivalent Doses - Lemming - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr9	1.2E-02	9.1E-03	5.6E-02	3.9E-04	5.4E-02	1.3E-01	=Idrat9*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr9	9.6E-04						=Xdrat9	
Total dose rate	mSv/d	tdr9	1.3E-01						=SUM(Hletdr9)+Lletdr9	
Equivalent Doses - Lemming - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr10	1.4E-03	3.6E-03	1.9E-02	3.0E-04	2.2E-02	4.6E-02	=Idrat10*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr10	9.6E-04						=Xdrat10	
Total dose rate	mSv/d	tdr10	4.7E-02						=SUM(Hletdr10)+Lletdr10	

Table H.2-4

Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

Equivalent Doses - Lapland Longspur - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr11	8.1E-05	2.0E-03	1.0E-02	2.2E-04	3.8E-02	5.1E-02	=Idrat11*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr11	9.6E-04						=Xdrat11	
Total dose rate	mSv/d	tdr11	5.2E-02						=SUM(Hletdr11)+Lletdr11	
Equivalent Doses - Lapland Longspur - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr12	1.1E-04	2.0E-03	1.0E-02	2.2E-04	4.0E-02	5.2E-02	=Idrat12*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr12	9.6E-04						=Xdrat12	
Total dose rate	mSv/d	tdr12	5.3E-02						=SUM(Hletdr12)+Lletdr12	
Equivalent Doses - Lapland Longspur - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr13	2.7E-04	2.5E-03	1.3E-02	2.4E-04	4.2E-02	5.8E-02	=Idrat13*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr13	9.6E-04						=Xdrat13	
Total dose rate	mSv/d	tdr13	5.9E-02						=SUM(Hletdr13)+Lletdr13	
Equivalent Doses - Lapland Longspur - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr14	1.8E-04	2.0E-03	1.0E-02	2.2E-04	3.9E-02	5.2E-02	=Idrat14*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr14	9.6E-04						=Xdrat14	
Total dose rate	mSv/d	tdr14	5.3E-02						=SUM(Hletdr14)+Lletdr14	
Equivalent Doses - Long-Tailed Duck - Rock Lake										
High LET dose rate	mSv/d	Hletdr15	1.1E-04	5.3E-04	1.5E-02	1.2E-04	4.6E-02	6.1E-02	=Idrat15*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr15	9.6E-04						=Xdrat15	
Total dose rate	mSv/d	tdr15	6.2E-02						=SUM(Hletdr15)+Lletdr15	
Equivalent Doses - Long-Tailed Duck - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr16	1.8E-04	5.2E-04	1.4E-02	1.2E-04	4.5E-02	6.0E-02	=Idrat16*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr16	9.6E-04						=Xdrat16	
Total dose rate	mSv/d	tdr16	6.1E-02						=SUM(Hletdr16)+Lletdr16	
Equivalent Doses - Long-Tailed Duck - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr17	2.7E-04	5.2E-04	1.4E-02	1.2E-04	4.5E-02	6.0E-02	=Idrat17*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr17	9.6E-04						=Xdrat17	
Total dose rate	mSv/d	tdr17	6.1E-02						=SUM(Hletdr17)+Lletdr17	
Equivalent Doses - Merganser - Rock Lake										
High LET dose rate	mSv/d	Hletdr18	1.3E-05	2.2E-04	7.9E-04	3.8E-05	6.3E-03	7.3E-03	=Idrat18*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr18	9.6E-04						=Xdrat18	
Total dose rate	mSv/d	tdr18	8.3E-03						=SUM(Hletdr18)+Lletdr18	
Equivalent Doses - Merganser - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr19	1.3E-05	2.1E-04	7.5E-04	3.7E-05	6.0E-03	7.1E-03	=Idrat19*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr19	9.6E-04						=Xdrat19	
Total dose rate	mSv/d	tdr19	8.0E-03						=SUM(Hletdr19)+Lletdr19	
Equivalent Doses - Merganser - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr20	1.3E-05	2.1E-04	7.6E-04	3.7E-05	6.1E-03	7.1E-03	=Idrat20*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr20	9.6E-04						=Xdrat20	
Total dose rate	mSv/d	tdr20	8.1E-03						=SUM(Hletdr20)+Lletdr20	
Equivalent Doses - Muskox - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr21	1.8E-04	1.3E-04	4.5E-04	1.3E-06	2.0E-02	2.1E-02	=Idrat21*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr21	9.6E-04						=Xdrat21	
Total dose rate	mSv/d	tdr21	2.2E-02						=SUM(Hletdr21)+Lletdr21	
Equivalent Doses - Muskox - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr22	1.8E-04	2.0E-03	1.0E-02	2.2E-04	3.9E-02	5.2E-02	=Idrat22*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr22	9.6E-04						=Xdrat22	
Total dose rate	mSv/d	tdr22	5.3E-02						=SUM(Hletdr22)+Lletdr22	
Equivalent Doses - Northern Pintail - Rock Lake										
High LET dose rate	mSv/d	Hletdr23	4.1E-05	3.0E-03	4.2E-03	3.2E-04	5.2E-02	6.0E-02	=Idrat23*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr23	9.6E-04						=Xdrat23	
Total dose rate	mSv/d	tdr23	6.1E-02						=SUM(Hletdr23)+Lletdr23	
Equivalent Doses - Northern Pintail - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr24	6.1E-05	2.9E-03	4.1E-03	3.1E-04	5.1E-02	5.8E-02	=Idrat24*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr24	9.6E-04						=Xdrat24	
Total dose rate	mSv/d	tdr24	5.9E-02						=SUM(Hletdr24)+Lletdr24	
Equivalent Doses - Northern Pintail - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr25	8.9E-05	3.0E-03	4.1E-03	3.1E-04	5.1E-02	5.8E-02	=Idrat25*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr25	9.6E-04						=Xdrat25	
Total dose rate	mSv/d	tdr25	5.9E-02						=SUM(Hletdr25)+Lletdr25	
Equivalent Doses - Ptarmigan - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr26	6.8E-05	6.0E-04	4.3E-03	8.3E-04	1.4E-01	1.5E-01	=Idrat26*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr26	9.6E-04						=Xdrat26	
Total dose rate	mSv/d	tdr26	1.5E-01						=SUM(Hletdr26)+Lletdr26	
Equivalent Doses - Ptarmigan - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr27	8.0E-05	6.0E-04	4.3E-03	8.3E-04	1.4E-01	1.5E-01	=Idrat27*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr27	9.6E-04						=Xdrat27	
Total dose rate	mSv/d	tdr27	1.5E-01						=SUM(Hletdr27)+Lletdr27	

Table H.2-4

Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

Equivalent Doses - Ptarmigan - Kiggavik Camp											
High LET dose rate	mSv/d	Hletdr28	1.0E-04	6.9E-04	4.7E-03	8.4E-04	1.4E-01	1.5E-01	=Idrat28*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr28	9.6E-04						=Xdrat28		
Total dose rate	mSv/d	tdr28	1.5E-01						=SUM(Hletdr28)+Lletdr28		
Equivalent Doses - Ptarmigan - JSL @ Sissons Discharge											
High LET dose rate	mSv/d	Hletdr29	1.0E-04	6.0E-04	4.3E-03	8.3E-04	1.4E-01	1.5E-01	=Idrat29*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr29	9.6E-04						=Xdrat29		
Total dose rate	mSv/d	tdr29	1.5E-01						=SUM(Hletdr29)+Lletdr29		
Equivalent Doses - Sandpiper - Rock Lake											
High LET dose rate	mSv/d	Hletdr30	2.8E-04	2.0E-03	2.5E-02	3.4E-04	1.0E-01	1.3E-01	=Idrat30*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr30	9.6E-04						=Xdrat30		
Total dose rate	mSv/d	tdr30	1.3E-01						=SUM(Hletdr30)+Lletdr30		
Equivalent Doses - Sandpiper - JSL @ Kiggavik Discharge											
High LET dose rate	mSv/d	Hletdr31	4.0E-04	2.0E-03	2.4E-02	3.4E-04	1.0E-01	1.3E-01	=Idrat31*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr31	9.6E-04						=Xdrat31		
Total dose rate	mSv/d	tdr31	1.3E-01						=SUM(Hletdr31)+Lletdr31		
Equivalent Doses - Sandpiper - JSL @ Sissons Discharge											
High LET dose rate	mSv/d	Hletdr32	6.1E-04	2.0E-03	2.4E-02	3.4E-04	1.0E-01	1.3E-01	=Idrat32*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr32	9.6E-04						=Xdrat32		
Total dose rate	mSv/d	tdr32	1.3E-01						=SUM(Hletdr32)+Lletdr32		
Equivalent Doses - Shrew - Rock Lake Watershed											
High LET dose rate	mSv/d	Hletdr33	5.7E-04	6.8E-04	9.2E-03	7.0E-05	7.2E-03	1.8E-02	=Idrat33*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr33	9.6E-04						=Xdrat33		
Total dose rate	mSv/d	tdr33	1.9E-02						=SUM(Hletdr33)+Lletdr33		
Equivalent Doses - Shrew - JSL @ Kiggavik Discharge											
High LET dose rate	mSv/d	Hletdr34	6.4E-04	6.8E-04	9.7E-03	7.0E-05	7.2E-03	1.8E-02	=Idrat34*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr34	9.6E-04						=Xdrat34		
Total dose rate	mSv/d	tdr34	1.9E-02						=SUM(Hletdr34)+Lletdr34		
Equivalent Doses - Shrew - Kiggavik Camp											
High LET dose rate	mSv/d	Hletdr35	7.2E-03	3.9E-03	2.8E-02	1.2E-04	2.6E-02	6.5E-02	=Idrat35*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr35	9.6E-04						=Xdrat35		
Total dose rate	mSv/d	tdr35	6.6E-02						=SUM(Hletdr35)+Lletdr35		
Equivalent Doses - Shrew - JSL @ Sissons Discharge											
High LET dose rate	mSv/d	Hletdr36	1.3E-03	8.7E-04	1.0E-02	7.3E-05	8.3E-03	2.1E-02	=Idrat36*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr36	2.7E-04						=Xdrat36		
Total dose rate	mSv/d	tdr36	2.1E-02						=SUM(Hletdr36)+Lletdr36		
Equivalent Doses - Squirrel - Rock Lake Watershed											
High LET dose rate	mSv/d	Hletdr37	1.6E-04	2.6E-03	9.5E-03	1.2E-04	6.9E-03	1.9E-02	=Idrat37*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr37	9.6E-04						=Xdrat37		
Total dose rate	mSv/d	tdr37	2.0E-02						=SUM(Hletdr37)+Lletdr37		
Equivalent Doses - Squirrel - JSL @ Kiggavik Discharge											
High LET dose rate	mSv/d	Hletdr38	1.6E-04	2.6E-03	9.5E-03	1.2E-04	6.9E-03	1.9E-02	=Idrat38*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr38	9.6E-04						=Xdrat38		
Total dose rate	mSv/d	tdr38	2.0E-02						=SUM(Hletdr38)+Lletdr38		
Equivalent Doses - Squirrel - Kiggavik Camp											
High LET dose rate	mSv/d	Hletdr39	3.2E-04	3.0E-03	1.1E-02	1.2E-04	7.0E-03	2.1E-02	=Idrat39*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr39	9.6E-04						=Xdrat39		
Total dose rate	mSv/d	tdr39	2.2E-02						=SUM(Hletdr39)+Lletdr39		
Equivalent Doses - Squirrel - JSL @ Sissons Discharge											
High LET dose rate	mSv/d	Hletdr40	1.7E-04	2.6E-03	9.6E-03	1.2E-04	6.9E-03	1.9E-02	=Idrat40*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr40	9.6E-04						=Xdrat40		
Total dose rate	mSv/d	tdr40	2.0E-02						=SUM(Hletdr40)+Lletdr40		
Equivalent Doses - Wolf - LSA											
High LET dose rate	mSv/d	Hletdr41	7.3E-05	2.5E-05	3.9E-05	2.2E-08	5.7E-03	5.8E-03	=Idrat41*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr41	9.6E-04						=Xdrat41		
Total dose rate	mSv/d	tdr41	6.8E-03						=SUM(Hletdr41)+Lletdr41		
Equivalent Doses - Wolf - RSA											
High LET dose rate	mSv/d	Hletdr42	7.2E-05	2.5E-05	3.9E-05	2.2E-08	5.7E-03	5.8E-03	=Idrat42*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr42	9.6E-04						=Xdrat42		
Total dose rate	mSv/d	tdr42	6.8E-03						=SUM(Hletdr42)+Lletdr42		
Equivalent Doses - Wolverine - LSA											
High LET dose rate	mSv/d	Hletdr43	1.2E-04	9.3E-05	3.7E-04	6.4E-07	1.5E-03	2.1E-03	=Idrat43*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr43	9.6E-04						=Xdrat43		
Total dose rate	mSv/d	tdr43	3.0E-03						=SUM(Hletdr43)+Lletdr43		
Equivalent Doses - Wolverine - RSA											
High LET dose rate	mSv/d	Hletdr44	1.0E-04	9.0E-05	3.5E-04	6.4E-07	1.4E-03	2.0E-03	=Idrat44*RBE , except Pb-210		
Low LET dose rate	mSv/d	Lletdr44	9.6E-04						=Xdrat44		
Total dose rate	mSv/d	tdr44	3.0E-03						=SUM(Hletdr44)+Lletdr44		

Table H.2-4
Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

SUMMARY

3 Screening Criterion in mGy/d	Total Absorbed Dose mGy/d	Total Equivalent Dose mSv/d	Index (Absorbed Dose)	Index (Equivalent Dose)
Bear - LSA	1.1E-03	6.6E-03	3.7E-04	2.2E-03
Caribou - LSA	2.8E-03	7.4E-02	9.3E-04	2.5E-02
Caribou - RSA	2.8E-03	7.3E-02	9.2E-04	2.4E-02
Falcon - LSA	2.9E-03	4.8E-02	9.8E-04	1.6E-02
Falcon - RSA	2.9E-03	4.8E-02	9.8E-04	1.6E-02
Fox - LSA	1.1E-03	5.0E-03	3.5E-04	1.7E-03
Lemming - Rock Lake Watershed	2.3E-03	4.2E-02	7.5E-04	1.4E-02
Lemming - JSL @ Kiggavik Discharge	2.2E-03	4.1E-02	7.5E-04	1.4E-02
Lemming - Kiggavik Camp	4.6E-03	1.3E-01	1.5E-03	4.4E-02
Lemming - JSL @ Sissons Discharge	2.4E-03	4.7E-02	8.0E-04	1.6E-02
Lapland Longspur - Rock Lake Watershed	2.4E-03	5.2E-02	8.1E-04	1.7E-02
Lapland Longspur - JSL @ Kiggavik Discharge	2.5E-03	5.3E-02	8.3E-04	1.8E-02
Lapland Longspur - Kiggavik Camp	2.6E-03	5.9E-02	8.8E-04	2.0E-02
Lapland Longspur - JSL @ Sissons Discharge	2.5E-03	5.3E-02	8.2E-04	1.8E-02
Long-Tailed Duck - Rock Lake	2.6E-03	6.2E-02	8.7E-04	2.1E-02
Long-Tailed Duck - JSL @ Kiggavik Discharge	2.6E-03	6.1E-02	8.6E-04	2.0E-02
Long-Tailed Duck - JSL @ Sissons Discharge	2.6E-03	6.1E-02	8.6E-04	2.0E-02
Merganser - Rock Lake	1.2E-03	8.3E-03	3.9E-04	2.8E-03
Merganser - JSL @ Kiggavik Discharge	1.2E-03	8.0E-03	3.9E-04	2.7E-03
Merganser - JSL @ Sissons Discharge	1.2E-03	8.1E-03	3.9E-04	2.7E-03
Muskox - JSL @ Kiggavik Discharge	1.5E-03	2.2E-02	5.0E-04	7.4E-03
Muskox - JSL @ Sissons Discharge	2.5E-03	5.3E-02	8.2E-04	1.8E-02
Northern Pintail - Rock Lake	2.8E-03	6.1E-02	9.2E-04	2.0E-02
Northern Pintail - JSL @ Kiggavik Discharge	2.7E-03	5.9E-02	9.0E-04	2.0E-02
Northern Pintail - JSL @ Sissons Discharge	2.7E-03	5.9E-02	9.1E-04	2.0E-02
Ptarmigan - Rock Lake Watershed	5.4E-03	1.5E-01	1.8E-03	4.9E-02
Ptarmigan - JSL @ Kiggavik Discharge	5.4E-03	1.5E-01	1.8E-03	4.9E-02
Ptarmigan - Kiggavik Camp	5.5E-03	1.5E-01	1.8E-03	4.9E-02
Ptarmigan - JSL @ Sissons Discharge	5.4E-03	1.5E-01	1.8E-03	4.9E-02
Sandpiper - Rock Lake	4.5E-03	1.3E-01	1.5E-03	4.4E-02
Sandpiper - JSL @ Kiggavik Discharge	4.5E-03	1.3E-01	1.5E-03	4.3E-02
Sandpiper - JSL @ Sissons Discharge	4.5E-03	1.3E-01	1.5E-03	4.3E-02
Shrew - Rock Lake Watershed	1.5E-03	1.9E-02	4.9E-04	6.2E-03
Shrew - JSL @ Kiggavik Discharge	1.5E-03	1.9E-02	5.0E-04	6.4E-03
Shrew - Kiggavik Camp	2.7E-03	6.6E-02	9.0E-04	2.2E-02
Shrew - JSL @ Sissons Discharge	8.6E-04	2.1E-02	2.9E-04	7.1E-03
Squirrel - Rock Lake Watershed	1.6E-03	2.0E-02	5.2E-04	6.8E-03
Squirrel - JSL @ Kiggavik Discharge	1.6E-03	2.0E-02	5.2E-04	6.8E-03
Squirrel - Kiggavik Camp	1.6E-03	2.2E-02	5.4E-04	7.5E-03
Squirrel - JSL @ Sissons Discharge	1.6E-03	2.0E-02	5.2E-04	6.8E-03
Wolf - LSA	1.1E-03	6.8E-03	3.7E-04	2.3E-03
Wolf - RSA	1.1E-03	6.8E-03	3.7E-04	2.3E-03
Wolverine - LSA	1.0E-03	3.0E-03	3.4E-04	1.0E-03
Wolverine - RSA	1.0E-03	3.0E-03	3.4E-04	9.8E-04

U-238+ Internal U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235
Ra-226+ Internal Ra-226 + 0.3* (Rn-222 + ...Po-214)
Pb-210+ Internal Pb-210 + Bi-210

Table H.2-4

Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

2023

DOSES TO SELECTED VECs - 95th Percentile Total Dose

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Absorbed Doses - Bear - LSA									
Concentration	Bq/g	Crad	5.86E-05	1.53E-04	7.24E-05	1.74E-04	6.46E-03		
Internal Dose Factor	mGy/d per Bq/g	ldcf	1.4E-01	6.6E-02	1.6E-01	6.0E-03	7.4E-02	5.1E-04	=Crad*ldcf
Internal dose rate	mGy/d	ldrat	8.3E-06	1.0E-05	1.2E-05	1.0E-06	4.8E-04		
External Gamma rate	uGy/h	Xgrat	0.04						
Fraction of time on site	-	fts	1.00						
External dose rate	mGy/d	Xdrat	9.6E-04						=Xgrat*24*fts/1000
Internal plus external	mGy/d	tdrat	1.5E-03						=SUM(ldrat)+Xdrat
Absorbed Doses - Caribou - LSA									
Concentration	Bq/g	Crad2	2.17E-04	1.43E-04	3.21E-04	2.53E-03	7.70E-02		
Internal dose rate	mGy/d	ldrat2	3.1E-05	9.4E-06	5.1E-05	1.5E-05	5.7E-03	5.8E-03	=Crad2*ldcf
Fraction of time on site	-	fts2	1.00						
External dose rate	mGy/d	Xdrat2	9.6E-04						=Xgrat*24*fts2/1000
Internal plus external	mGy/d	tdrat2	6.8E-03						=SUM(ldrat2)+Xdrat2
Absorbed Doses - Caribou - RSA									
Concentration	Bq/g	Crad3	1.43E-04	1.35E-04	3.10E-04	2.53E-03	7.68E-02		
Internal dose rate	mGy/d	ldrat3	2.0E-05	8.9E-06	4.9E-05	1.5E-05	5.7E-03	5.8E-03	=Crad3*ldcf
Fraction of time on site	-	fts3	1.00						
External dose rate	mGy/d	Xdrat3	9.6E-04						=Xgrat*24*fts3/1000
Internal plus external	mGy/d	tdrat3	6.7E-03						=SUM(ldrat3)+Xdrat3
Absorbed Doses - Falcon - LSA									
Concentration	Bq/g	Crad4	1.31E-05	3.60E-04	1.40E-03	4.43E-01	5.03E-02		
Internal dose rate	mGy/d	ldrat4	1.9E-06	2.4E-05	2.2E-04	2.7E-03	3.7E-03	6.6E-03	=Crad4*ldcf
Fraction of time on site	-	fts4	1.00						
External dose rate	mGy/d	Xdrat4	9.6E-04						=Xgrat*24*fts4/1000
Internal plus external	mGy/d	tdrat4	7.6E-03						=SUM(ldrat4)+Xdrat4
Absorbed Doses - Falcon - RSA									
Concentration	Bq/g	Crad5	1.15E-05	3.57E-04	1.39E-03	4.41E-01	5.02E-02		
Internal dose rate	mGy/d	ldrat5	1.6E-06	2.3E-05	2.2E-04	2.7E-03	3.7E-03	6.6E-03	=Crad5*ldcf
Fraction of time on site	-	fts5	1.00						
External dose rate	mGy/d	Xdrat5	9.6E-04						=Xgrat*24*fts5/1000
Internal plus external	mGy/d	tdrat5	7.6E-03						=SUM(ldrat5)+Xdrat5
Absorbed Doses - Fox - LSA									
Concentration	Bq/g	Crad6	6.08E-05	1.01E-04	1.40E-04	5.33E-04	3.76E-03		
Internal dose rate	mGy/d	ldrat6	8.6E-06	6.6E-06	2.2E-05	3.2E-06	2.8E-04	3.2E-04	=Crad6*ldcf
Fraction of time on site	-	fts6	1.00						
External dose rate	mGy/d	Xdrat6	9.6E-04						=Xgrat*24*fts6/1000
Internal plus external	mGy/d	tdrat6	1.3E-03						=SUM(ldrat6)+Xdrat6
Absorbed Doses - Lemming - Rock Lake Watershed									
Concentration	Bq/g	Crad7	4.49E-04	3.99E-03	6.83E-03	1.75E-01	2.37E-02		
Internal dose rate	mGy/d	ldrat7	6.4E-05	2.6E-04	1.1E-03	1.1E-03	1.8E-03	4.2E-03	=Crad7*ldcf
Fraction of time on site	-	fts7	1.00						
External dose rate	mGy/d	Xdrat7	9.6E-04						=Xgrat*24*fts7/1000
Internal plus external	mGy/d	tdrat7	5.2E-03						=SUM(ldrat7)+Xdrat7
Absorbed Doses - Lemming - JSL @ Kiggavik Discharge									
Concentration	Bq/g	Crad8	3.96E-04	3.88E-03	6.70E-03	1.74E-01	2.32E-02		
Internal dose rate	mGy/d	ldrat8	5.6E-05	2.6E-04	1.1E-03	1.0E-03	1.7E-03	4.1E-03	=Crad8*ldcf
Fraction of time on site	-	fts8	1.00						
External dose rate	mGy/d	Xdrat8	9.6E-04						=Xgrat*24*fts8/1000
Internal plus external	mGy/d	tdrat8	5.1E-03						=SUM(ldrat8)+Xdrat8
Absorbed Doses - Lemming - Kiggavik Camp									
Concentration	Bq/g	Crad9	6.85E-03	1.54E-02	3.19E-02	2.79E-01	6.09E-02		
Internal dose rate	mGy/d	ldrat9	9.7E-04	1.0E-03	5.1E-03	1.7E-03	4.5E-03	1.3E-02	=Crad9*ldcf
Fraction of time on site	-	fts9	1.00						
External dose rate	mGy/d	Xdrat9	9.6E-04						=Xgrat*24*fts9/1000
Internal plus external	mGy/d	tdrat9	1.4E-02						=SUM(ldrat9)+Xdrat9
Absorbed Doses - Lemming - JSL @ Sissons Discharge									
Concentration	Bq/g	Crad10	7.64E-04	4.47E-03	7.73E-03	1.80E-01	2.64E-02		
Internal dose rate	mGy/d	ldrat10	1.1E-04	2.9E-04	1.2E-03	1.1E-03	2.0E-03	4.7E-03	=Crad10*ldcf
Fraction of time on site	-	fts10	1.00						
External dose rate	mGy/d	Xdrat10	9.6E-04						=Xgrat*24*fts10/1000
Internal plus external	mGy/d	tdrat10	5.6E-03						=SUM(ldrat10)+Xdrat10
Absorbed Doses - Lapland Longspur - Rock Lake Watershed									
Concentration	Bq/g	Crad11	4.55E-05	3.38E-03	5.35E-03	1.36E-01	3.64E-02		
Internal dose rate	mGy/d	ldrat11	6.5E-06	2.2E-04	8.5E-04	8.2E-04	2.7E-03	4.6E-03	=Crad11*ldcf
Fraction of time on site	-	fts11	1.00						
External dose rate	mGy/d	Xdrat11	9.6E-04						=Xgrat*24*fts11/1000
Internal plus external	mGy/d	tdrat11	5.6E-03						=SUM(ldrat11)+Xdrat11

Table H.2-4

Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

Absorbed Doses - Lapland Longspur - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad12	6.59E-05	3.38E-03	5.51E-03	1.37E-01	3.75E-02			
Internal dose rate	mGy/d	ldrat12	9.4E-06	2.2E-04	8.8E-04	8.3E-04	2.8E-03	4.7E-03	=Crad12*ldcf	
Fraction of time on site	-	fts12	1.00							
External dose rate	mGy/d	Xdrat12	9.6E-04						=Xgrat*24*fts12/1000	
Internal plus external	mGy/d	tdrat12	5.7E-03						=SUM(ldrat12)+Xdrat12	
Absorbed Doses - Lapland Longspur - Kiggavik Camp										
Concentration	Bq/g	Crad13	1.41E-04	3.79E-03	7.11E-03	1.61E-01	3.86E-02			
Internal dose rate	mGy/d	ldrat13	2.0E-05	2.5E-04	1.1E-03	9.7E-04	2.9E-03	5.2E-03	=Crad13*ldcf	
Fraction of time on site	-	fts13	1.00							
External dose rate	mGy/d	Xdrat13	9.6E-04						=Xgrat*24*fts13/1000	
Internal plus external	mGy/d	tdrat13	6.2E-03						=SUM(ldrat13)+Xdrat13	
Absorbed Doses - Lapland Longspur - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad14	1.08E-04	3.39E-03	5.61E-03	1.37E-01	3.66E-02			
Internal dose rate	mGy/d	ldrat14	1.5E-05	2.2E-04	8.9E-04	8.3E-04	2.7E-03	4.7E-03	=Crad14*ldcf	
Fraction of time on site	-	fts14	1.00							
External dose rate	mGy/d	Xdrat14	9.6E-04						=Xgrat*24*fts14/1000	
Internal plus external	mGy/d	tdrat14	5.6E-03						=SUM(ldrat14)+Xdrat14	
Absorbed Doses - Long-Tailed Duck - Rock Lake										
Concentration	Bq/g	Crad15	5.55E-05	6.03E-04	9.25E-03	6.39E-02	5.78E-02			
Internal dose rate	mGy/d	ldrat15	7.9E-06	4.0E-05	1.5E-03	3.9E-04	4.3E-03	6.2E-03	=Crad15*ldcf	
Fraction of time on site	-	fts15	1.00							
External dose rate	mGy/d	Xdrat15	9.6E-04						=Xgrat*24*fts15/1000	
Internal plus external	mGy/d	tdrat15	7.1E-03						=SUM(ldrat15)+Xdrat15	
Absorbed Doses - Long-Tailed Duck - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad16	1.05E-04	5.88E-04	8.96E-03	6.24E-02	5.61E-02			
Internal dose rate	mGy/d	ldrat16	1.5E-05	3.9E-05	1.4E-03	3.8E-04	4.2E-03	6.0E-03	=Crad16*ldcf	
Fraction of time on site	-	fts16	1.00							
External dose rate	mGy/d	Xdrat16	9.6E-04						=Xgrat*24*fts16/1000	
Internal plus external	mGy/d	tdrat16	7.0E-03						=SUM(ldrat16)+Xdrat16	
Absorbed Doses - Long-Tailed Duck - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad17	1.80E-04	5.95E-04	9.11E-03	6.35E-02	5.62E-02			
Internal dose rate	mGy/d	ldrat17	2.6E-05	3.9E-05	1.4E-03	3.8E-04	4.2E-03	6.1E-03	=Crad17*ldcf	
Fraction of time on site	-	fts17	1.00							
External dose rate	mGy/d	Xdrat17	9.6E-04						=Xgrat*24*fts17/1000	
Internal plus external	mGy/d	tdrat17	7.0E-03						=SUM(ldrat17)+Xdrat17	
Absorbed Doses - Merganser - Rock Lake										
Concentration	Bq/g	Crad18	7.69E-06	3.15E-04	3.98E-04	1.98E-02	7.05E-03			
Internal dose rate	mGy/d	ldrat18	1.1E-06	2.1E-05	6.3E-05	1.2E-04	5.2E-04	7.3E-04	=Crad18*ldcf	
Fraction of time on site	-	fts18	1.00							
External dose rate	mGy/d	Xdrat18	9.6E-04						=Xgrat*24*fts18/1000	
Internal plus external	mGy/d	tdrat18	1.7E-03						=SUM(ldrat18)+Xdrat18	
Absorbed Doses - Merganser - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad19	7.79E-06	3.09E-04	3.71E-04	1.98E-02	6.68E-03			
Internal dose rate	mGy/d	ldrat19	1.1E-06	2.0E-05	5.9E-05	1.2E-04	4.9E-04	6.9E-04	=Crad19*ldcf	
Fraction of time on site	-	fts19	1.00							
External dose rate	mGy/d	Xdrat19	9.6E-04						=Xgrat*24*fts19/1000	
Internal plus external	mGy/d	tdrat19	1.7E-03						=SUM(ldrat19)+Xdrat19	
Absorbed Doses - Merganser - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad20	7.95E-06	3.12E-04	3.74E-04	1.98E-02	6.73E-03			
Internal dose rate	mGy/d	ldrat20	1.1E-06	2.1E-05	5.9E-05	1.2E-04	5.0E-04	7.0E-04	=Crad20*ldcf	
Fraction of time on site	-	fts20	1.00							
External dose rate	mGy/d	Xdrat20	9.6E-04						=Xgrat*24*fts20/1000	
Internal plus external	mGy/d	tdrat20	1.7E-03						=SUM(ldrat20)+Xdrat20	
Absorbed Doses - Muskox - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad21	1.18E-04	1.86E-04	2.87E-04	6.76E-04	2.04E-02			
Internal dose rate	mGy/d	ldrat21	1.7E-05	1.2E-05	4.6E-05	4.1E-06	1.5E-03	1.6E-03	=Crad21*ldcf	
Fraction of time on site	-	fts21	1.00							
External dose rate	mGy/d	Xdrat21	9.6E-04						=Xgrat*24*fts21/1000	
Internal plus external	mGy/d	tdrat21	2.6E-03						=SUM(ldrat21)+Xdrat21	
Absorbed Doses - Muskox - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad22	1.08E-04	3.39E-03	5.61E-03	1.37E-01	3.66E-02			
Internal dose rate	mGy/d	ldrat22	1.5E-05	2.2E-04	8.9E-04	8.3E-04	2.7E-03	4.7E-03	=Crad22*ldcf	
Fraction of time on site	-	fts22	1.00							
External dose rate	mGy/d	Xdrat22	9.6E-04						=Xgrat*24*fts22/1000	
Internal plus external	mGy/d	tdrat22	5.6E-03						=SUM(ldrat22)+Xdrat22	
Absorbed Doses - Northern Pintail - Rock Lake										
Concentration	Bq/g	Crad23	2.34E-05	4.59E-03	2.26E-03	1.68E-01	6.11E-02			
Internal dose rate	mGy/d	ldrat23	3.3E-06	3.0E-04	3.6E-04	1.0E-03	4.5E-03	6.2E-03	=Crad23*ldcf	
Fraction of time on site	-	fts23	1.00							
External dose rate	mGy/d	Xdrat23	9.6E-04						=Xgrat*24*fts23/1000	
Internal plus external	mGy/d	tdrat23	7.2E-03						=SUM(ldrat23)+Xdrat23	

Table H.2-4
Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

Absorbed Doses - Northern Pintail - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad24	3.49E-05	4.46E-03	2.18E-03	1.63E-01	5.87E-02			
Internal dose rate	mGy/d	Idrat24	5.0E-06	2.9E-04	3.5E-04	9.8E-04	4.3E-03	6.0E-03	=Crad24*Idcf	
Fraction of time on site	-	fts24	1.00							
External dose rate	mGy/d	Xdrat24	9.6E-04						=Xgrat*24*fts24/1000	
Internal plus external	mGy/d	tdrat24	6.9E-03						=SUM(Idrat24)+Xdrat24	
Absorbed Doses - Northern Pintail - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad25	5.40E-05	4.51E-03	2.22E-03	1.66E-01	5.90E-02			
Internal dose rate	mGy/d	Idrat25	7.7E-06	3.0E-04	3.5E-04	1.0E-03	4.4E-03	6.0E-03	=Crad25*Idcf	
Fraction of time on site	-	fts25	1.00							
External dose rate	mGy/d	Xdrat25	9.6E-04						=Xgrat*24*fts25/1000	
Internal plus external	mGy/d	tdrat25	7.0E-03						=SUM(Idrat25)+Xdrat25	
Absorbed Doses - Ptarmigan - Rock Lake Watershed										
Concentration	Bq/g	Crad26	4.30E-05	9.05E-04	2.19E-03	3.88E-01	1.43E-01			
Internal dose rate	mGy/d	Idrat26	6.1E-06	6.0E-05	3.5E-04	2.3E-03	1.1E-02	1.3E-02	=Crad26*Idcf	
Fraction of time on site	-	fts26	1.00							
External dose rate	mGy/d	Xdrat26	9.6E-04						=Xgrat*24*fts26/1000	
Internal plus external	mGy/d	tdrat26	1.4E-02						=SUM(Idrat26)+Xdrat26	
Absorbed Doses - Ptarmigan - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad27	4.92E-05	9.06E-04	2.22E-03	3.89E-01	1.43E-01			
Internal dose rate	mGy/d	Idrat27	7.0E-06	6.0E-05	3.5E-04	2.3E-03	1.1E-02	1.3E-02	=Crad27*Idcf	
Fraction of time on site	-	fts27	1.00							
External dose rate	mGy/d	Xdrat27	9.6E-04						=Xgrat*24*fts27/1000	
Internal plus external	mGy/d	tdrat27	1.4E-02						=SUM(Idrat27)+Xdrat27	
Absorbed Doses - Ptarmigan - Kiggavik Camp										
Concentration	Bq/g	Crad28	6.42E-05	1.02E-03	2.39E-03	3.90E-01	1.44E-01			
Internal dose rate	mGy/d	Idrat28	9.1E-06	6.7E-05	3.8E-04	2.4E-03	1.1E-02	1.3E-02	=Crad28*Idcf	
Fraction of time on site	-	fts28	1.00							
External dose rate	mGy/d	Xdrat28	9.6E-04						=Xgrat*24*fts28/1000	
Internal plus external	mGy/d	tdrat28	1.4E-02						=SUM(Idrat28)+Xdrat28	
Absorbed Doses - Ptarmigan - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad29	6.35E-05	9.08E-04	2.21E-03	3.89E-01	1.43E-01			
Internal dose rate	mGy/d	Idrat29	9.0E-06	6.0E-05	3.5E-04	2.3E-03	1.1E-02	1.3E-02	=Crad29*Idcf	
Fraction of time on site	-	fts29	1.00							
External dose rate	mGy/d	Xdrat29	9.6E-04						=Xgrat*24*fts29/1000	
Internal plus external	mGy/d	tdrat29	1.4E-02						=SUM(Idrat29)+Xdrat29	
Absorbed Doses - Sandpiper - Rock Lake										
Concentration	Bq/g	Crad30	1.96E-04	2.14E-03	1.53E-02	1.83E-01	1.19E-01			
Internal dose rate	mGy/d	Idrat30	2.8E-05	1.4E-04	2.4E-03	1.1E-03	8.8E-03	1.3E-02	=Crad30*Idcf	
Fraction of time on site	-	fts30	1.00							
External dose rate	mGy/d	Xdrat30	9.6E-04						=Xgrat*24*fts30/1000	
Internal plus external	mGy/d	tdrat30	1.3E-02						=SUM(Idrat30)+Xdrat30	
Absorbed Doses - Sandpiper - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad31	2.92E-04	2.11E-03	1.48E-02	1.79E-01	1.17E-01			
Internal dose rate	mGy/d	Idrat31	4.1E-05	1.4E-04	2.3E-03	1.1E-03	8.6E-03	1.2E-02	=Crad31*Idcf	
Fraction of time on site	-	fts31	1.00							
External dose rate	mGy/d	Xdrat31	9.6E-04						=Xgrat*24*fts31/1000	
Internal plus external	mGy/d	tdrat31	1.3E-02						=SUM(Idrat31)+Xdrat31	
Absorbed Doses - Sandpiper - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad32	4.14E-04	2.11E-03	1.48E-02	1.79E-01	1.19E-01			
Internal dose rate	mGy/d	Idrat32	5.9E-05	1.4E-04	2.4E-03	1.1E-03	8.8E-03	1.2E-02	=Crad32*Idcf	
Fraction of time on site	-	fts32	1.00							
External dose rate	mGy/d	Xdrat32	9.6E-04						=Xgrat*24*fts32/1000	
Internal plus external	mGy/d	tdrat32	1.3E-02						=SUM(Idrat32)+Xdrat32	
Absorbed Doses - Shrew - Rock Lake Watershed										
Concentration	Bq/g	Crad33	3.38E-04	8.11E-04	4.38E-03	3.80E-02	6.81E-03			
Internal dose rate	mGy/d	Idrat33	4.8E-05	5.3E-05	7.0E-04	2.3E-04	5.0E-04	1.5E-03	=Crad33*Idcf	
Fraction of time on site	-	fts33	1.00							
External dose rate	mGy/d	Xdrat33	9.6E-04						=Xgrat*24*fts33/1000	
Internal plus external	mGy/d	tdrat33	2.5E-03						=SUM(Idrat33)+Xdrat33	
Absorbed Doses - Shrew - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad34	3.59E-04	8.26E-04	4.64E-03	3.82E-02	6.87E-03			
Internal dose rate	mGy/d	Idrat34	5.1E-05	5.4E-05	7.4E-04	2.3E-04	5.1E-04	1.6E-03	=Crad34*Idcf	
Fraction of time on site	-	fts34	1.00							
External dose rate	mGy/d	Xdrat34	9.6E-04						=Xgrat*24*fts34/1000	
Internal plus external	mGy/d	tdrat34	2.5E-03						=SUM(Idrat34)+Xdrat34	
Absorbed Doses - Shrew - Kiggavik Camp										
Concentration	Bq/g	Crad35	4.58E-03	5.90E-03	1.78E-02	6.87E-02	2.64E-02			
Internal dose rate	mGy/d	Idrat35	6.5E-04	3.9E-04	2.8E-03	4.1E-04	2.0E-03	6.2E-03	=Crad35*Idcf	
Fraction of time on site	-	fts35	1.00							
External dose rate	mGy/d	Xdrat35	9.6E-04						=Xgrat*24*fts35/1000	
Internal plus external	mGy/d	tdrat35	7.2E-03						=SUM(Idrat35)+Xdrat35	
Absorbed Doses - Shrew - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad36	7.03E-04	1.19E-03	5.13E-03	3.97E-02	8.00E-03			
Internal dose rate	mGy/d	Idrat36	1.0E-04	7.8E-05	8.2E-04	2.4E-04	5.9E-04	1.8E-03	=Crad36*Idcf	
Fraction of time on site	-	fts36	1.00							

Table H.2-4

Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

External dose rate	mGy/d	Xdrat36	2.7E-04							=Xgrat*24*fts36/3600
Internal plus external	mGy/d	tdrat36	2.1E-03							=SUM(ldrat36)+Xdrat36
Absorbed Doses - Squirrel - Rock Lake Watershed										
Concentration	Bq/g	Crad37	9.06E-05	3.42E-03	6.41E-03	8.31E-02	1.01E-02			
Internal dose rate	mGy/d	ldrat37	1.3E-05	2.3E-04	1.0E-03	5.0E-04	7.5E-04	2.5E-03		=Crad37*ldcf
Fraction of time on site	-	fts37	1.00							
External dose rate	mGy/d	Xdrat37	9.6E-04							=Xgrat*24*fts37/1000
Internal plus external	mGy/d	tdrat37	3.5E-03							=SUM(ldrat37)+Xdrat37
Absorbed Doses - Squirrel - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad38	9.03E-05	3.42E-03	6.41E-03	8.31E-02	1.01E-02			
Internal dose rate	mGy/d	ldrat38	1.3E-05	2.3E-04	1.0E-03	5.0E-04	7.5E-04	2.5E-03		=Crad38*ldcf
Fraction of time on site	-	fts38	1.00							
External dose rate	mGy/d	Xdrat38	9.6E-04							=Xgrat*24*fts38/1000
Internal plus external	mGy/d	tdrat38	3.5E-03							=SUM(ldrat38)+Xdrat38
Absorbed Doses - Squirrel - Kiggavik Camp										
Concentration	Bq/g	Crad39	1.71E-04	3.45E-03	6.61E-03	8.33E-02	1.01E-02			
Internal dose rate	mGy/d	ldrat39	2.4E-05	2.3E-04	1.1E-03	5.0E-04	7.5E-04	2.6E-03		=Crad39*ldcf
Fraction of time on site	-	fts39	1.00							
External dose rate	mGy/d	Xdrat39	9.6E-04							=Xgrat*24*fts39/1000
Internal plus external	mGy/d	tdrat39	3.5E-03							=SUM(ldrat39)+Xdrat39

Table H.2-4

Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

Absorbed Doses - Squirrel - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad40	9.27E-05	3.42E-03	6.42E-03	8.31E-02	1.01E-02			
Internal dose rate	mGy/d	Idrat40	1.3E-05	2.3E-04	1.0E-03	5.0E-04	7.5E-04	2.5E-03	=Crad40*Idcf	
Fraction of time on site	-	fts40	1.00							
External dose rate	mGy/d	Xdrat40	9.6E-04						=Xgrat*24*fts40/1000	
Internal plus external	mGy/d	tdrat40	3.5E-03						=SUM(Idrat40)+Xdrat40	
Absorbed Doses - Wolf - LSA										
Concentration	Bq/g	Crad41	4.47E-05	2.94E-05	2.20E-05	1.44E-05	7.66E-03			
Internal dose rate	mGy/d	Idrat41	6.3E-06	1.9E-06	3.5E-06	8.7E-08	5.7E-04	5.8E-04	=Crad41*Idcf	
Fraction of time on site	-	fts41	1.00							
External dose rate	mGy/d	Xdrat41	9.6E-04						=Xgrat*24*fts41/1000	
Internal plus external	mGy/d	tdrat41	1.5E-03						=SUM(Idrat41)+Xdrat41	
Absorbed Doses - Wolf - RSA										
Concentration	Bq/g	Crad42	4.48E-05	2.94E-05	2.20E-05	1.44E-05	7.68E-03			
Internal dose rate	mGy/d	Idrat42	6.4E-06	1.9E-06	3.5E-06	8.7E-08	5.7E-04	5.8E-04	=Crad42*Idcf	
Fraction of time on site	-	fts42	1.00							
External dose rate	mGy/d	Xdrat42	9.6E-04						=Xgrat*24*fts42/1000	
Internal plus external	mGy/d	tdrat42	1.5E-03						=SUM(Idrat42)+Xdrat42	
Absorbed Doses - Wolverine - LSA										
Concentration	Bq/g	Crad43	7.28E-05	1.17E-04	2.17E-04	4.90E-04	1.83E-03			
Internal dose rate	mGy/d	Idrat43	1.0E-05	7.7E-06	3.5E-05	3.0E-06	1.4E-04	1.9E-04	=Crad43*Idcf	
Fraction of time on site	-	fts43	1.00							
External dose rate	mGy/d	Xdrat43	9.6E-04						=Xgrat*24*fts43/1000	
Internal plus external	mGy/d	tdrat43	1.2E-03						=SUM(Idrat43)+Xdrat43	
Absorbed Doses - Wolverine - RSA										
Concentration	Bq/g	Crad44	6.64E-05	1.16E-04	2.15E-04	4.78E-04	1.81E-03			
Internal dose rate	mGy/d	Idrat44	9.4E-06	7.6E-06	3.4E-05	2.9E-06	1.3E-04	1.9E-04	=Crad44*Idcf	
Fraction of time on site	-	fts44	1.00							
External dose rate	mGy/d	Xdrat44	9.6E-04						=Xgrat*24*fts44/1000	
Internal plus external	mGy/d	tdrat44	1.1E-03						=SUM(Idrat44)+Xdrat44	
Equivalent Doses - Bear - LSA										
RBE for alpha	Sv/Gy	RBE	40							
High LET dose rate	mSv/d	Hletdr	3.3E-04	4.0E-04	4.6E-04	1.0E-06	1.9E-02	2.0E-02	=Idrat*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr	9.6E-04						=Xdrat	
Total dose rate	mSv/d	tdr	2.1E-02						=SUM(Hletdr)+Lletdr	
Equivalent Doses - Caribou - LSA										
High LET dose rate	mSv/d	Hletdr2	1.2E-03	3.8E-04	2.0E-03	1.5E-05	2.3E-01	2.3E-01	=Idrat2*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr2	9.6E-04						=Xdrat2	
Total dose rate	mSv/d	tdr2	2.3E-01						=SUM(Hletdr2)+Lletdr2	
Equivalent Doses - Caribou - RSA										
High LET dose rate	mSv/d	Hletdr3	8.1E-04	3.5E-04	2.0E-03	1.5E-05	2.3E-01	2.3E-01	=Idrat3*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr3	9.6E-04						=Xdrat3	
Total dose rate	mSv/d	tdr3	2.3E-01						=SUM(Hletdr3)+Lletdr3	
Equivalent Doses - Falcon - LSA										
High LET dose rate	mSv/d	Hletdr4	7.4E-05	9.5E-04	8.9E-03	2.7E-03	1.5E-01	1.6E-01	=Idrat4*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr4	9.6E-04						=Xdrat4	
Total dose rate	mSv/d	tdr4	1.6E-01						=SUM(Hletdr4)+Lletdr4	
Equivalent Doses - Falcon - RSA										
High LET dose rate	mSv/d	Hletdr5	6.5E-05	9.4E-04	8.8E-03	2.7E-03	1.5E-01	1.6E-01	=Idrat5*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr5	9.6E-04						=Xdrat5	
Total dose rate	mSv/d	tdr5	1.6E-01						=SUM(Hletdr5)+Lletdr5	
Equivalent Doses - Fox - LSA										
High LET dose rate	mSv/d	Hletdr6	3.5E-04	2.7E-04	8.9E-04	3.2E-06	1.1E-02	1.3E-02	=Idrat6*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr6	9.6E-04						=Xdrat6	
Total dose rate	mSv/d	tdr6	1.4E-02						=SUM(Hletdr6)+Lletdr6	
Equivalent Doses - Lemming - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr7	2.6E-03	1.1E-02	4.3E-02	1.1E-03	7.0E-02	1.3E-01	=Idrat7*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr7	9.6E-04						=Xdrat7	
Total dose rate	mSv/d	tdr7	1.3E-01						=SUM(Hletdr7)+Lletdr7	
Equivalent Doses - Lemming - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr8	2.2E-03	1.0E-02	4.3E-02	1.0E-03	6.9E-02	1.2E-01	=Idrat8*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr8	9.6E-04						=Xdrat8	
Total dose rate	mSv/d	tdr8	1.3E-01						=SUM(Hletdr8)+Lletdr8	
Equivalent Doses - Lemming - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr9	3.9E-02	4.1E-02	2.0E-01	1.7E-03	1.8E-01	4.6E-01	=Idrat9*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr9	9.6E-04						=Xdrat9	
Total dose rate	mSv/d	tdr9	4.6E-01						=SUM(Hletdr9)+Lletdr9	
Equivalent Doses - Lemming - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr10	4.3E-03	1.2E-02	4.9E-02	1.1E-03	7.8E-02	1.4E-01	=Idrat10*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr10	9.6E-04						=Xdrat10	
Total dose rate	mSv/d	tdr10	1.5E-01						=SUM(Hletdr10)+Lletdr10	

Table H.2-4

Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

Equivalent Doses - Lapland Longspur - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr11	2.6E-04	8.9E-03	3.4E-02	8.2E-04	1.1E-01	1.5E-01	=Idrat11*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr11	9.6E-04						=Xdrat11	
Total dose rate	mSv/d	tdr11	1.5E-01						=SUM(Hletdr11)+Lletdr11	
Equivalent Doses - Lapland Longspur - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr12	3.7E-04	8.9E-03	3.5E-02	8.3E-04	1.1E-01	1.6E-01	=Idrat12*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr12	9.6E-04						=Xdrat12	
Total dose rate	mSv/d	tdr12	1.6E-01						=SUM(Hletdr12)+Lletdr12	
Equivalent Doses - Lapland Longspur - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr13	8.0E-04	1.0E-02	4.5E-02	9.7E-04	1.1E-01	1.7E-01	=Idrat13*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr13	9.6E-04						=Xdrat13	
Total dose rate	mSv/d	tdr13	1.7E-01						=SUM(Hletdr13)+Lletdr13	
Equivalent Doses - Lapland Longspur - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr14	6.1E-04	8.9E-03	3.6E-02	8.3E-04	1.1E-01	1.5E-01	=Idrat14*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr14	9.6E-04						=Xdrat14	
Total dose rate	mSv/d	tdr14	1.6E-01						=SUM(Hletdr14)+Lletdr14	
Equivalent Doses - Long-Tailed Duck - Rock Lake										
High LET dose rate	mSv/d	Hletdr15	3.2E-04	1.6E-03	5.9E-02	3.9E-04	1.7E-01	2.3E-01	=Idrat15*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr15	9.6E-04						=Xdrat15	
Total dose rate	mSv/d	tdr15	2.3E-01						=SUM(Hletdr15)+Lletdr15	
Equivalent Doses - Long-Tailed Duck - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr16	5.9E-04	1.5E-03	5.7E-02	3.8E-04	1.7E-01	2.3E-01	=Idrat16*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr16	9.6E-04						=Xdrat16	
Total dose rate	mSv/d	tdr16	2.3E-01						=SUM(Hletdr16)+Lletdr16	
Equivalent Doses - Long-Tailed Duck - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr17	1.0E-03	1.6E-03	5.8E-02	3.8E-04	1.7E-01	2.3E-01	=Idrat17*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr17	9.6E-04						=Xdrat17	
Total dose rate	mSv/d	tdr17	2.3E-01						=SUM(Hletdr17)+Lletdr17	
Equivalent Doses - Merganser - Rock Lake										
High LET dose rate	mSv/d	Hletdr18	4.4E-05	8.3E-04	2.5E-03	1.2E-04	2.1E-02	2.4E-02	=Idrat18*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr18	9.6E-04						=Xdrat18	
Total dose rate	mSv/d	tdr18	2.5E-02						=SUM(Hletdr18)+Lletdr18	
Equivalent Doses - Merganser - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr19	4.4E-05	8.1E-04	2.4E-03	1.2E-04	2.0E-02	2.3E-02	=Idrat19*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr19	9.6E-04						=Xdrat19	
Total dose rate	mSv/d	tdr19	2.4E-02						=SUM(Hletdr19)+Lletdr19	
Equivalent Doses - Merganser - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr20	4.5E-05	8.2E-04	2.4E-03	1.2E-04	2.0E-02	2.3E-02	=Idrat20*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr20	9.6E-04						=Xdrat20	
Total dose rate	mSv/d	tdr20	2.4E-02						=SUM(Hletdr20)+Lletdr20	
Equivalent Doses - Muskox - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr21	6.7E-04	4.9E-04	1.8E-03	4.1E-06	6.0E-02	6.3E-02	=Idrat21*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr21	9.6E-04						=Xdrat21	
Total dose rate	mSv/d	tdr21	6.4E-02						=SUM(Hletdr21)+Lletdr21	
Equivalent Doses - Muskox - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr22	6.1E-04	8.9E-03	3.6E-02	8.3E-04	1.1E-01	1.5E-01	=Idrat22*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr22	9.6E-04						=Xdrat22	
Total dose rate	mSv/d	tdr22	1.6E-01						=SUM(Hletdr22)+Lletdr22	
Equivalent Doses - Northern Pintail - Rock Lake										
High LET dose rate	mSv/d	Hletdr23	1.3E-04	1.2E-02	1.4E-02	1.0E-03	1.8E-01	2.1E-01	=Idrat23*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr23	9.6E-04						=Xdrat23	
Total dose rate	mSv/d	tdr23	2.1E-01						=SUM(Hletdr23)+Lletdr23	
Equivalent Doses - Northern Pintail - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr24	2.0E-04	1.2E-02	1.4E-02	9.8E-04	1.7E-01	2.0E-01	=Idrat24*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr24	9.6E-04						=Xdrat24	
Total dose rate	mSv/d	tdr24	2.0E-01						=SUM(Hletdr24)+Lletdr24	
Equivalent Doses - Northern Pintail - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr25	3.1E-04	1.2E-02	1.4E-02	1.0E-03	1.7E-01	2.0E-01	=Idrat25*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr25	9.6E-04						=Xdrat25	
Total dose rate	mSv/d	tdr25	2.0E-01						=SUM(Hletdr25)+Lletdr25	
Equivalent Doses - Ptarmigan - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr26	2.4E-04	2.4E-03	1.4E-02	2.3E-03	4.2E-01	4.4E-01	=Idrat26*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr26	9.6E-04						=Xdrat26	
Total dose rate	mSv/d	tdr26	4.4E-01						=SUM(Hletdr26)+Lletdr26	
Equivalent Doses - Ptarmigan - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr27	2.8E-04	2.4E-03	1.4E-02	2.3E-03	4.2E-01	4.4E-01	=Idrat27*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr27	9.6E-04						=Xdrat27	
Total dose rate	mSv/d	tdr27	4.4E-01						=SUM(Hletdr27)+Lletdr27	

Table H.2-4

Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

Equivalent Doses - Ptarmigan - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr28	3.6E-04	2.7E-03	1.5E-02	2.4E-03	4.3E-01	4.5E-01	=Idrat28*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr28	9.6E-04						=Xdrat28	
Total dose rate	mSv/d	tdr28	4.5E-01						=SUM(Hletdr28)+Lletdr28	
Equivalent Doses - Ptarmigan - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr29	3.6E-04	2.4E-03	1.4E-02	2.3E-03	4.2E-01	4.4E-01	=Idrat29*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr29	9.6E-04						=Xdrat29	
Total dose rate	mSv/d	tdr29	4.4E-01						=SUM(Hletdr29)+Lletdr29	
Equivalent Doses - Sandpiper - Rock Lake										
High LET dose rate	mSv/d	Hletdr30	1.1E-03	5.6E-03	9.7E-02	1.1E-03	3.5E-01	4.6E-01	=Idrat30*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr30	9.6E-04						=Xdrat30	
Total dose rate	mSv/d	tdr30	4.6E-01						=SUM(Hletdr30)+Lletdr30	
Equivalent Doses - Sandpiper - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr31	1.7E-03	5.6E-03	9.4E-02	1.1E-03	3.5E-01	4.5E-01	=Idrat31*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr31	9.6E-04						=Xdrat31	
Total dose rate	mSv/d	tdr31	4.5E-01						=SUM(Hletdr31)+Lletdr31	
Equivalent Doses - Sandpiper - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr32	2.4E-03	5.5E-03	9.4E-02	1.1E-03	3.5E-01	4.6E-01	=Idrat32*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr32	9.6E-04						=Xdrat32	
Total dose rate	mSv/d	tdr32	4.6E-01						=SUM(Hletdr32)+Lletdr32	
Equivalent Doses - Shrew - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr33	1.9E-03	2.1E-03	2.8E-02	2.3E-04	2.0E-02	5.2E-02	=Idrat33*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr33	9.6E-04						=Xdrat33	
Total dose rate	mSv/d	tdr33	5.3E-02						=SUM(Hletdr33)+Lletdr33	
Equivalent Doses - Shrew - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr34	2.0E-03	2.2E-03	3.0E-02	2.3E-04	2.0E-02	5.4E-02	=Idrat34*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr34	9.6E-04						=Xdrat34	
Total dose rate	mSv/d	tdr34	5.5E-02						=SUM(Hletdr34)+Lletdr34	
Equivalent Doses - Shrew - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr35	2.6E-02	1.6E-02	1.1E-01	4.1E-04	7.8E-02	2.3E-01	=Idrat35*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr35	9.6E-04						=Xdrat35	
Total dose rate	mSv/d	tdr35	2.3E-01						=SUM(Hletdr35)+Lletdr35	
Equivalent Doses - Shrew - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr36	4.0E-03	3.1E-03	3.3E-02	2.4E-04	2.4E-02	6.4E-02	=Idrat36*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr36	2.7E-04						=Xdrat36	
Total dose rate	mSv/d	tdr36	6.4E-02						=SUM(Hletdr36)+Lletdr36	
Equivalent Doses - Squirrel - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr37	5.1E-04	9.0E-03	4.1E-02	5.0E-04	3.0E-02	8.1E-02	=Idrat37*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr37	9.6E-04						=Xdrat37	
Total dose rate	mSv/d	tdr37	8.2E-02						=SUM(Hletdr37)+Lletdr37	
Equivalent Doses - Squirrel - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr38	5.1E-04	9.0E-03	4.1E-02	5.0E-04	3.0E-02	8.1E-02	=Idrat38*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr38	9.6E-04						=Xdrat38	
Total dose rate	mSv/d	tdr38	8.2E-02						=SUM(Hletdr38)+Lletdr38	
Equivalent Doses - Squirrel - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr39	9.7E-04	9.1E-03	4.2E-02	5.0E-04	3.0E-02	8.3E-02	=Idrat39*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr39	9.6E-04						=Xdrat39	
Total dose rate	mSv/d	tdr39	8.4E-02						=SUM(Hletdr39)+Lletdr39	
Equivalent Doses - Squirrel - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr40	5.3E-04	9.0E-03	4.1E-02	5.0E-04	3.0E-02	8.1E-02	=Idrat40*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr40	9.6E-04						=Xdrat40	
Total dose rate	mSv/d	tdr40	8.2E-02						=SUM(Hletdr40)+Lletdr40	
Equivalent Doses - Wolf - LSA										
High LET dose rate	mSv/d	Hletdr41	2.5E-04	7.7E-05	1.4E-04	8.7E-08	2.3E-02	2.3E-02	=Idrat41*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr41	9.6E-04						=Xdrat41	
Total dose rate	mSv/d	tdr41	2.4E-02						=SUM(Hletdr41)+Lletdr41	
Equivalent Doses - Wolf - RSA										
High LET dose rate	mSv/d	Hletdr42	2.5E-04	7.7E-05	1.4E-04	8.7E-08	2.3E-02	2.3E-02	=Idrat42*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr42	9.6E-04						=Xdrat42	
Total dose rate	mSv/d	tdr42	2.4E-02						=SUM(Hletdr42)+Lletdr42	
Equivalent Doses - Wolverine - LSA										
High LET dose rate	mSv/d	Hletdr43	4.1E-04	3.1E-04	1.4E-03	3.0E-06	5.4E-03	7.5E-03	=Idrat43*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr43	9.6E-04						=Xdrat43	
Total dose rate	mSv/d	tdr43	8.5E-03						=SUM(Hletdr43)+Lletdr43	
Equivalent Doses - Wolverine - RSA										
High LET dose rate	mSv/d	Hletdr44	3.8E-04	3.1E-04	1.4E-03	2.9E-06	5.4E-03	7.4E-03	=Idrat44*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr44	9.6E-04						=Xdrat44	
Total dose rate	mSv/d	tdr44	8.4E-03						=SUM(Hletdr44)+Lletdr44	

Table H.2-4
Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

SUMMARY

3 Screening Criterion in mGy/d	Total Absorbed Dose mGy/d	Total Equivalent Dose mSv/d	Index (Absorbed Dose)	Index (Equivalent Dose)
Bear - LSA	1.5E-03	2.1E-02	4.9E-04	7.1E-03
Caribou - LSA	6.8E-03	2.3E-01	2.3E-03	7.8E-02
Caribou - RSA	6.7E-03	2.3E-01	2.2E-03	7.7E-02
Falcon - LSA	7.6E-03	1.6E-01	2.5E-03	5.4E-02
Falcon - RSA	7.6E-03	1.6E-01	2.5E-03	5.4E-02
Fox - LSA	1.3E-03	1.4E-02	4.3E-04	4.5E-03
Lemming - Rock Lake Watershed	5.2E-03	1.3E-01	1.7E-03	4.3E-02
Lemming - JSL @ Kiggavik Discharge	5.1E-03	1.3E-01	1.7E-03	4.2E-02
Lemming - Kiggavik Camp	1.4E-02	4.6E-01	4.7E-03	1.5E-01
Lemming - JSL @ Sissons Discharge	5.6E-03	1.5E-01	1.9E-03	4.9E-02
Lapland Longspur - Rock Lake Watershed	5.6E-03	1.5E-01	1.9E-03	5.1E-02
Lapland Longspur - JSL @ Kiggavik Discharge	5.7E-03	1.6E-01	1.9E-03	5.2E-02
Lapland Longspur - Kiggavik Camp	6.2E-03	1.7E-01	2.1E-03	5.7E-02
Lapland Longspur - JSL @ Sissons Discharge	5.6E-03	1.6E-01	1.9E-03	5.2E-02
Long-Tailed Duck - Rock Lake	7.1E-03	2.3E-01	2.4E-03	7.8E-02
Long-Tailed Duck - JSL @ Kiggavik Discharge	7.0E-03	2.3E-01	2.3E-03	7.6E-02
Long-Tailed Duck - JSL @ Sissons Discharge	7.0E-03	2.3E-01	2.3E-03	7.6E-02
Merganser - Rock Lake	1.7E-03	2.5E-02	5.6E-04	8.5E-03
Merganser - JSL @ Kiggavik Discharge	1.7E-03	2.4E-02	5.5E-04	8.0E-03
Merganser - JSL @ Sissons Discharge	1.7E-03	2.4E-02	5.5E-04	8.1E-03
Muskox - JSL @ Kiggavik Discharge	2.6E-03	6.4E-02	8.5E-04	2.1E-02
Muskox - JSL @ Sissons Discharge	5.6E-03	1.6E-01	1.9E-03	5.2E-02
Northern Pintail - Rock Lake	7.2E-03	2.1E-01	2.4E-03	7.0E-02
Northern Pintail - JSL @ Kiggavik Discharge	6.9E-03	2.0E-01	2.3E-03	6.7E-02
Northern Pintail - JSL @ Sissons Discharge	7.0E-03	2.0E-01	2.3E-03	6.8E-02
Ptarmigan - Rock Lake Watershed	1.4E-02	4.4E-01	4.8E-03	1.5E-01
Ptarmigan - JSL @ Kiggavik Discharge	1.4E-02	4.4E-01	4.8E-03	1.5E-01
Ptarmigan - Kiggavik Camp	1.4E-02	4.5E-01	4.8E-03	1.5E-01
Ptarmigan - JSL @ Sissons Discharge	1.4E-02	4.4E-01	4.8E-03	1.5E-01
Sandpiper - Rock Lake	1.3E-02	4.6E-01	4.5E-03	1.5E-01
Sandpiper - JSL @ Kiggavik Discharge	1.3E-02	4.5E-01	4.4E-03	1.5E-01
Sandpiper - JSL @ Sissons Discharge	1.3E-02	4.6E-01	4.5E-03	1.5E-01
Shrew - Rock Lake Watershed	2.5E-03	5.3E-02	8.3E-04	1.8E-02
Shrew - JSL @ Kiggavik Discharge	2.5E-03	5.5E-02	8.5E-04	1.8E-02
Shrew - Kiggavik Camp	7.2E-03	2.3E-01	2.4E-03	7.8E-02
Shrew - JSL @ Sissons Discharge	2.1E-03	6.4E-02	7.0E-04	2.1E-02
Squirrel - Rock Lake Watershed	3.5E-03	8.2E-02	1.2E-03	2.7E-02
Squirrel - JSL @ Kiggavik Discharge	3.5E-03	8.2E-02	1.2E-03	2.7E-02
Squirrel - Kiggavik Camp	3.5E-03	8.4E-02	1.2E-03	2.8E-02
Squirrel - JSL @ Sissons Discharge	3.5E-03	8.2E-02	1.2E-03	2.7E-02
Wolf - LSA	1.5E-03	2.4E-02	5.1E-04	8.0E-03
Wolf - RSA	1.5E-03	2.4E-02	5.1E-04	8.1E-03
Wolverine - LSA	1.2E-03	8.5E-03	3.8E-04	2.8E-03
Wolverine - RSA	1.1E-03	8.4E-03	3.8E-04	2.8E-03

U-238+ Internal U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235
Ra-226+ Internal Ra-226 + 0.3* (Rn-222 + ...Po-214)
Pb-210+ Internal Pb-210 + Bi-210

Table H.2-4

Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

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DOSES TO SELECTED VECs - Average Total Dose

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Absorbed Doses - Bear - LSA									
Concentration	Bq/g	Crad	1.27E-05	3.36E-05	2.28E-05	5.31E-05	1.79E-03		
Internal Dose Factor	mGy/d per Bq/g	ldcf	1.4E-01	6.6E-02	1.6E-01	6.0E-03	7.4E-02		
Internal dose rate	mGy/d	ldrat	1.8E-06	2.2E-06	3.6E-06	3.2E-07	1.3E-04	1.4E-04	=Crad*ldcf
External Gamma rate	uGy/h	Xgrat	0.04						
Fraction of time on site	-	fts	1.00						
External dose rate	mGy/d	Xdrat	9.6E-04						=Xgrat*24*fts/1000
Internal plus external	mGy/d	tdrat	1.1E-03						=SUM(ldrat)+Xdrat
Absorbed Doses - Caribou - LSA									
Concentration	Bq/g	Crad2	2.99E-05	4.43E-05	8.68E-05	9.05E-04	2.39E-02		
Internal dose rate	mGy/d	ldrat2	4.3E-06	2.9E-06	1.4E-05	5.5E-06	1.8E-03	1.8E-03	=Crad2*ldcf
Fraction of time on site	-	fts2	1.00						
External dose rate	mGy/d	Xdrat2	9.6E-04						=Xgrat*24*fts2/1000
Internal plus external	mGy/d	tdrat2	2.8E-03						=SUM(ldrat2)+Xdrat2
Absorbed Doses - Caribou - RSA									
Concentration	Bq/g	Crad3	2.99E-05	4.43E-05	8.68E-05	9.05E-04	2.39E-02		
Internal dose rate	mGy/d	ldrat3	4.3E-06	2.9E-06	1.4E-05	5.5E-06	1.8E-03	1.8E-03	=Crad3*ldcf
Fraction of time on site	-	fts3	1.00						
External dose rate	mGy/d	Xdrat3	9.6E-04						=Xgrat*24*fts3/1000
Internal plus external	mGy/d	tdrat3	2.8E-03						=SUM(ldrat3)+Xdrat3
Absorbed Doses - Falcon - LSA									
Concentration	Bq/g	Crad4	3.85E-06	1.20E-04	3.99E-04	1.34E-01	1.47E-02		
Internal dose rate	mGy/d	ldrat4	5.5E-07	7.9E-06	6.3E-05	8.1E-04	1.1E-03	2.0E-03	=Crad4*ldcf
Fraction of time on site	-	fts4	1.00						
External dose rate	mGy/d	Xdrat4	9.6E-04						=Xgrat*24*fts4/1000
Internal plus external	mGy/d	tdrat4	2.9E-03						=SUM(ldrat4)+Xdrat4
Absorbed Doses - Falcon - RSA									
Concentration	Bq/g	Crad5	3.84E-06	1.20E-04	3.98E-04	1.34E-01	1.47E-02		
Internal dose rate	mGy/d	ldrat5	5.5E-07	7.9E-06	6.3E-05	8.1E-04	1.1E-03	2.0E-03	=Crad5*ldcf
Fraction of time on site	-	fts5	1.00						
External dose rate	mGy/d	Xdrat5	9.6E-04						=Xgrat*24*fts5/1000
Internal plus external	mGy/d	tdrat5	2.9E-03						=SUM(ldrat5)+Xdrat5
Absorbed Doses - Fox - LSA									
Concentration	Bq/g	Crad6	8.52E-06	2.48E-05	5.34E-05	1.28E-04	1.09E-03		
Internal dose rate	mGy/d	ldrat6	1.2E-06	1.6E-06	8.5E-06	7.7E-07	8.0E-05	9.2E-05	=Crad6*ldcf
Fraction of time on site	-	fts6	1.00						
External dose rate	mGy/d	Xdrat6	9.6E-04						=Xgrat*24*fts6/1000
Internal plus external	mGy/d	tdrat6	1.1E-03						=SUM(ldrat6)+Xdrat6
Absorbed Doses - Lemming - Rock Lake Watershed									
Concentration	Bq/g	Crad7	3.23E-05	1.14E-03	2.26E-03	4.72E-02	6.01E-03		
Internal dose rate	mGy/d	ldrat7	4.6E-06	7.5E-05	3.6E-04	2.8E-04	4.4E-04	1.2E-03	=Crad7*ldcf
Fraction of time on site	-	fts7	1.00						
External dose rate	mGy/d	Xdrat7	9.6E-04						=Xgrat*24*fts7/1000
Internal plus external	mGy/d	tdrat7	2.1E-03						=SUM(ldrat7)+Xdrat7
Absorbed Doses - Lemming - JSL @ Kiggavik Discharge									
Concentration	Bq/g	Crad8	3.23E-05	1.14E-03	2.26E-03	4.72E-02	6.01E-03		
Internal dose rate	mGy/d	ldrat8	4.6E-06	7.5E-05	3.6E-04	2.8E-04	4.4E-04	1.2E-03	=Crad8*ldcf
Fraction of time on site	-	fts8	1.00						
External dose rate	mGy/d	Xdrat8	9.6E-04						=Xgrat*24*fts8/1000
Internal plus external	mGy/d	tdrat8	2.1E-03						=SUM(ldrat8)+Xdrat8
Absorbed Doses - Lemming - Kiggavik Camp									
Concentration	Bq/g	Crad9	3.45E-05	1.14E-03	2.26E-03	4.73E-02	6.02E-03		
Internal dose rate	mGy/d	ldrat9	4.9E-06	7.5E-05	3.6E-04	2.9E-04	4.5E-04	1.2E-03	=Crad9*ldcf
Fraction of time on site	-	fts9	1.00						
External dose rate	mGy/d	Xdrat9	9.6E-04						=Xgrat*24*fts9/1000
Internal plus external	mGy/d	tdrat9	2.1E-03						=SUM(ldrat9)+Xdrat9
Absorbed Doses - Lemming - JSL @ Sissons Discharge									
Concentration	Bq/g	Crad10	3.24E-05	1.14E-03	2.26E-03	4.72E-02	6.01E-03		
Internal dose rate	mGy/d	ldrat10	4.6E-06	7.5E-05	3.6E-04	2.8E-04	4.4E-04	1.2E-03	=Crad10*ldcf
Fraction of time on site	-	fts10	1.00						
External dose rate	mGy/d	Xdrat10	9.6E-04						=Xgrat*24*fts10/1000
Internal plus external	mGy/d	tdrat10	2.1E-03						=SUM(ldrat10)+Xdrat10
Absorbed Doses - Lapland Longspur - Rock Lake Watershed									
Concentration	Bq/g	Crad11	1.15E-05	7.43E-04	1.58E-03	3.56E-02	1.28E-02		
Internal dose rate	mGy/d	ldrat11	1.6E-06	4.9E-05	2.5E-04	2.1E-04	9.5E-04	1.5E-03	=Crad11*ldcf
Fraction of time on site	-	fts11	1.00						
External dose rate	mGy/d	Xdrat11	9.6E-04						=Xgrat*24*fts11/1000
Internal plus external	mGy/d	tdrat11	2.4E-03						=SUM(ldrat11)+Xdrat11

Table H.2-4

Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

Absorbed Doses - Lapland Longspur - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad12	1.54E-05	7.45E-04	1.62E-03	3.59E-02	1.32E-02			
Internal dose rate	mGy/d	ldrat12	2.2E-06	4.9E-05	2.6E-04	2.2E-04	9.8E-04	1.5E-03	=Crad12*ldcf	
Fraction of time on site	-	fts12	1.00							
External dose rate	mGy/d	Xdrat12	9.6E-04						=Xgrat*24*fts12/1000	
Internal plus external	mGy/d	tdrat12	2.5E-03						=SUM(ldrat12)+Xdrat12	
Absorbed Doses - Lapland Longspur - Kiggavik Camp										
Concentration	Bq/g	Crad13	3.57E-06	7.43E-04	1.55E-03	3.54E-02	1.27E-02			
Internal dose rate	mGy/d	ldrat13	5.1E-07	4.9E-05	2.5E-04	2.1E-04	9.4E-04	1.4E-03	=Crad13*ldcf	
Fraction of time on site	-	fts13	1.00							
External dose rate	mGy/d	Xdrat13	9.6E-04						=Xgrat*24*fts13/1000	
Internal plus external	mGy/d	tdrat13	2.4E-03						=SUM(ldrat13)+Xdrat13	
Absorbed Doses - Lapland Longspur - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad14	1.98E-05	7.44E-04	1.58E-03	3.57E-02	1.29E-02			
Internal dose rate	mGy/d	ldrat14	2.8E-06	4.9E-05	2.5E-04	2.1E-04	9.6E-04	1.5E-03	=Crad14*ldcf	
Fraction of time on site	-	fts14	1.00							
External dose rate	mGy/d	Xdrat14	9.6E-04						=Xgrat*24*fts14/1000	
Internal plus external	mGy/d	tdrat14	2.4E-03						=SUM(ldrat14)+Xdrat14	
Absorbed Doses - Long-Tailed Duck - Rock Lake										
Concentration	Bq/g	Crad15	1.95E-05	2.01E-04	2.30E-03	1.99E-02	1.55E-02			
Internal dose rate	mGy/d	ldrat15	2.8E-06	1.3E-05	3.6E-04	1.2E-04	1.1E-03	1.6E-03	=Crad15*ldcf	
Fraction of time on site	-	fts15	1.00							
External dose rate	mGy/d	Xdrat15	9.6E-04						=Xgrat*24*fts15/1000	
Internal plus external	mGy/d	tdrat15	2.6E-03						=SUM(ldrat15)+Xdrat15	
Absorbed Doses - Long-Tailed Duck - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad16	2.55E-05	1.95E-04	2.21E-03	1.93E-02	1.50E-02			
Internal dose rate	mGy/d	ldrat16	3.6E-06	1.3E-05	3.5E-04	1.2E-04	1.1E-03	1.6E-03	=Crad16*ldcf	
Fraction of time on site	-	fts16	1.00							
External dose rate	mGy/d	Xdrat16	9.6E-04						=Xgrat*24*fts16/1000	
Internal plus external	mGy/d	tdrat16	2.6E-03						=SUM(ldrat16)+Xdrat16	
Absorbed Doses - Long-Tailed Duck - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad17	3.34E-05	1.96E-04	2.22E-03	1.93E-02	1.51E-02			
Internal dose rate	mGy/d	ldrat17	4.7E-06	1.3E-05	3.5E-04	1.2E-04	1.1E-03	1.6E-03	=Crad17*ldcf	
Fraction of time on site	-	fts17	1.00							
External dose rate	mGy/d	Xdrat17	9.6E-04						=Xgrat*24*fts17/1000	
Internal plus external	mGy/d	tdrat17	2.6E-03						=SUM(ldrat17)+Xdrat17	
Absorbed Doses - Merganser - Rock Lake										
Concentration	Bq/g	Crad18	2.29E-06	8.27E-05	1.25E-04	6.29E-03	2.11E-03			
Internal dose rate	mGy/d	ldrat18	3.3E-07	5.4E-06	2.0E-05	3.8E-05	1.6E-04	2.2E-04	=Crad18*ldcf	
Fraction of time on site	-	fts18	1.00							
External dose rate	mGy/d	Xdrat18	9.6E-04						=Xgrat*24*fts18/1000	
Internal plus external	mGy/d	tdrat18	1.2E-03						=SUM(ldrat18)+Xdrat18	
Absorbed Doses - Merganser - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad19	2.31E-06	7.99E-05	1.18E-04	6.10E-03	2.03E-03			
Internal dose rate	mGy/d	ldrat19	3.3E-07	5.3E-06	1.9E-05	3.7E-05	1.5E-04	2.1E-04	=Crad19*ldcf	
Fraction of time on site	-	fts19	1.00							
External dose rate	mGy/d	Xdrat19	9.6E-04						=Xgrat*24*fts19/1000	
Internal plus external	mGy/d	tdrat19	1.2E-03						=SUM(ldrat19)+Xdrat19	
Absorbed Doses - Merganser - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad20	2.32E-06	8.02E-05	1.18E-04	6.12E-03	2.04E-03			
Internal dose rate	mGy/d	ldrat20	3.3E-07	5.3E-06	1.9E-05	3.7E-05	1.5E-04	2.1E-04	=Crad20*ldcf	
Fraction of time on site	-	fts20	1.00							
External dose rate	mGy/d	Xdrat20	9.6E-04						=Xgrat*24*fts20/1000	
Internal plus external	mGy/d	tdrat20	1.2E-03						=SUM(ldrat20)+Xdrat20	
Absorbed Doses - Muskox - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad21	3.12E-05	5.03E-05	7.12E-05	2.23E-04	6.91E-03			
Internal dose rate	mGy/d	ldrat21	4.4E-06	3.3E-06	1.1E-05	1.3E-06	5.1E-04	5.3E-04	=Crad21*ldcf	
Fraction of time on site	-	fts21	1.00							
External dose rate	mGy/d	Xdrat21	9.6E-04						=Xgrat*24*fts21/1000	
Internal plus external	mGy/d	tdrat21	1.5E-03						=SUM(ldrat21)+Xdrat21	
Absorbed Doses - Muskox - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad22	1.98E-05	7.44E-04	1.58E-03	3.57E-02	1.29E-02			
Internal dose rate	mGy/d	ldrat22	2.8E-06	4.9E-05	2.5E-04	2.1E-04	9.6E-04	1.5E-03	=Crad22*ldcf	
Fraction of time on site	-	fts22	1.00							
External dose rate	mGy/d	Xdrat22	9.6E-04						=Xgrat*24*fts22/1000	
Internal plus external	mGy/d	tdrat22	2.4E-03						=SUM(ldrat22)+Xdrat22	
Absorbed Doses - Northern Pintail - Rock Lake										
Concentration	Bq/g	Crad23	7.17E-06	1.15E-03	6.60E-04	5.23E-02	1.76E-02			
Internal dose rate	mGy/d	ldrat23	1.0E-06	7.5E-05	1.0E-04	3.2E-04	1.3E-03	1.8E-03	=Crad23*ldcf	
Fraction of time on site	-	fts23	1.00							
External dose rate	mGy/d	Xdrat23	9.6E-04						=Xgrat*24*fts23/1000	
Internal plus external	mGy/d	tdrat23	2.8E-03						=SUM(ldrat23)+Xdrat23	

Table H.2-4

Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

Absorbed Doses - Northern Pintail - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad24	9.04E-06	1.11E-03	6.37E-04	5.05E-02	1.70E-02			
Internal dose rate	mGy/d	Idrat24	1.3E-06	7.3E-05	1.0E-04	3.0E-04	1.3E-03	1.7E-03	=Crad24*Idcf	
Fraction of time on site	-	fts24	1.00							
External dose rate	mGy/d	Xdrat24	9.6E-04						=Xgrat*24*fts24/1000	
Internal plus external	mGy/d	tdrat24	2.7E-03						=SUM(Idrat24)+Xdrat24	
Absorbed Doses - Northern Pintail - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad25	1.11E-05	1.11E-03	6.41E-04	5.08E-02	1.71E-02			
Internal dose rate	mGy/d	Idrat25	1.6E-06	7.3E-05	1.0E-04	3.1E-04	1.3E-03	1.7E-03	=Crad25*Idcf	
Fraction of time on site	-	fts25	1.00							
External dose rate	mGy/d	Xdrat25	9.6E-04						=Xgrat*24*fts25/1000	
Internal plus external	mGy/d	tdrat25	2.7E-03						=SUM(Idrat25)+Xdrat25	
Absorbed Doses - Ptarmigan - Rock Lake Watershed										
Concentration	Bq/g	Crad26	1.15E-05	2.25E-04	6.65E-04	1.38E-01	4.75E-02			
Internal dose rate	mGy/d	Idrat26	1.6E-06	1.5E-05	1.1E-04	8.3E-04	3.5E-03	4.5E-03	=Crad26*Idcf	
Fraction of time on site	-	fts26	1.00							
External dose rate	mGy/d	Xdrat26	9.6E-04						=Xgrat*24*fts26/1000	
Internal plus external	mGy/d	tdrat26	5.4E-03						=SUM(Idrat26)+Xdrat26	
Absorbed Doses - Ptarmigan - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad27	1.29E-05	2.26E-04	6.77E-04	1.38E-01	4.76E-02			
Internal dose rate	mGy/d	Idrat27	1.8E-06	1.5E-05	1.1E-04	8.3E-04	3.5E-03	4.5E-03	=Crad27*Idcf	
Fraction of time on site	-	fts27	1.00							
External dose rate	mGy/d	Xdrat27	9.6E-04						=Xgrat*24*fts27/1000	
Internal plus external	mGy/d	tdrat27	5.4E-03						=SUM(Idrat27)+Xdrat27	
Absorbed Doses - Ptarmigan - Kiggavik Camp										
Concentration	Bq/g	Crad28	9.50E-06	2.26E-04	6.55E-04	1.38E-01	4.75E-02			
Internal dose rate	mGy/d	Idrat28	1.3E-06	1.5E-05	1.0E-04	8.3E-04	3.5E-03	4.5E-03	=Crad28*Idcf	
Fraction of time on site	-	fts28	1.00							
External dose rate	mGy/d	Xdrat28	9.6E-04						=Xgrat*24*fts28/1000	
Internal plus external	mGy/d	tdrat28	5.4E-03						=SUM(Idrat28)+Xdrat28	
Absorbed Doses - Ptarmigan - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad29	1.44E-05	2.26E-04	6.65E-04	1.38E-01	4.75E-02			
Internal dose rate	mGy/d	Idrat29	2.0E-06	1.5E-05	1.1E-04	8.3E-04	3.5E-03	4.5E-03	=Crad29*Idcf	
Fraction of time on site	-	fts29	1.00							
External dose rate	mGy/d	Xdrat29	9.6E-04						=Xgrat*24*fts29/1000	
Internal plus external	mGy/d	tdrat29	5.4E-03						=SUM(Idrat29)+Xdrat29	
Absorbed Doses - Sandpiper - Rock Lake										
Concentration	Bq/g	Crad30	4.85E-05	7.57E-04	3.86E-03	5.69E-02	3.46E-02			
Internal dose rate	mGy/d	Idrat30	6.9E-06	5.0E-05	6.1E-04	3.4E-04	2.6E-03	3.6E-03	=Crad30*Idcf	
Fraction of time on site	-	fts30	1.00							
External dose rate	mGy/d	Xdrat30	9.6E-04						=Xgrat*24*fts30/1000	
Internal plus external	mGy/d	tdrat30	4.5E-03						=SUM(Idrat30)+Xdrat30	
Absorbed Doses - Sandpiper - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad31	6.12E-05	7.46E-04	3.73E-03	5.57E-02	3.36E-02			
Internal dose rate	mGy/d	Idrat31	8.7E-06	4.9E-05	5.9E-04	3.4E-04	2.5E-03	3.5E-03	=Crad31*Idcf	
Fraction of time on site	-	fts31	1.00							
External dose rate	mGy/d	Xdrat31	9.6E-04						=Xgrat*24*fts31/1000	
Internal plus external	mGy/d	tdrat31	4.4E-03						=SUM(Idrat31)+Xdrat31	
Absorbed Doses - Sandpiper - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad32	7.38E-05	7.46E-04	3.74E-03	5.57E-02	3.38E-02			
Internal dose rate	mGy/d	Idrat32	1.0E-05	4.9E-05	6.0E-04	3.4E-04	2.5E-03	3.5E-03	=Crad32*Idcf	
Fraction of time on site	-	fts32	1.00							
External dose rate	mGy/d	Xdrat32	9.6E-04						=Xgrat*24*fts32/1000	
Internal plus external	mGy/d	tdrat32	4.5E-03						=SUM(Idrat32)+Xdrat32	
Absorbed Doses - Shrew - Rock Lake Watershed										
Concentration	Bq/g	Crad33	3.27E-05	1.90E-04	1.27E-03	1.12E-02	2.07E-03			
Internal dose rate	mGy/d	Idrat33	4.6E-06	1.3E-05	2.0E-04	6.8E-05	1.5E-04	4.4E-04	=Crad33*Idcf	
Fraction of time on site	-	fts33	1.00							
External dose rate	mGy/d	Xdrat33	9.6E-04						=Xgrat*24*fts33/1000	
Internal plus external	mGy/d	tdrat33	1.4E-03						=SUM(Idrat33)+Xdrat33	
Absorbed Doses - Shrew - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad34	4.66E-05	2.01E-04	1.38E-03	1.13E-02	2.12E-03			
Internal dose rate	mGy/d	Idrat34	6.6E-06	1.3E-05	2.2E-04	6.8E-05	1.6E-04	4.6E-04	=Crad34*Idcf	
Fraction of time on site	-	fts34	1.00							
External dose rate	mGy/d	Xdrat34	9.6E-04						=Xgrat*24*fts34/1000	
Internal plus external	mGy/d	tdrat34	1.4E-03						=SUM(Idrat34)+Xdrat34	
Absorbed Doses - Shrew - Kiggavik Camp										
Concentration	Bq/g	Crad35	3.16E-06	1.85E-04	1.18E-03	1.11E-02	2.05E-03			
Internal dose rate	mGy/d	Idrat35	4.5E-07	1.2E-05	1.9E-04	6.7E-05	1.5E-04	4.2E-04	=Crad35*Idcf	
Fraction of time on site	-	fts35	1.00							
External dose rate	mGy/d	Xdrat35	9.6E-04						=Xgrat*24*fts35/1000	
Internal plus external	mGy/d	tdrat35	1.4E-03						=SUM(Idrat35)+Xdrat35	
Absorbed Doses - Shrew - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad36	6.26E-05	1.93E-04	1.27E-03	1.12E-02	2.09E-03			
Internal dose rate	mGy/d	Idrat36	8.9E-06	1.3E-05	2.0E-04	6.8E-05	1.5E-04	4.5E-04	=Crad36*Idcf	
Fraction of time on site	-	fts36	1.00							

Table H.2-4

Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

External dose rate	mGy/d	Xdrat36	2.7E-04							=Xgrat*24*fts36/3600
Internal plus external	mGy/d	tdrat36	7.1E-04							=SUM(ldrat36)+Xdrat36
Absorbed Doses - Squirrel - Rock Lake Watershed										
Concentration	Bq/g	Crad37	2.71E-05	9.87E-04	1.48E-03	1.97E-02	2.34E-03			
Internal dose rate	mGy/d	ldrat37	3.8E-06	6.5E-05	2.4E-04	1.2E-04	1.7E-04	6.0E-04		=Crad37*ldcf
Fraction of time on site	-	fts37	1.00							
External dose rate	mGy/d	Xdrat37	9.6E-04							=Xgrat*24*fts37/1000
Internal plus external	mGy/d	tdrat37	1.6E-03							=SUM(ldrat37)+Xdrat37
Absorbed Doses - Squirrel - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad38	2.70E-05	9.87E-04	1.48E-03	1.97E-02	2.34E-03			
Internal dose rate	mGy/d	ldrat38	3.8E-06	6.5E-05	2.4E-04	1.2E-04	1.7E-04	6.0E-04		=Crad38*ldcf
Fraction of time on site	-	fts38	1.00							
External dose rate	mGy/d	Xdrat38	9.6E-04							=Xgrat*24*fts38/1000
Internal plus external	mGy/d	tdrat38	1.6E-03							=SUM(ldrat38)+Xdrat38
Absorbed Doses - Squirrel - Kiggavik Camp										
Concentration	Bq/g	Crad39	2.88E-05	9.92E-04	1.48E-03	1.97E-02	2.34E-03			
Internal dose rate	mGy/d	ldrat39	4.1E-06	6.5E-05	2.4E-04	1.2E-04	1.7E-04	6.0E-04		=Crad39*ldcf
Fraction of time on site	-	fts39	1.00							
External dose rate	mGy/d	Xdrat39	9.6E-04							=Xgrat*24*fts39/1000
Internal plus external	mGy/d	tdrat39	1.6E-03							=SUM(ldrat39)+Xdrat39

Table H.2-4

Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

Absorbed Doses - Squirrel - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad40	2.71E-05	9.87E-04	1.48E-03	1.97E-02	2.34E-03			
Internal dose rate	mGy/d	Idrat40	3.9E-06	6.5E-05	2.4E-04	1.2E-04	1.7E-04	6.0E-04	=Crad40*Idcf	
Fraction of time on site	-	fts40	1.00							
External dose rate	mGy/d	Xdrat40	9.6E-04						=Xgrat*24*fts40/1000	
Internal plus external	mGy/d	tdrat40	1.6E-03						=SUM(Idrat40)+Xdrat40	
Absorbed Doses - Wolf - LSA										
Concentration	Bq/g	Crad41	1.16E-05	9.61E-06	6.02E-06	3.68E-06	1.90E-03			
Internal dose rate	mGy/d	Idrat41	1.6E-06	6.3E-07	9.6E-07	2.2E-08	1.4E-04	1.4E-04	=Crad41*Idcf	
Fraction of time on site	-	fts41	1.00							
External dose rate	mGy/d	Xdrat41	9.6E-04						=Xgrat*24*fts41/1000	
Internal plus external	mGy/d	tdrat41	1.1E-03						=SUM(Idrat41)+Xdrat41	
Absorbed Doses - Wolf - RSA										
Concentration	Bq/g	Crad42	1.17E-05	9.60E-06	6.02E-06	3.68E-06	1.90E-03			
Internal dose rate	mGy/d	Idrat42	1.7E-06	6.3E-07	9.6E-07	2.2E-08	1.4E-04	1.4E-04	=Crad42*Idcf	
Fraction of time on site	-	fts42	1.00							
External dose rate	mGy/d	Xdrat42	9.6E-04						=Xgrat*24*fts42/1000	
Internal plus external	mGy/d	tdrat42	1.1E-03						=SUM(Idrat42)+Xdrat42	
Absorbed Doses - Wolverine - LSA										
Concentration	Bq/g	Crad43	1.57E-05	3.36E-05	5.34E-05	1.05E-04	4.77E-04			
Internal dose rate	mGy/d	Idrat43	2.2E-06	2.2E-06	8.5E-06	6.3E-07	3.5E-05	4.9E-05	=Crad43*Idcf	
Fraction of time on site	-	fts43	1.00							
External dose rate	mGy/d	Xdrat43	9.6E-04						=Xgrat*24*fts43/1000	
Internal plus external	mGy/d	tdrat43	1.0E-03						=SUM(Idrat43)+Xdrat43	
Absorbed Doses - Wolverine - RSA										
Concentration	Bq/g	Crad44	1.57E-05	3.37E-05	5.34E-05	1.05E-04	4.77E-04			
Internal dose rate	mGy/d	Idrat44	2.2E-06	2.2E-06	8.5E-06	6.3E-07	3.5E-05	4.9E-05	=Crad44*Idcf	
Fraction of time on site	-	fts44	1.00							
External dose rate	mGy/d	Xdrat44	9.6E-04						=Xgrat*24*fts44/1000	
Internal plus external	mGy/d	tdrat44	1.0E-03						=SUM(Idrat44)+Xdrat44	
Equivalent Doses - Bear - LSA										
RBE for alpha	Sv/Gy	RBE	40							
High LET dose rate	mSv/d	Hletdr	7.2E-05	8.8E-05	1.4E-04	3.2E-07	5.3E-03	5.6E-03	=Idrat*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr	9.6E-04						=Xdrat	
Total dose rate	mSv/d	tdr	6.6E-03						=SUM(Hletdr)+Lletdr	
Equivalent Doses - Caribou - LSA										
High LET dose rate	mSv/d	Hletdr2	1.7E-04	1.2E-04	5.5E-04	5.5E-06	7.1E-02	7.2E-02	=Idrat2*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr2	9.6E-04						=Xdrat2	
Total dose rate	mSv/d	tdr2	7.3E-02						=SUM(Hletdr2)+Lletdr2	
Equivalent Doses - Caribou - RSA										
High LET dose rate	mSv/d	Hletdr3	1.7E-04	1.2E-04	5.5E-04	5.5E-06	7.1E-02	7.2E-02	=Idrat3*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr3	9.6E-04						=Xdrat3	
Total dose rate	mSv/d	tdr3	7.3E-02						=SUM(Hletdr3)+Lletdr3	
Equivalent Doses - Falcon - LSA										
High LET dose rate	mSv/d	Hletdr4	2.2E-05	3.2E-04	2.5E-03	8.1E-04	4.3E-02	4.7E-02	=Idrat4*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr4	9.6E-04						=Xdrat4	
Total dose rate	mSv/d	tdr4	4.8E-02						=SUM(Hletdr4)+Lletdr4	
Equivalent Doses - Falcon - RSA										
High LET dose rate	mSv/d	Hletdr5	2.2E-05	3.2E-04	2.5E-03	8.1E-04	4.3E-02	4.7E-02	=Idrat5*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr5	9.6E-04						=Xdrat5	
Total dose rate	mSv/d	tdr5	4.8E-02						=SUM(Hletdr5)+Lletdr5	
Equivalent Doses - Fox - LSA										
High LET dose rate	mSv/d	Hletdr6	4.8E-05	6.5E-05	3.4E-04	7.7E-07	3.2E-03	3.7E-03	=Idrat6*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr6	9.6E-04						=Xdrat6	
Total dose rate	mSv/d	tdr6	4.6E-03						=SUM(Hletdr6)+Lletdr6	
Equivalent Doses - Lemming - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr7	1.8E-04	3.0E-03	1.4E-02	2.8E-04	1.8E-02	3.6E-02	=Idrat7*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr7	9.6E-04						=Xdrat7	
Total dose rate	mSv/d	tdr7	3.7E-02						=SUM(Hletdr7)+Lletdr7	
Equivalent Doses - Lemming - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr8	1.8E-04	3.0E-03	1.4E-02	2.8E-04	1.8E-02	3.6E-02	=Idrat8*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr8	9.6E-04						=Xdrat8	
Total dose rate	mSv/d	tdr8	3.7E-02						=SUM(Hletdr8)+Lletdr8	
Equivalent Doses - Lemming - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr9	2.0E-04	3.0E-03	1.4E-02	2.9E-04	1.8E-02	3.6E-02	=Idrat9*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr9	9.6E-04						=Xdrat9	
Total dose rate	mSv/d	tdr9	3.7E-02						=SUM(Hletdr9)+Lletdr9	
Equivalent Doses - Lemming - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr10	1.8E-04	3.0E-03	1.4E-02	2.8E-04	1.8E-02	3.6E-02	=Idrat10*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr10	9.6E-04						=Xdrat10	
Total dose rate	mSv/d	tdr10	3.7E-02						=SUM(Hletdr10)+Lletdr10	

Table H.2-4

Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

Equivalent Doses - Lapland Longspur - Rock Lake Watershed									
High LET dose rate	mSv/d	Hletdr11	6.5E-05	2.0E-03	1.0E-02	2.1E-04	3.8E-02	5.0E-02	=Idrat11*RBE, except Pb-210
Low LET dose rate	mSv/d	Lletdr11	9.6E-04						=Xdrat11
Total dose rate	mSv/d	tdr11	5.1E-02						=SUM(Hletdr11)+Lletdr11
Equivalent Doses - Lapland Longspur - JSL @ Kiggavik Discharge									
High LET dose rate	mSv/d	Hletdr12	8.7E-05	2.0E-03	1.0E-02	2.2E-04	3.9E-02	5.2E-02	=Idrat12*RBE, except Pb-210
Low LET dose rate	mSv/d	Lletdr12	9.6E-04						=Xdrat12
Total dose rate	mSv/d	tdr12	5.3E-02						=SUM(Hletdr12)+Lletdr12
Equivalent Doses - Lapland Longspur - Kiggavik Camp									
High LET dose rate	mSv/d	Hletdr13	2.0E-05	2.0E-03	9.8E-03	2.1E-04	3.7E-02	4.9E-02	=Idrat13*RBE, except Pb-210
Low LET dose rate	mSv/d	Lletdr13	9.6E-04						=Xdrat13
Total dose rate	mSv/d	tdr13	5.0E-02						=SUM(Hletdr13)+Lletdr13
Equivalent Doses - Lapland Longspur - JSL @ Sissons Discharge									
High LET dose rate	mSv/d	Hletdr14	1.1E-04	2.0E-03	1.0E-02	2.1E-04	3.8E-02	5.1E-02	=Idrat14*RBE, except Pb-210
Low LET dose rate	mSv/d	Lletdr14	9.6E-04						=Xdrat14
Total dose rate	mSv/d	tdr14	5.2E-02						=SUM(Hletdr14)+Lletdr14
Equivalent Doses - Long-Tailed Duck - Rock Lake									
High LET dose rate	mSv/d	Hletdr15	1.1E-04	5.3E-04	1.5E-02	1.2E-04	4.6E-02	6.1E-02	=Idrat15*RBE, except Pb-210
Low LET dose rate	mSv/d	Lletdr15	9.6E-04						=Xdrat15
Total dose rate	mSv/d	tdr15	6.2E-02						=SUM(Hletdr15)+Lletdr15
Equivalent Doses - Long-Tailed Duck - JSL @ Kiggavik Discharge									
High LET dose rate	mSv/d	Hletdr16	1.5E-04	5.1E-04	1.4E-02	1.2E-04	4.4E-02	5.9E-02	=Idrat16*RBE, except Pb-210
Low LET dose rate	mSv/d	Lletdr16	9.6E-04						=Xdrat16
Total dose rate	mSv/d	tdr16	6.0E-02						=SUM(Hletdr16)+Lletdr16
Equivalent Doses - Long-Tailed Duck - JSL @ Sissons Discharge									
High LET dose rate	mSv/d	Hletdr17	1.9E-04	5.2E-04	1.4E-02	1.2E-04	4.5E-02	6.0E-02	=Idrat17*RBE, except Pb-210
Low LET dose rate	mSv/d	Lletdr17	9.6E-04						=Xdrat17
Total dose rate	mSv/d	tdr17	6.1E-02						=SUM(Hletdr17)+Lletdr17
Equivalent Doses - Merganser - Rock Lake									
High LET dose rate	mSv/d	Hletdr18	1.3E-05	2.2E-04	7.9E-04	3.8E-05	6.3E-03	7.3E-03	=Idrat18*RBE, except Pb-210
Low LET dose rate	mSv/d	Lletdr18	9.6E-04						=Xdrat18
Total dose rate	mSv/d	tdr18	8.3E-03						=SUM(Hletdr18)+Lletdr18
Equivalent Doses - Merganser - JSL @ Kiggavik Discharge									
High LET dose rate	mSv/d	Hletdr19	1.3E-05	2.1E-04	7.5E-04	3.7E-05	6.0E-03	7.0E-03	=Idrat19*RBE, except Pb-210
Low LET dose rate	mSv/d	Lletdr19	9.6E-04						=Xdrat19
Total dose rate	mSv/d	tdr19	8.0E-03						=SUM(Hletdr19)+Lletdr19
Equivalent Doses - Merganser - JSL @ Sissons Discharge									
High LET dose rate	mSv/d	Hletdr20	1.3E-05	2.1E-04	7.5E-04	3.7E-05	6.0E-03	7.1E-03	=Idrat20*RBE, except Pb-210
Low LET dose rate	mSv/d	Lletdr20	9.6E-04						=Xdrat20
Total dose rate	mSv/d	tdr20	8.0E-03						=SUM(Hletdr20)+Lletdr20
Equivalent Doses - Muskox - JSL @ Kiggavik Discharge									
High LET dose rate	mSv/d	Hletdr21	1.8E-04	1.3E-04	4.5E-04	1.3E-06	2.0E-02	2.1E-02	=Idrat21*RBE, except Pb-210
Low LET dose rate	mSv/d	Lletdr21	9.6E-04						=Xdrat21
Total dose rate	mSv/d	tdr21	2.2E-02						=SUM(Hletdr21)+Lletdr21
Equivalent Doses - Muskox - JSL @ Sissons Discharge									
High LET dose rate	mSv/d	Hletdr22	1.1E-04	2.0E-03	1.0E-02	2.1E-04	3.8E-02	5.1E-02	=Idrat22*RBE, except Pb-210
Low LET dose rate	mSv/d	Lletdr22	9.6E-04						=Xdrat22
Total dose rate	mSv/d	tdr22	5.2E-02						=SUM(Hletdr22)+Lletdr22
Equivalent Doses - Northern Pintail - Rock Lake									
High LET dose rate	mSv/d	Hletdr23	4.1E-05	3.0E-03	4.2E-03	3.2E-04	5.2E-02	6.0E-02	=Idrat23*RBE, except Pb-210
Low LET dose rate	mSv/d	Lletdr23	9.6E-04						=Xdrat23
Total dose rate	mSv/d	tdr23	6.1E-02						=SUM(Hletdr23)+Lletdr23
Equivalent Doses - Northern Pintail - JSL @ Kiggavik Discharge									
High LET dose rate	mSv/d	Hletdr24	5.1E-05	2.9E-03	4.1E-03	3.0E-04	5.0E-02	5.8E-02	=Idrat24*RBE, except Pb-210
Low LET dose rate	mSv/d	Lletdr24	9.6E-04						=Xdrat24
Total dose rate	mSv/d	tdr24	5.9E-02						=SUM(Hletdr24)+Lletdr24
Equivalent Doses - Northern Pintail - JSL @ Sissons Discharge									
High LET dose rate	mSv/d	Hletdr25	6.3E-05	2.9E-03	4.1E-03	3.1E-04	5.1E-02	5.8E-02	=Idrat25*RBE, except Pb-210
Low LET dose rate	mSv/d	Lletdr25	9.6E-04						=Xdrat25
Total dose rate	mSv/d	tdr25	5.9E-02						=SUM(Hletdr25)+Lletdr25
Equivalent Doses - Ptarmigan - Rock Lake Watershed									
High LET dose rate	mSv/d	Hletdr26	6.5E-05	5.9E-04	4.2E-03	8.3E-04	1.4E-01	1.5E-01	=Idrat26*RBE, except Pb-210
Low LET dose rate	mSv/d	Lletdr26	9.6E-04						=Xdrat26
Total dose rate	mSv/d	tdr26	1.5E-01						=SUM(Hletdr26)+Lletdr26
Equivalent Doses - Ptarmigan - JSL @ Kiggavik Discharge									
High LET dose rate	mSv/d	Hletdr27	7.3E-05	6.0E-04	4.3E-03	8.3E-04	1.4E-01	1.5E-01	=Idrat27*RBE, except Pb-210
Low LET dose rate	mSv/d	Lletdr27	9.6E-04						=Xdrat27
Total dose rate	mSv/d	tdr27	1.5E-01						=SUM(Hletdr27)+Lletdr27

Table H.2-4

Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

Equivalent Doses - Ptarmigan - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr28	5.4E-05	6.0E-04	4.2E-03	8.3E-04	1.4E-01	1.5E-01	=Idrat28*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr28	9.6E-04						=Xdrat28	
Total dose rate	mSv/d	tdr28	1.5E-01						=SUM(Hletdr28)+Lletdr28	
Equivalent Doses - Ptarmigan - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr29	8.2E-05	5.9E-04	4.2E-03	8.3E-04	1.4E-01	1.5E-01	=Idrat29*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr29	9.6E-04						=Xdrat29	
Total dose rate	mSv/d	tdr29	1.5E-01						=SUM(Hletdr29)+Lletdr29	
Equivalent Doses - Sandpiper - Rock Lake										
High LET dose rate	mSv/d	Hletdr30	2.8E-04	2.0E-03	2.5E-02	3.4E-04	1.0E-01	1.3E-01	=Idrat30*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr30	9.6E-04						=Xdrat30	
Total dose rate	mSv/d	tdr30	1.3E-01						=SUM(Hletdr30)+Lletdr30	
Equivalent Doses - Sandpiper - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr31	3.5E-04	2.0E-03	2.4E-02	3.4E-04	9.9E-02	1.3E-01	=Idrat31*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr31	9.6E-04						=Xdrat31	
Total dose rate	mSv/d	tdr31	1.3E-01						=SUM(Hletdr31)+Lletdr31	
Equivalent Doses - Sandpiper - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr32	4.2E-04	2.0E-03	2.4E-02	3.4E-04	1.0E-01	1.3E-01	=Idrat32*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr32	9.6E-04						=Xdrat32	
Total dose rate	mSv/d	tdr32	1.3E-01						=SUM(Hletdr32)+Lletdr32	
Equivalent Doses - Shrew - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr33	1.9E-04	5.0E-04	8.1E-03	6.8E-05	6.1E-03	1.5E-02	=Idrat33*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr33	9.6E-04						=Xdrat33	
Total dose rate	mSv/d	tdr33	1.6E-02						=SUM(Hletdr33)+Lletdr33	
Equivalent Doses - Shrew - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr34	2.6E-04	5.3E-04	8.7E-03	6.8E-05	6.3E-03	1.6E-02	=Idrat34*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr34	9.6E-04						=Xdrat34	
Total dose rate	mSv/d	tdr34	1.7E-02						=SUM(Hletdr34)+Lletdr34	
Equivalent Doses - Shrew - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr35	1.8E-05	4.9E-04	7.5E-03	6.7E-05	6.1E-03	1.4E-02	=Idrat35*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr35	9.6E-04						=Xdrat35	
Total dose rate	mSv/d	tdr35	1.5E-02						=SUM(Hletdr35)+Lletdr35	
Equivalent Doses - Shrew - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr36	3.6E-04	5.1E-04	8.1E-03	6.8E-05	6.2E-03	1.5E-02	=Idrat36*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr36	2.7E-04						=Xdrat36	
Total dose rate	mSv/d	tdr36	1.5E-02						=SUM(Hletdr36)+Lletdr36	
Equivalent Doses - Squirrel - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr37	1.5E-04	2.6E-03	9.4E-03	1.2E-04	6.9E-03	1.9E-02	=Idrat37*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr37	9.6E-04						=Xdrat37	
Total dose rate	mSv/d	tdr37	2.0E-02						=SUM(Hletdr37)+Lletdr37	
Equivalent Doses - Squirrel - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr38	1.5E-04	2.6E-03	9.4E-03	1.2E-04	6.9E-03	1.9E-02	=Idrat38*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr38	9.6E-04						=Xdrat38	
Total dose rate	mSv/d	tdr38	2.0E-02						=SUM(Hletdr38)+Lletdr38	
Equivalent Doses - Squirrel - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr39	1.6E-04	2.6E-03	9.4E-03	1.2E-04	6.9E-03	1.9E-02	=Idrat39*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr39	9.6E-04						=Xdrat39	
Total dose rate	mSv/d	tdr39	2.0E-02						=SUM(Hletdr39)+Lletdr39	
Equivalent Doses - Squirrel - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr40	1.5E-04	2.6E-03	9.4E-03	1.2E-04	6.9E-03	1.9E-02	=Idrat40*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr40	9.6E-04						=Xdrat40	
Total dose rate	mSv/d	tdr40	2.0E-02						=SUM(Hletdr40)+Lletdr40	
Equivalent Doses - Wolf - LSA										
High LET dose rate	mSv/d	Hletdr41	6.6E-05	2.5E-05	3.8E-05	2.2E-08	5.6E-03	5.8E-03	=Idrat41*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr41	9.6E-04						=Xdrat41	
Total dose rate	mSv/d	tdr41	6.7E-03						=SUM(Hletdr41)+Lletdr41	
Equivalent Doses - Wolf - RSA										
High LET dose rate	mSv/d	Hletdr42	6.6E-05	2.5E-05	3.8E-05	2.2E-08	5.6E-03	5.8E-03	=Idrat42*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr42	9.6E-04						=Xdrat42	
Total dose rate	mSv/d	tdr42	6.7E-03						=SUM(Hletdr42)+Lletdr42	
Equivalent Doses - Wolverine - LSA										
High LET dose rate	mSv/d	Hletdr43	8.9E-05	8.9E-05	3.4E-04	6.3E-07	1.4E-03	1.9E-03	=Idrat43*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr43	9.6E-04						=Xdrat43	
Total dose rate	mSv/d	tdr43	2.9E-03						=SUM(Hletdr43)+Lletdr43	
Equivalent Doses - Wolverine - RSA										
High LET dose rate	mSv/d	Hletdr44	8.9E-05	8.9E-05	3.4E-04	6.3E-07	1.4E-03	1.9E-03	=Idrat44*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr44	9.6E-04						=Xdrat44	
Total dose rate	mSv/d	tdr44	2.9E-03						=SUM(Hletdr44)+Lletdr44	

Table H.2-4
Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

SUMMARY

3 Screening Criterion in mGy/d	Total Absorbed Dose mGy/d	Total Equivalent Dose mSv/d	Index (Absorbed Dose)	Index (Equivalent Dose)
Bear - LSA	1.1E-03	6.6E-03	3.7E-04	2.2E-03
Caribou - LSA	2.8E-03	7.3E-02	9.2E-04	2.4E-02
Caribou - RSA	2.8E-03	7.3E-02	9.2E-04	2.4E-02
Falcon - LSA	2.9E-03	4.8E-02	9.8E-04	1.6E-02
Falcon - RSA	2.9E-03	4.8E-02	9.8E-04	1.6E-02
Fox - LSA	1.1E-03	4.6E-03	3.5E-04	1.5E-03
Lemming - Rock Lake Watershed	2.1E-03	3.7E-02	7.1E-04	1.2E-02
Lemming - JSL @ Kiggavik Discharge	2.1E-03	3.7E-02	7.1E-04	1.2E-02
Lemming - Kiggavik Camp	2.1E-03	3.7E-02	7.1E-04	1.2E-02
Lemming - JSL @ Sissons Discharge	2.1E-03	3.7E-02	7.1E-04	1.2E-02
Lapland Longspur - Rock Lake Watershed	2.4E-03	5.1E-02	8.1E-04	1.7E-02
Lapland Longspur - JSL @ Kiggavik Discharge	2.5E-03	5.3E-02	8.2E-04	1.8E-02
Lapland Longspur - Kiggavik Camp	2.4E-03	5.0E-02	8.0E-04	1.7E-02
Lapland Longspur - JSL @ Sissons Discharge	2.4E-03	5.2E-02	8.1E-04	1.7E-02
Long-Tailed Duck - Rock Lake	2.6E-03	6.2E-02	8.7E-04	2.1E-02
Long-Tailed Duck - JSL @ Kiggavik Discharge	2.6E-03	6.0E-02	8.5E-04	2.0E-02
Long-Tailed Duck - JSL @ Sissons Discharge	2.6E-03	6.1E-02	8.6E-04	2.0E-02
Merganser - Rock Lake	1.2E-03	8.3E-03	3.9E-04	2.8E-03
Merganser - JSL @ Kiggavik Discharge	1.2E-03	8.0E-03	3.9E-04	2.7E-03
Merganser - JSL @ Sissons Discharge	1.2E-03	8.0E-03	3.9E-04	2.7E-03
Muskox - JSL @ Kiggavik Discharge	1.5E-03	2.2E-02	5.0E-04	7.4E-03
Muskox - JSL @ Sissons Discharge	2.4E-03	5.2E-02	8.1E-04	1.7E-02
Northern Pintail - Rock Lake	2.8E-03	6.1E-02	9.2E-04	2.0E-02
Northern Pintail - JSL @ Kiggavik Discharge	2.7E-03	5.9E-02	9.0E-04	2.0E-02
Northern Pintail - JSL @ Sissons Discharge	2.7E-03	5.9E-02	9.0E-04	2.0E-02
Ptarmigan - Rock Lake Watershed	5.4E-03	1.5E-01	1.8E-03	4.9E-02
Ptarmigan - JSL @ Kiggavik Discharge	5.4E-03	1.5E-01	1.8E-03	4.9E-02
Ptarmigan - Kiggavik Camp	5.4E-03	1.5E-01	1.8E-03	4.9E-02
Ptarmigan - JSL @ Sissons Discharge	5.4E-03	1.5E-01	1.8E-03	4.9E-02
Sandpiper - Rock Lake	4.5E-03	1.3E-01	1.5E-03	4.4E-02
Sandpiper - JSL @ Kiggavik Discharge	4.4E-03	1.3E-01	1.5E-03	4.2E-02
Sandpiper - JSL @ Sissons Discharge	4.5E-03	1.3E-01	1.5E-03	4.3E-02
Shrew - Rock Lake Watershed	1.4E-03	1.6E-02	4.7E-04	5.3E-03
Shrew - JSL @ Kiggavik Discharge	1.4E-03	1.7E-02	4.7E-04	5.6E-03
Shrew - Kiggavik Camp	1.4E-03	1.5E-02	4.6E-04	5.0E-03
Shrew - JSL @ Sissons Discharge	7.1E-04	1.5E-02	2.4E-04	5.1E-03
Squirrel - Rock Lake Watershed	1.6E-03	2.0E-02	5.2E-04	6.7E-03
Squirrel - JSL @ Kiggavik Discharge	1.6E-03	2.0E-02	5.2E-04	6.7E-03
Squirrel - Kiggavik Camp	1.6E-03	2.0E-02	5.2E-04	6.7E-03
Squirrel - JSL @ Sissons Discharge	1.6E-03	2.0E-02	5.2E-04	6.7E-03
Wolf - LSA	1.1E-03	6.7E-03	3.7E-04	2.2E-03
Wolf - RSA	1.1E-03	6.7E-03	3.7E-04	2.2E-03
Wolverine - LSA	1.0E-03	2.9E-03	3.4E-04	9.6E-04
Wolverine - RSA	1.0E-03	2.9E-03	3.4E-04	9.6E-04

U-238+ Internal U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235
Ra-226+ Internal Ra-226 + 0.3* (Rn-222 + ...Po-214)
Pb-210+ Internal Pb-210 + Bi-210

Table H.2-4

Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

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DOSES TO SELECTED VECs - 95th Percentile Total Dose

		U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Absorbed Doses - Bear - LSA								
Concentration	Bq/g	Crad	3.88E-05	1.51E-04	6.99E-05	1.74E-04	6.43E-03	
Internal Dose Factor	mGy/d per Bq/g	ldcf	1.4E-01	6.6E-02	1.6E-01	6.0E-03	7.4E-02	
Internal dose rate	mGy/d	ldrat	5.5E-06	9.9E-06	1.1E-05	1.0E-06	4.8E-04	5.0E-04 =Crad*ldcf
External Gamma rate	uGy/h	Xgrat	0.04					
Fraction of time on site	-	fts	1.00					
External dose rate	mGy/d	Xdrat	9.6E-04					=Xgrat*24*fts/1000
Internal plus external	mGy/d	tdrat	1.5E-03					=SUM(ldrat)+Xdrat
Absorbed Doses - Caribou - LSA								
Concentration	Bq/g	Crad2	8.62E-05	1.33E-04	2.95E-04	2.53E-03	7.65E-02	
Internal dose rate	mGy/d	ldrat2	1.2E-05	8.7E-06	4.7E-05	1.5E-05	5.7E-03	=Crad2*ldcf
Fraction of time on site	-	fts2	1.00					
External dose rate	mGy/d	Xdrat2	9.6E-04					=Xgrat*24*fts2/1000
Internal plus external	mGy/d	tdrat2	6.7E-03					=SUM(ldrat2)+Xdrat2
Absorbed Doses - Caribou - RSA								
Concentration	Bq/g	Crad3	8.62E-05	1.33E-04	2.95E-04	2.53E-03	7.65E-02	
Internal dose rate	mGy/d	ldrat3	1.2E-05	8.7E-06	4.7E-05	1.5E-05	5.7E-03	=Crad3*ldcf
Fraction of time on site	-	fts3	1.00					
External dose rate	mGy/d	Xdrat3	9.6E-04					=Xgrat*24*fts3/1000
Internal plus external	mGy/d	tdrat3	6.7E-03					=SUM(ldrat3)+Xdrat3
Absorbed Doses - Falcon - LSA								
Concentration	Bq/g	Crad4	1.15E-05	3.57E-04	1.38E-03	4.41E-01	5.01E-02	
Internal dose rate	mGy/d	ldrat4	1.6E-06	2.3E-05	2.2E-04	2.7E-03	3.7E-03	6.6E-03 =Crad4*ldcf
Fraction of time on site	-	fts4	1.00					
External dose rate	mGy/d	Xdrat4	9.6E-04					=Xgrat*24*fts4/1000
Internal plus external	mGy/d	tdrat4	7.6E-03					=SUM(ldrat4)+Xdrat4
Absorbed Doses - Falcon - RSA								
Concentration	Bq/g	Crad5	1.14E-05	3.56E-04	1.38E-03	4.41E-01	5.00E-02	
Internal dose rate	mGy/d	ldrat5	1.6E-06	2.3E-05	2.2E-04	2.7E-03	3.7E-03	6.6E-03 =Crad5*ldcf
Fraction of time on site	-	fts5	1.00					
External dose rate	mGy/d	Xdrat5	9.6E-04					=Xgrat*24*fts5/1000
Internal plus external	mGy/d	tdrat5	7.6E-03					=SUM(ldrat5)+Xdrat5
Absorbed Doses - Fox - LSA								
Concentration	Bq/g	Crad6	2.13E-05	7.95E-05	1.30E-04	5.17E-04	3.66E-03	
Internal dose rate	mGy/d	ldrat6	3.0E-06	5.2E-06	2.1E-05	3.1E-06	2.7E-04	3.0E-04 =Crad6*ldcf
Fraction of time on site	-	fts6	1.00					
External dose rate	mGy/d	Xdrat6	9.6E-04					=Xgrat*24*fts6/1000
Internal plus external	mGy/d	tdrat6	1.3E-03					=SUM(ldrat6)+Xdrat6
Absorbed Doses - Lemming - Rock Lake Watershed								
Concentration	Bq/g	Crad7	1.51E-04	3.56E-03	6.36E-03	1.69E-01	2.09E-02	
Internal dose rate	mGy/d	ldrat7	2.1E-05	2.3E-04	1.0E-03	1.0E-03	1.5E-03	3.8E-03 =Crad7*ldcf
Fraction of time on site	-	fts7	1.00					
External dose rate	mGy/d	Xdrat7	9.6E-04					=Xgrat*24*fts7/1000
Internal plus external	mGy/d	tdrat7	4.8E-03					=SUM(ldrat7)+Xdrat7
Absorbed Doses - Lemming - JSL @ Kiggavik Discharge								
Concentration	Bq/g	Crad8	1.50E-04	3.56E-03	6.36E-03	1.69E-01	2.09E-02	
Internal dose rate	mGy/d	ldrat8	2.1E-05	2.3E-04	1.0E-03	1.0E-03	1.5E-03	3.8E-03 =Crad8*ldcf
Fraction of time on site	-	fts8	1.00					
External dose rate	mGy/d	Xdrat8	9.6E-04					=Xgrat*24*fts8/1000
Internal plus external	mGy/d	tdrat8	4.8E-03					=SUM(ldrat8)+Xdrat8
Absorbed Doses - Lemming - Kiggavik Camp								
Concentration	Bq/g	Crad9	1.55E-04	3.57E-03	6.37E-03	1.69E-01	2.09E-02	
Internal dose rate	mGy/d	ldrat9	2.2E-05	2.3E-04	1.0E-03	1.0E-03	1.5E-03	3.8E-03 =Crad9*ldcf
Fraction of time on site	-	fts9	1.00					
External dose rate	mGy/d	Xdrat9	9.6E-04					=Xgrat*24*fts9/1000
Internal plus external	mGy/d	tdrat9	4.8E-03					=SUM(ldrat9)+Xdrat9
Absorbed Doses - Lemming - JSL @ Sissons Discharge								
Concentration	Bq/g	Crad10	1.51E-04	3.56E-03	6.36E-03	1.69E-01	2.09E-02	
Internal dose rate	mGy/d	ldrat10	2.1E-05	2.3E-04	1.0E-03	1.0E-03	1.5E-03	3.8E-03 =Crad10*ldcf
Fraction of time on site	-	fts10	1.00					
External dose rate	mGy/d	Xdrat10	9.6E-04					=Xgrat*24*fts10/1000
Internal plus external	mGy/d	tdrat10	4.8E-03					=SUM(ldrat10)+Xdrat10
Absorbed Doses - Lapland Longspur - Rock Lake Watershed								
Concentration	Bq/g	Crad11	4.07E-05	3.37E-03	5.24E-03	1.35E-01	3.62E-02	
Internal dose rate	mGy/d	ldrat11	5.8E-06	2.2E-04	8.3E-04	8.1E-04	2.7E-03	4.6E-03 =Crad11*ldcf
Fraction of time on site	-	fts11	1.00					
External dose rate	mGy/d	Xdrat11	9.6E-04					=Xgrat*24*fts11/1000
Internal plus external	mGy/d	tdrat11	5.5E-03					=SUM(ldrat11)+Xdrat11

Table H.2-4
Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

Absorbed Doses - Lapland Longspur - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad12	5.50E-05	3.38E-03	5.40E-03	1.37E-01	3.73E-02			
Internal dose rate	mGy/d	ldrat12	7.8E-06	2.2E-04	8.6E-04	8.2E-04	2.8E-03	4.7E-03	=Crad12*ldcf	
Fraction of time on site	-	fts12	1.00							
External dose rate	mGy/d	Xdrat12	9.6E-04						=Xgrat*24*fts12/1000	
Internal plus external	mGy/d	tdrat12	5.6E-03						=SUM(ldrat12)+Xdrat12	
Absorbed Doses - Lapland Longspur - Kiggavik Camp										
Concentration	Bq/g	Crad13	1.30E-05	3.37E-03	5.10E-03	1.34E-01	3.57E-02			
Internal dose rate	mGy/d	ldrat13	1.8E-06	2.2E-04	8.1E-04	8.1E-04	2.6E-03	4.5E-03	=Crad13*ldcf	
Fraction of time on site	-	fts13	1.00							
External dose rate	mGy/d	Xdrat13	9.6E-04						=Xgrat*24*fts13/1000	
Internal plus external	mGy/d	tdrat13	5.4E-03						=SUM(ldrat13)+Xdrat13	
Absorbed Doses - Lapland Longspur - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad14	6.24E-05	3.37E-03	5.26E-03	1.35E-01	3.64E-02			
Internal dose rate	mGy/d	ldrat14	8.9E-06	2.2E-04	8.4E-04	8.1E-04	2.7E-03	4.6E-03	=Crad14*ldcf	
Fraction of time on site	-	fts14	1.00							
External dose rate	mGy/d	Xdrat14	9.6E-04						=Xgrat*24*fts14/1000	
Internal plus external	mGy/d	tdrat14	5.5E-03						=SUM(ldrat14)+Xdrat14	
Absorbed Doses - Long-Tailed Duck - Rock Lake										
Concentration	Bq/g	Crad15	5.55E-05	6.03E-04	9.26E-03	6.39E-02	5.78E-02			
Internal dose rate	mGy/d	ldrat15	7.9E-06	4.0E-05	1.5E-03	3.9E-04	4.3E-03	6.2E-03	=Crad15*ldcf	
Fraction of time on site	-	fts15	1.00							
External dose rate	mGy/d	Xdrat15	9.6E-04						=Xgrat*24*fts15/1000	
Internal plus external	mGy/d	tdrat15	7.1E-03						=SUM(ldrat15)+Xdrat15	
Absorbed Doses - Long-Tailed Duck - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad16	8.71E-05	5.84E-04	8.95E-03	6.16E-02	5.56E-02			
Internal dose rate	mGy/d	ldrat16	1.2E-05	3.8E-05	1.4E-03	3.7E-04	4.1E-03	6.0E-03	=Crad16*ldcf	
Fraction of time on site	-	fts16	1.00							
External dose rate	mGy/d	Xdrat16	9.6E-04						=Xgrat*24*fts16/1000	
Internal plus external	mGy/d	tdrat16	6.9E-03						=SUM(ldrat16)+Xdrat16	
Absorbed Doses - Long-Tailed Duck - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad17	1.11E-04	5.86E-04	9.00E-03	6.18E-02	5.58E-02			
Internal dose rate	mGy/d	ldrat17	1.6E-05	3.9E-05	1.4E-03	3.7E-04	4.1E-03	6.0E-03	=Crad17*ldcf	
Fraction of time on site	-	fts17	1.00							
External dose rate	mGy/d	Xdrat17	9.6E-04						=Xgrat*24*fts17/1000	
Internal plus external	mGy/d	tdrat17	7.0E-03						=SUM(ldrat17)+Xdrat17	
Absorbed Doses - Merganser - Rock Lake										
Concentration	Bq/g	Crad18	7.69E-06	3.15E-04	3.99E-04	1.98E-02	7.05E-03			
Internal dose rate	mGy/d	ldrat18	1.1E-06	2.1E-05	6.3E-05	1.2E-04	5.2E-04	7.3E-04	=Crad18*ldcf	
Fraction of time on site	-	fts18	1.00							
External dose rate	mGy/d	Xdrat18	9.6E-04						=Xgrat*24*fts18/1000	
Internal plus external	mGy/d	tdrat18	1.7E-03						=SUM(ldrat18)+Xdrat18	
Absorbed Doses - Merganser - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad19	7.74E-06	3.09E-04	3.71E-04	1.98E-02	6.69E-03			
Internal dose rate	mGy/d	ldrat19	1.1E-06	2.0E-05	5.9E-05	1.2E-04	5.0E-04	6.9E-04	=Crad19*ldcf	
Fraction of time on site	-	fts19	1.00							
External dose rate	mGy/d	Xdrat19	9.6E-04						=Xgrat*24*fts19/1000	
Internal plus external	mGy/d	tdrat19	1.7E-03						=SUM(ldrat19)+Xdrat19	
Absorbed Doses - Merganser - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad20	7.77E-06	3.09E-04	3.73E-04	1.98E-02	6.85E-03			
Internal dose rate	mGy/d	ldrat20	1.1E-06	2.0E-05	5.9E-05	1.2E-04	5.1E-04	7.1E-04	=Crad20*ldcf	
Fraction of time on site	-	fts20	1.00							
External dose rate	mGy/d	Xdrat20	9.6E-04						=Xgrat*24*fts20/1000	
Internal plus external	mGy/d	tdrat20	1.7E-03						=SUM(ldrat20)+Xdrat20	
Absorbed Doses - Muskox - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad21	1.18E-04	1.86E-04	2.87E-04	6.77E-04	2.04E-02			
Internal dose rate	mGy/d	ldrat21	1.7E-05	1.2E-05	4.6E-05	4.1E-06	1.5E-03	1.6E-03	=Crad21*ldcf	
Fraction of time on site	-	fts21	1.00							
External dose rate	mGy/d	Xdrat21	9.6E-04						=Xgrat*24*fts21/1000	
Internal plus external	mGy/d	tdrat21	2.6E-03						=SUM(ldrat21)+Xdrat21	
Absorbed Doses - Muskox - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad22	6.24E-05	3.37E-03	5.26E-03	1.35E-01	3.64E-02			
Internal dose rate	mGy/d	ldrat22	8.9E-06	2.2E-04	8.4E-04	8.1E-04	2.7E-03	4.6E-03	=Crad22*ldcf	
Fraction of time on site	-	fts22	1.00							
External dose rate	mGy/d	Xdrat22	9.6E-04						=Xgrat*24*fts22/1000	
Internal plus external	mGy/d	tdrat22	5.5E-03						=SUM(ldrat22)+Xdrat22	
Absorbed Doses - Northern Pintail - Rock Lake										
Concentration	Bq/g	Crad23	2.34E-05	4.59E-03	2.26E-03	1.68E-01	6.11E-02			
Internal dose rate	mGy/d	ldrat23	3.3E-06	3.0E-04	3.6E-04	1.0E-03	4.5E-03	6.2E-03	=Crad23*ldcf	
Fraction of time on site	-	fts23	1.00							
External dose rate	mGy/d	Xdrat23	9.6E-04						=Xgrat*24*fts23/1000	
Internal plus external	mGy/d	tdrat23	7.2E-03						=SUM(ldrat23)+Xdrat23	

Table H.2-4
Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

Absorbed Doses - Northern Pintail - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad24	2.66E-05	4.43E-03	2.18E-03	1.62E-01	5.96E-02			
Internal dose rate	mGy/d	Idrat24	3.8E-06	2.9E-04	3.5E-04	9.8E-04	4.4E-03	6.0E-03	=Crad24*Idcf	
Fraction of time on site	-	fts24	1.00							
External dose rate	mGy/d	Xdrat24	9.6E-04						=Xgrat*24*fts24/1000	
Internal plus external	mGy/d	tdrat24	7.0E-03						=SUM(Idrat24)+Xdrat24	
Absorbed Doses - Northern Pintail - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad25	3.78E-05	4.45E-03	2.20E-03	1.63E-01	5.90E-02			
Internal dose rate	mGy/d	Idrat25	5.4E-06	2.9E-04	3.5E-04	9.8E-04	4.4E-03	6.0E-03	=Crad25*Idcf	
Fraction of time on site	-	fts25	1.00							
External dose rate	mGy/d	Xdrat25	9.6E-04						=Xgrat*24*fts25/1000	
Internal plus external	mGy/d	tdrat25	7.0E-03						=SUM(Idrat25)+Xdrat25	
Absorbed Doses - Ptarmigan - Rock Lake Watershed										
Concentration	Bq/g	Crad26	4.26E-05	9.01E-04	2.17E-03	3.89E-01	1.43E-01			
Internal dose rate	mGy/d	Idrat26	6.0E-06	5.9E-05	3.5E-04	2.3E-03	1.1E-02	1.3E-02	=Crad26*Idcf	
Fraction of time on site	-	fts26	1.00							
External dose rate	mGy/d	Xdrat26	9.6E-04						=Xgrat*24*fts26/1000	
Internal plus external	mGy/d	tdrat26	1.4E-02						=SUM(Idrat26)+Xdrat26	
Absorbed Doses - Ptarmigan - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad27	4.59E-05	9.03E-04	2.21E-03	3.89E-01	1.43E-01			
Internal dose rate	mGy/d	Idrat27	6.5E-06	5.9E-05	3.5E-04	2.3E-03	1.1E-02	1.3E-02	=Crad27*Idcf	
Fraction of time on site	-	fts27	1.00							
External dose rate	mGy/d	Xdrat27	9.6E-04						=Xgrat*24*fts27/1000	
Internal plus external	mGy/d	tdrat27	1.4E-02						=SUM(Idrat27)+Xdrat27	
Absorbed Doses - Ptarmigan - Kiggavik Camp										
Concentration	Bq/g	Crad28	3.65E-05	9.03E-04	2.10E-03	3.89E-01	1.43E-01			
Internal dose rate	mGy/d	Idrat28	5.2E-06	5.9E-05	3.3E-04	2.3E-03	1.1E-02	1.3E-02	=Crad28*Idcf	
Fraction of time on site	-	fts28	1.00							
External dose rate	mGy/d	Xdrat28	9.6E-04						=Xgrat*24*fts28/1000	
Internal plus external	mGy/d	tdrat28	1.4E-02						=SUM(Idrat28)+Xdrat28	
Absorbed Doses - Ptarmigan - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad29	5.23E-05	9.01E-04	2.16E-03	3.89E-01	1.43E-01			
Internal dose rate	mGy/d	Idrat29	7.4E-06	5.9E-05	3.4E-04	2.3E-03	1.1E-02	1.3E-02	=Crad29*Idcf	
Fraction of time on site	-	fts29	1.00							
External dose rate	mGy/d	Xdrat29	9.6E-04						=Xgrat*24*fts29/1000	
Internal plus external	mGy/d	tdrat29	1.4E-02						=SUM(Idrat29)+Xdrat29	
Absorbed Doses - Sandpiper - Rock Lake										
Concentration	Bq/g	Crad30	1.96E-04	2.14E-03	1.53E-02	1.83E-01	1.19E-01			
Internal dose rate	mGy/d	Idrat30	2.8E-05	1.4E-04	2.4E-03	1.1E-03	8.8E-03	1.3E-02	=Crad30*Idcf	
Fraction of time on site	-	fts30	1.00							
External dose rate	mGy/d	Xdrat30	9.6E-04						=Xgrat*24*fts30/1000	
Internal plus external	mGy/d	tdrat30	1.3E-02						=SUM(Idrat30)+Xdrat30	
Absorbed Doses - Sandpiper - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad31	2.34E-04	2.11E-03	1.48E-02	1.78E-01	1.14E-01			
Internal dose rate	mGy/d	Idrat31	3.3E-05	1.4E-04	2.4E-03	1.1E-03	8.5E-03	1.2E-02	=Crad31*Idcf	
Fraction of time on site	-	fts31	1.00							
External dose rate	mGy/d	Xdrat31	9.6E-04						=Xgrat*24*fts31/1000	
Internal plus external	mGy/d	tdrat31	1.3E-02						=SUM(Idrat31)+Xdrat31	
Absorbed Doses - Sandpiper - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad32	2.56E-04	2.11E-03	1.49E-02	1.79E-01	1.15E-01			
Internal dose rate	mGy/d	Idrat32	3.6E-05	1.4E-04	2.4E-03	1.1E-03	8.5E-03	1.2E-02	=Crad32*Idcf	
Fraction of time on site	-	fts32	1.00							
External dose rate	mGy/d	Xdrat32	9.6E-04						=Xgrat*24*fts32/1000	
Internal plus external	mGy/d	tdrat32	1.3E-02						=SUM(Idrat32)+Xdrat32	
Absorbed Doses - Shrew - Rock Lake Watershed										
Concentration	Bq/g	Crad33	1.03E-04	6.31E-04	4.02E-03	3.64E-02	5.70E-03			
Internal dose rate	mGy/d	Idrat33	1.5E-05	4.2E-05	6.4E-04	2.2E-04	4.2E-04	1.3E-03	=Crad33*Idcf	
Fraction of time on site	-	fts33	1.00							
External dose rate	mGy/d	Xdrat33	9.6E-04						=Xgrat*24*fts33/1000	
Internal plus external	mGy/d	tdrat33	2.3E-03						=SUM(Idrat33)+Xdrat33	
Absorbed Doses - Shrew - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad34	1.42E-04	6.72E-04	4.37E-03	3.68E-02	6.01E-03			
Internal dose rate	mGy/d	Idrat34	2.0E-05	4.4E-05	7.0E-04	2.2E-04	4.4E-04	1.4E-03	=Crad34*Idcf	
Fraction of time on site	-	fts34	1.00							
External dose rate	mGy/d	Xdrat34	9.6E-04						=Xgrat*24*fts34/1000	
Internal plus external	mGy/d	tdrat34	2.4E-03						=SUM(Idrat34)+Xdrat34	
Absorbed Doses - Shrew - Kiggavik Camp										
Concentration	Bq/g	Crad35	9.53E-06	6.00E-04	3.72E-03	3.61E-02	5.69E-03			
Internal dose rate	mGy/d	Idrat35	1.4E-06	3.9E-05	5.9E-04	2.2E-04	4.2E-04	1.3E-03	=Crad35*Idcf	
Fraction of time on site	-	fts35	1.00							
External dose rate	mGy/d	Xdrat35	9.6E-04						=Xgrat*24*fts35/1000	
Internal plus external	mGy/d	tdrat35	2.2E-03						=SUM(Idrat35)+Xdrat35	
Absorbed Doses - Shrew - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad36	2.20E-04	6.31E-04	4.01E-03	3.65E-02	5.84E-03			
Internal dose rate	mGy/d	Idrat36	3.1E-05	4.2E-05	6.4E-04	2.2E-04	4.3E-04	1.4E-03	=Crad36*Idcf	
Fraction of time on site	-	fts36	1.00							

Table H.2-4

Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

External dose rate	mGy/d	Xdrat36	2.7E-04							=Xgrat*24*fts36/3600
Internal plus external	mGy/d	tdrat36	1.6E-03							=SUM(ldrat36)+Xdrat36
Absorbed Doses - Squirrel - Rock Lake Watershed										
Concentration	Bq/g	Crad37	8.97E-05	3.42E-03	6.40E-03	8.32E-02	1.01E-02			
Internal dose rate	mGy/d	ldrat37	1.3E-05	2.3E-04	1.0E-03	5.0E-04	7.5E-04	2.5E-03		=Crad37*ldcf
Fraction of time on site	-	fts37	1.00							
External dose rate	mGy/d	Xdrat37	9.6E-04							=Xgrat*24*fts37/1000
Internal plus external	mGy/d	tdrat37	3.5E-03							=SUM(ldrat37)+Xdrat37
Absorbed Doses - Squirrel - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad38	8.97E-05	3.42E-03	6.40E-03	8.32E-02	1.01E-02			
Internal dose rate	mGy/d	ldrat38	1.3E-05	2.3E-04	1.0E-03	5.0E-04	7.5E-04	2.5E-03		=Crad38*ldcf
Fraction of time on site	-	fts38	1.00							
External dose rate	mGy/d	Xdrat38	9.6E-04							=Xgrat*24*fts38/1000
Internal plus external	mGy/d	tdrat38	3.5E-03							=SUM(ldrat38)+Xdrat38
Absorbed Doses - Squirrel - Kiggavik Camp										
Concentration	Bq/g	Crad39	9.37E-05	3.43E-03	6.42E-03	8.33E-02	1.01E-02			
Internal dose rate	mGy/d	ldrat39	1.3E-05	2.3E-04	1.0E-03	5.0E-04	7.5E-04	2.5E-03		=Crad39*ldcf
Fraction of time on site	-	fts39	1.00							
External dose rate	mGy/d	Xdrat39	9.6E-04							=Xgrat*24*fts39/1000
Internal plus external	mGy/d	tdrat39	3.5E-03							=SUM(ldrat39)+Xdrat39

Table H.2-4
Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

Absorbed Doses - Squirrel - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad40	8.98E-05	3.42E-03	6.40E-03	8.32E-02	1.01E-02			
Internal dose rate	mGy/d	Idrat40	1.3E-05	2.3E-04	1.0E-03	5.0E-04	7.5E-04	2.5E-03	=Crad40*Idcf	
Fraction of time on site	-	fts40	1.00							
External dose rate	mGy/d	Xdrat40	9.6E-04						=Xgrat*24*fts40/1000	
Internal plus external	mGy/d	tdrat40	3.5E-03						=SUM(Idrat40)+Xdrat40	
Absorbed Doses - Wolf - LSA										
Concentration	Bq/g	Crad41	4.16E-05	2.94E-05	2.20E-05	1.44E-05	7.66E-03			
Internal dose rate	mGy/d	Idrat41	5.9E-06	1.9E-06	3.5E-06	8.7E-08	5.7E-04	5.8E-04	=Crad41*Idcf	
Fraction of time on site	-	fts41	1.00							
External dose rate	mGy/d	Xdrat41	9.6E-04						=Xgrat*24*fts41/1000	
Internal plus external	mGy/d	tdrat41	1.5E-03						=SUM(Idrat41)+Xdrat41	
Absorbed Doses - Wolf - RSA										
Concentration	Bq/g	Crad42	4.17E-05	2.94E-05	2.20E-05	1.44E-05	7.66E-03			
Internal dose rate	mGy/d	Idrat42	5.9E-06	1.9E-06	3.5E-06	8.7E-08	5.7E-04	5.8E-04	=Crad42*Idcf	
Fraction of time on site	-	fts42	1.00							
External dose rate	mGy/d	Xdrat42	9.6E-04						=Xgrat*24*fts42/1000	
Internal plus external	mGy/d	tdrat42	1.5E-03						=SUM(Idrat42)+Xdrat42	
Absorbed Doses - Wolverine - LSA										
Concentration	Bq/g	Crad43	5.83E-05	1.16E-04	2.13E-04	4.70E-04	1.79E-03			
Internal dose rate	mGy/d	Idrat43	8.3E-06	7.6E-06	3.4E-05	2.8E-06	1.3E-04	1.9E-04	=Crad43*Idcf	
Fraction of time on site	-	fts43	1.00							
External dose rate	mGy/d	Xdrat43	9.6E-04						=Xgrat*24*fts43/1000	
Internal plus external	mGy/d	tdrat43	1.1E-03						=SUM(Idrat43)+Xdrat43	
Absorbed Doses - Wolverine - RSA										
Concentration	Bq/g	Crad44	5.84E-05	1.16E-04	2.13E-04	4.70E-04	1.79E-03			
Internal dose rate	mGy/d	Idrat44	8.3E-06	7.6E-06	3.4E-05	2.8E-06	1.3E-04	1.9E-04	=Crad44*Idcf	
Fraction of time on site	-	fts44	1.00							
External dose rate	mGy/d	Xdrat44	9.6E-04						=Xgrat*24*fts44/1000	
Internal plus external	mGy/d	tdrat44	1.1E-03						=SUM(Idrat44)+Xdrat44	
Equivalent Doses - Bear - LSA										
RBE for alpha	Sv/Gy	RBE	40							
High LET dose rate	mSv/d	Hletdr	2.2E-04	4.0E-04	4.4E-04	1.0E-06	1.9E-02	2.0E-02	=Idrat*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr	9.6E-04						=Xdrat	
Total dose rate	mSv/d	tdr	2.1E-02						=SUM(Hletdr)+Lletdr	
Equivalent Doses - Caribou - LSA										
High LET dose rate	mSv/d	Hletdr2	4.9E-04	3.5E-04	1.9E-03	1.5E-05	2.3E-01	2.3E-01	=Idrat2*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr2	9.6E-04						=Xdrat2	
Total dose rate	mSv/d	tdr2	2.3E-01						=SUM(Hletdr2)+Lletdr2	
Equivalent Doses - Caribou - RSA										
High LET dose rate	mSv/d	Hletdr3	4.9E-04	3.5E-04	1.9E-03	1.5E-05	2.3E-01	2.3E-01	=Idrat3*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr3	9.6E-04						=Xdrat3	
Total dose rate	mSv/d	tdr3	2.3E-01						=SUM(Hletdr3)+Lletdr3	
Equivalent Doses - Falcon - LSA										
High LET dose rate	mSv/d	Hletdr4	6.5E-05	9.4E-04	8.8E-03	2.7E-03	1.5E-01	1.6E-01	=Idrat4*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr4	9.6E-04						=Xdrat4	
Total dose rate	mSv/d	tdr4	1.6E-01						=SUM(Hletdr4)+Lletdr4	
Equivalent Doses - Falcon - RSA										
High LET dose rate	mSv/d	Hletdr5	6.5E-05	9.4E-04	8.8E-03	2.7E-03	1.5E-01	1.6E-01	=Idrat5*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr5	9.6E-04						=Xdrat5	
Total dose rate	mSv/d	tdr5	1.6E-01						=SUM(Hletdr5)+Lletdr5	
Equivalent Doses - Fox - LSA										
High LET dose rate	mSv/d	Hletdr6	1.2E-04	2.1E-04	8.3E-04	3.1E-06	1.1E-02	1.2E-02	=Idrat6*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr6	9.6E-04						=Xdrat6	
Total dose rate	mSv/d	tdr6	1.3E-02						=SUM(Hletdr6)+Lletdr6	
Equivalent Doses - Lemming - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr7	8.6E-04	9.4E-03	4.0E-02	1.0E-03	6.2E-02	1.1E-01	=Idrat7*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr7	9.6E-04						=Xdrat7	
Total dose rate	mSv/d	tdr7	1.1E-01						=SUM(Hletdr7)+Lletdr7	
Equivalent Doses - Lemming - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr8	8.5E-04	9.4E-03	4.0E-02	1.0E-03	6.2E-02	1.1E-01	=Idrat8*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr8	9.6E-04						=Xdrat8	
Total dose rate	mSv/d	tdr8	1.1E-01						=SUM(Hletdr8)+Lletdr8	
Equivalent Doses - Lemming - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr9	8.8E-04	9.4E-03	4.0E-02	1.0E-03	6.2E-02	1.1E-01	=Idrat9*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr9	9.6E-04						=Xdrat9	
Total dose rate	mSv/d	tdr9	1.1E-01						=SUM(Hletdr9)+Lletdr9	
Equivalent Doses - Lemming - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr10	8.6E-04	9.4E-03	4.0E-02	1.0E-03	6.2E-02	1.1E-01	=Idrat10*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr10	9.6E-04						=Xdrat10	
Total dose rate	mSv/d	tdr10	1.1E-01						=SUM(Hletdr10)+Lletdr10	

Table H.2-4

Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

Equivalent Doses - Lapland Longspur - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr11	2.3E-04	8.9E-03	3.3E-02	8.1E-04	1.1E-01	1.5E-01	=Idrat11*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr11	9.6E-04						=Xdrat11	
Total dose rate	mSv/d	tdr11	1.5E-01						=SUM(Hletdr11)+Lletdr11	
Equivalent Doses - Lapland Longspur - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr12	3.1E-04	8.9E-03	3.4E-02	8.2E-04	1.1E-01	1.5E-01	=Idrat12*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr12	9.6E-04						=Xdrat12	
Total dose rate	mSv/d	tdr12	1.6E-01						=SUM(Hletdr12)+Lletdr12	
Equivalent Doses - Lapland Longspur - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr13	7.4E-05	8.9E-03	3.2E-02	8.1E-04	1.1E-01	1.5E-01	=Idrat13*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr13	9.6E-04						=Xdrat13	
Total dose rate	mSv/d	tdr13	1.5E-01						=SUM(Hletdr13)+Lletdr13	
Equivalent Doses - Lapland Longspur - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr14	3.5E-04	8.9E-03	3.3E-02	8.1E-04	1.1E-01	1.5E-01	=Idrat14*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr14	9.6E-04						=Xdrat14	
Total dose rate	mSv/d	tdr14	1.5E-01						=SUM(Hletdr14)+Lletdr14	
Equivalent Doses - Long-Tailed Duck - Rock Lake										
High LET dose rate	mSv/d	Hletdr15	3.2E-04	1.6E-03	5.9E-02	3.9E-04	1.7E-01	2.3E-01	=Idrat15*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr15	9.6E-04						=Xdrat15	
Total dose rate	mSv/d	tdr15	2.3E-01						=SUM(Hletdr15)+Lletdr15	
Equivalent Doses - Long-Tailed Duck - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr16	4.9E-04	1.5E-03	5.7E-02	3.7E-04	1.6E-01	2.2E-01	=Idrat16*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr16	9.6E-04						=Xdrat16	
Total dose rate	mSv/d	tdr16	2.2E-01						=SUM(Hletdr16)+Lletdr16	
Equivalent Doses - Long-Tailed Duck - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr17	6.3E-04	1.5E-03	5.7E-02	3.7E-04	1.7E-01	2.3E-01	=Idrat17*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr17	9.6E-04						=Xdrat17	
Total dose rate	mSv/d	tdr17	2.3E-01						=SUM(Hletdr17)+Lletdr17	
Equivalent Doses - Merganser - Rock Lake										
High LET dose rate	mSv/d	Hletdr18	4.4E-05	8.3E-04	2.5E-03	1.2E-04	2.1E-02	2.4E-02	=Idrat18*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr18	9.6E-04						=Xdrat18	
Total dose rate	mSv/d	tdr18	2.5E-02						=SUM(Hletdr18)+Lletdr18	
Equivalent Doses - Merganser - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr19	4.4E-05	8.1E-04	2.4E-03	1.2E-04	2.0E-02	2.3E-02	=Idrat19*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr19	9.6E-04						=Xdrat19	
Total dose rate	mSv/d	tdr19	2.4E-02						=SUM(Hletdr19)+Lletdr19	
Equivalent Doses - Merganser - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr20	4.4E-05	8.1E-04	2.4E-03	1.2E-04	2.0E-02	2.4E-02	=Idrat20*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr20	9.6E-04						=Xdrat20	
Total dose rate	mSv/d	tdr20	2.5E-02						=SUM(Hletdr20)+Lletdr20	
Equivalent Doses - Muskox - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr21	6.7E-04	4.9E-04	1.8E-03	4.1E-06	6.1E-02	6.3E-02	=Idrat21*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr21	9.6E-04						=Xdrat21	
Total dose rate	mSv/d	tdr21	6.4E-02						=SUM(Hletdr21)+Lletdr21	
Equivalent Doses - Muskox - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr22	3.5E-04	8.9E-03	3.3E-02	8.1E-04	1.1E-01	1.5E-01	=Idrat22*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr22	9.6E-04						=Xdrat22	
Total dose rate	mSv/d	tdr22	1.5E-01						=SUM(Hletdr22)+Lletdr22	
Equivalent Doses - Northern Pintail - Rock Lake										
High LET dose rate	mSv/d	Hletdr23	1.3E-04	1.2E-02	1.4E-02	1.0E-03	1.8E-01	2.1E-01	=Idrat23*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr23	9.6E-04						=Xdrat23	
Total dose rate	mSv/d	tdr23	2.1E-01						=SUM(Hletdr23)+Lletdr23	
Equivalent Doses - Northern Pintail - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr24	1.5E-04	1.2E-02	1.4E-02	9.8E-04	1.8E-01	2.0E-01	=Idrat24*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr24	9.6E-04						=Xdrat24	
Total dose rate	mSv/d	tdr24	2.0E-01						=SUM(Hletdr24)+Lletdr24	
Equivalent Doses - Northern Pintail - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr25	2.1E-04	1.2E-02	1.4E-02	9.8E-04	1.7E-01	2.0E-01	=Idrat25*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr25	9.6E-04						=Xdrat25	
Total dose rate	mSv/d	tdr25	2.0E-01						=SUM(Hletdr25)+Lletdr25	
Equivalent Doses - Ptarmigan - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr26	2.4E-04	2.4E-03	1.4E-02	2.3E-03	4.2E-01	4.4E-01	=Idrat26*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr26	9.6E-04						=Xdrat26	
Total dose rate	mSv/d	tdr26	4.4E-01						=SUM(Hletdr26)+Lletdr26	
Equivalent Doses - Ptarmigan - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr27	2.6E-04	2.4E-03	1.4E-02	2.3E-03	4.2E-01	4.4E-01	=Idrat27*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr27	9.6E-04						=Xdrat27	
Total dose rate	mSv/d	tdr27	4.4E-01						=SUM(Hletdr27)+Lletdr27	

Table H.2-4

Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

Equivalent Doses - Ptarmigan - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr28	2.1E-04	2.4E-03	1.3E-02	2.3E-03	4.2E-01	4.4E-01	=Idrat28*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr28	9.6E-04						=Xdrat28	
Total dose rate	mSv/d	tdr28	4.4E-01						=SUM(Hletdr28)+Lletdr28	
Equivalent Doses - Ptarmigan - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr29	3.0E-04	2.4E-03	1.4E-02	2.3E-03	4.2E-01	4.4E-01	=Idrat29*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr29	9.6E-04						=Xdrat29	
Total dose rate	mSv/d	tdr29	4.4E-01						=SUM(Hletdr29)+Lletdr29	
Equivalent Doses - Sandpiper - Rock Lake										
High LET dose rate	mSv/d	Hletdr30	1.1E-03	5.6E-03	9.7E-02	1.1E-03	3.5E-01	4.6E-01	=Idrat30*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr30	9.6E-04						=Xdrat30	
Total dose rate	mSv/d	tdr30	4.6E-01						=SUM(Hletdr30)+Lletdr30	
Equivalent Doses - Sandpiper - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr31	1.3E-03	5.6E-03	9.4E-02	1.1E-03	3.4E-01	4.4E-01	=Idrat31*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr31	9.6E-04						=Xdrat31	
Total dose rate	mSv/d	tdr31	4.4E-01						=SUM(Hletdr31)+Lletdr31	
Equivalent Doses - Sandpiper - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr32	1.5E-03	5.5E-03	9.5E-02	1.1E-03	3.4E-01	4.4E-01	=Idrat32*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr32	9.6E-04						=Xdrat32	
Total dose rate	mSv/d	tdr32	4.4E-01						=SUM(Hletdr32)+Lletdr32	
Equivalent Doses - Shrew - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr33	5.9E-04	1.7E-03	2.6E-02	2.2E-04	1.7E-02	4.5E-02	=Idrat33*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr33	9.6E-04						=Xdrat33	
Total dose rate	mSv/d	tdr33	4.6E-02						=SUM(Hletdr33)+Lletdr33	
Equivalent Doses - Shrew - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr34	8.1E-04	1.8E-03	2.8E-02	2.2E-04	1.8E-02	4.8E-02	=Idrat34*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr34	9.6E-04						=Xdrat34	
Total dose rate	mSv/d	tdr34	4.9E-02						=SUM(Hletdr34)+Lletdr34	
Equivalent Doses - Shrew - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr35	5.4E-05	1.6E-03	2.4E-02	2.2E-04	1.7E-02	4.2E-02	=Idrat35*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr35	9.6E-04						=Xdrat35	
Total dose rate	mSv/d	tdr35	4.3E-02						=SUM(Hletdr35)+Lletdr35	
Equivalent Doses - Shrew - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr36	1.3E-03	1.7E-03	2.5E-02	2.2E-04	1.7E-02	4.6E-02	=Idrat36*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr36	2.7E-04						=Xdrat36	
Total dose rate	mSv/d	tdr36	4.6E-02						=SUM(Hletdr36)+Lletdr36	
Equivalent Doses - Squirrel - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr37	5.1E-04	9.0E-03	4.1E-02	5.0E-04	3.0E-02	8.1E-02	=Idrat37*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr37	9.6E-04						=Xdrat37	
Total dose rate	mSv/d	tdr37	8.2E-02						=SUM(Hletdr37)+Lletdr37	
Equivalent Doses - Squirrel - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr38	5.1E-04	9.0E-03	4.1E-02	5.0E-04	3.0E-02	8.1E-02	=Idrat38*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr38	9.6E-04						=Xdrat38	
Total dose rate	mSv/d	tdr38	8.2E-02						=SUM(Hletdr38)+Lletdr38	
Equivalent Doses - Squirrel - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr39	5.3E-04	9.0E-03	4.1E-02	5.0E-04	3.0E-02	8.1E-02	=Idrat39*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr39	9.6E-04						=Xdrat39	
Total dose rate	mSv/d	tdr39	8.2E-02						=SUM(Hletdr39)+Lletdr39	
Equivalent Doses - Squirrel - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr40	5.1E-04	9.0E-03	4.1E-02	5.0E-04	3.0E-02	8.1E-02	=Idrat40*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr40	9.6E-04						=Xdrat40	
Total dose rate	mSv/d	tdr40	8.2E-02						=SUM(Hletdr40)+Lletdr40	
Equivalent Doses - Wolf - LSA										
High LET dose rate	mSv/d	Hletdr41	2.4E-04	7.7E-05	1.4E-04	8.7E-08	2.3E-02	2.3E-02	=Idrat41*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr41	9.6E-04						=Xdrat41	
Total dose rate	mSv/d	tdr41	2.4E-02						=SUM(Hletdr41)+Lletdr41	
Equivalent Doses - Wolf - RSA										
High LET dose rate	mSv/d	Hletdr42	2.4E-04	7.7E-05	1.4E-04	8.7E-08	2.3E-02	2.3E-02	=Idrat42*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr42	9.6E-04						=Xdrat42	
Total dose rate	mSv/d	tdr42	2.4E-02						=SUM(Hletdr42)+Lletdr42	
Equivalent Doses - Wolverine - LSA										
High LET dose rate	mSv/d	Hletdr43	3.3E-04	3.0E-04	1.4E-03	2.8E-06	5.3E-03	7.3E-03	=Idrat43*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr43	9.6E-04						=Xdrat43	
Total dose rate	mSv/d	tdr43	8.3E-03						=SUM(Hletdr43)+Lletdr43	
Equivalent Doses - Wolverine - RSA										
High LET dose rate	mSv/d	Hletdr44	3.3E-04	3.0E-04	1.4E-03	2.8E-06	5.3E-03	7.3E-03	=Idrat44*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr44	9.6E-04						=Xdrat44	
Total dose rate	mSv/d	tdr44	8.3E-03						=SUM(Hletdr44)+Lletdr44	

Table H.2-4
Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

SUMMARY

3 Screening Criterion in mGy/d	Total Absorbed Dose mGy/d	Total Equivalent Dose mSv/d	Index (Absorbed Dose)	Index (Equivalent Dose)
Bear - LSA	1.5E-03	2.1E-02	4.9E-04	7.0E-03
Caribou - LSA	6.7E-03	2.3E-01	2.2E-03	7.7E-02
Caribou - RSA	6.7E-03	2.3E-01	2.2E-03	7.7E-02
Falcon - LSA	7.6E-03	1.6E-01	2.5E-03	5.4E-02
Falcon - RSA	7.6E-03	1.6E-01	2.5E-03	5.4E-02
Fox - LSA	1.3E-03	1.3E-02	4.2E-04	4.3E-03
Lemming - Rock Lake Watershed	4.8E-03	1.1E-01	1.6E-03	3.8E-02
Lemming - JSL @ Kiggavik Discharge	4.8E-03	1.1E-01	1.6E-03	3.8E-02
Lemming - Kiggavik Camp	4.8E-03	1.1E-01	1.6E-03	3.8E-02
Lemming - JSL @ Sissons Discharge	4.8E-03	1.1E-01	1.6E-03	3.8E-02
Lapland Longspur - Rock Lake Watershed	5.5E-03	1.5E-01	1.8E-03	5.0E-02
Lapland Longspur - JSL @ Kiggavik Discharge	5.6E-03	1.6E-01	1.9E-03	5.2E-02
Lapland Longspur - Kiggavik Camp	5.4E-03	1.5E-01	1.8E-03	5.0E-02
Lapland Longspur - JSL @ Sissons Discharge	5.5E-03	1.5E-01	1.8E-03	5.1E-02
Long-Tailed Duck - Rock Lake	7.1E-03	2.3E-01	2.4E-03	7.8E-02
Long-Tailed Duck - JSL @ Kiggavik Discharge	6.9E-03	2.2E-01	2.3E-03	7.5E-02
Long-Tailed Duck - JSL @ Sissons Discharge	7.0E-03	2.3E-01	2.3E-03	7.5E-02
Merganser - Rock Lake	1.7E-03	2.5E-02	5.6E-04	8.5E-03
Merganser - JSL @ Kiggavik Discharge	1.7E-03	2.4E-02	5.5E-04	8.0E-03
Merganser - JSL @ Sissons Discharge	1.7E-03	2.5E-02	5.6E-04	8.2E-03
Muskox - JSL @ Kiggavik Discharge	2.6E-03	6.4E-02	8.5E-04	2.1E-02
Muskox - JSL @ Sissons Discharge	5.5E-03	1.5E-01	1.8E-03	5.1E-02
Northern Pintail - Rock Lake	7.2E-03	2.1E-01	2.4E-03	7.0E-02
Northern Pintail - JSL @ Kiggavik Discharge	7.0E-03	2.0E-01	2.3E-03	6.8E-02
Northern Pintail - JSL @ Sissons Discharge	7.0E-03	2.0E-01	2.3E-03	6.7E-02
Ptarmigan - Rock Lake Watershed	1.4E-02	4.4E-01	4.8E-03	1.5E-01
Ptarmigan - JSL @ Kiggavik Discharge	1.4E-02	4.4E-01	4.8E-03	1.5E-01
Ptarmigan - Kiggavik Camp	1.4E-02	4.4E-01	4.8E-03	1.5E-01
Ptarmigan - JSL @ Sissons Discharge	1.4E-02	4.4E-01	4.8E-03	1.5E-01
Sandpiper - Rock Lake	1.3E-02	4.6E-01	4.5E-03	1.5E-01
Sandpiper - JSL @ Kiggavik Discharge	1.3E-02	4.4E-01	4.3E-03	1.5E-01
Sandpiper - JSL @ Sissons Discharge	1.3E-02	4.4E-01	4.4E-03	1.5E-01
Shrew - Rock Lake Watershed	2.3E-03	4.6E-02	7.7E-04	1.5E-02
Shrew - JSL @ Kiggavik Discharge	2.4E-03	4.9E-02	8.0E-04	1.6E-02
Shrew - Kiggavik Camp	2.2E-03	4.3E-02	7.4E-04	1.4E-02
Shrew - JSL @ Sissons Discharge	1.6E-03	4.6E-02	5.4E-04	1.5E-02
Squirrel - Rock Lake Watershed	3.5E-03	8.2E-02	1.2E-03	2.7E-02
Squirrel - JSL @ Kiggavik Discharge	3.5E-03	8.2E-02	1.2E-03	2.7E-02
Squirrel - Kiggavik Camp	3.5E-03	8.2E-02	1.2E-03	2.7E-02
Squirrel - JSL @ Sissons Discharge	3.5E-03	8.2E-02	1.2E-03	2.7E-02
Wolf - LSA	1.5E-03	2.4E-02	5.1E-04	8.0E-03
Wolf - RSA	1.5E-03	2.4E-02	5.1E-04	8.0E-03
Wolverine - LSA	1.1E-03	8.3E-03	3.8E-04	2.8E-03
Wolverine - RSA	1.1E-03	8.3E-03	3.8E-04	2.8E-03

U-238+ Internal U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235
Ra-226+ Internal Ra-226 + 0.3* (Rn-222 + ...Po-214)
Pb-210+ Internal Pb-210 + Bi-210

Table H.2-4

Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

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DOSES TO SELECTED VECs - Average Total Dose

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Absorbed Doses - Bear - LSA									
Concentration	Bq/g	Crad	1.27E-05	3.35E-05	2.28E-05	5.31E-05	1.79E-03		
Internal Dose Factor	mGy/d per Bq/g	ldcf	1.4E-01	6.6E-02	1.6E-01	6.0E-03	7.4E-02		
Internal dose rate	mGy/d	ldrat	1.8E-06	2.2E-06	3.6E-06	3.2E-07	1.3E-04	1.4E-04	=Crad*ldcf
External Gamma rate	uGy/h	Xgrat	0.04						
Fraction of time on site	-	fts	1.00						
External dose rate	mGy/d	Xdrat	9.6E-04						=Xgrat*24*fts/1000
Internal plus external	mGy/d	tdrat	1.1E-03						=SUM(ldrat)+Xdrat
Absorbed Doses - Caribou - LSA									
Concentration	Bq/g	Crad2	2.99E-05	4.43E-05	8.68E-05	9.05E-04	2.39E-02		
Internal dose rate	mGy/d	ldrat2	4.3E-06	2.9E-06	1.4E-05	5.5E-06	1.8E-03	1.8E-03	=Crad2*ldcf
Fraction of time on site	-	fts2	1.00						
External dose rate	mGy/d	Xdrat2	9.6E-04						=Xgrat*24*fts2/1000
Internal plus external	mGy/d	tdrat2	2.8E-03						=SUM(ldrat2)+Xdrat2
Absorbed Doses - Caribou - RSA									
Concentration	Bq/g	Crad3	2.99E-05	4.43E-05	8.68E-05	9.05E-04	2.39E-02		
Internal dose rate	mGy/d	ldrat3	4.3E-06	2.9E-06	1.4E-05	5.5E-06	1.8E-03	1.8E-03	=Crad3*ldcf
Fraction of time on site	-	fts3	1.00						
External dose rate	mGy/d	Xdrat3	9.6E-04						=Xgrat*24*fts3/1000
Internal plus external	mGy/d	tdrat3	2.8E-03						=SUM(ldrat3)+Xdrat3
Absorbed Doses - Falcon - LSA									
Concentration	Bq/g	Crad4	3.80E-06	1.20E-04	3.99E-04	1.34E-01	1.47E-02		
Internal dose rate	mGy/d	ldrat4	5.4E-07	7.9E-06	6.3E-05	8.1E-04	1.1E-03	2.0E-03	=Crad4*ldcf
Fraction of time on site	-	fts4	1.00						
External dose rate	mGy/d	Xdrat4	9.6E-04						=Xgrat*24*fts4/1000
Internal plus external	mGy/d	tdrat4	2.9E-03						=SUM(ldrat4)+Xdrat4
Absorbed Doses - Falcon - RSA									
Concentration	Bq/g	Crad5	3.79E-06	1.20E-04	3.98E-04	1.34E-01	1.47E-02		
Internal dose rate	mGy/d	ldrat5	5.4E-07	7.9E-06	6.3E-05	8.1E-04	1.1E-03	2.0E-03	=Crad5*ldcf
Fraction of time on site	-	fts5	1.00						
External dose rate	mGy/d	Xdrat5	9.6E-04						=Xgrat*24*fts5/1000
Internal plus external	mGy/d	tdrat5	2.9E-03						=SUM(ldrat5)+Xdrat5
Absorbed Doses - Fox - LSA									
Concentration	Bq/g	Crad6	8.21E-06	2.48E-05	5.34E-05	1.28E-04	1.09E-03		
Internal dose rate	mGy/d	ldrat6	1.2E-06	1.6E-06	8.5E-06	7.7E-07	8.0E-05	9.2E-05	=Crad6*ldcf
Fraction of time on site	-	fts6	1.00						
External dose rate	mGy/d	Xdrat6	9.6E-04						=Xgrat*24*fts6/1000
Internal plus external	mGy/d	tdrat6	1.1E-03						=SUM(ldrat6)+Xdrat6
Absorbed Doses - Lemming - Rock Lake Watershed									
Concentration	Bq/g	Crad7	3.23E-05	1.14E-03	2.26E-03	4.73E-02	6.01E-03		
Internal dose rate	mGy/d	ldrat7	4.6E-06	7.5E-05	3.6E-04	2.8E-04	4.4E-04	1.2E-03	=Crad7*ldcf
Fraction of time on site	-	fts7	1.00						
External dose rate	mGy/d	Xdrat7	9.6E-04						=Xgrat*24*fts7/1000
Internal plus external	mGy/d	tdrat7	2.1E-03						=SUM(ldrat7)+Xdrat7
Absorbed Doses - Lemming - JSL @ Kiggavik Discharge									
Concentration	Bq/g	Crad8	3.23E-05	1.14E-03	2.26E-03	4.73E-02	6.01E-03		
Internal dose rate	mGy/d	ldrat8	4.6E-06	7.5E-05	3.6E-04	2.8E-04	4.4E-04	1.2E-03	=Crad8*ldcf
Fraction of time on site	-	fts8	1.00						
External dose rate	mGy/d	Xdrat8	9.6E-04						=Xgrat*24*fts8/1000
Internal plus external	mGy/d	tdrat8	2.1E-03						=SUM(ldrat8)+Xdrat8
Absorbed Doses - Lemming - Kiggavik Camp									
Concentration	Bq/g	Crad9	3.43E-05	1.15E-03	2.26E-03	4.73E-02	6.02E-03		
Internal dose rate	mGy/d	ldrat9	4.9E-06	7.6E-05	3.6E-04	2.9E-04	4.5E-04	1.2E-03	=Crad9*ldcf
Fraction of time on site	-	fts9	1.00						
External dose rate	mGy/d	Xdrat9	9.6E-04						=Xgrat*24*fts9/1000
Internal plus external	mGy/d	tdrat9	2.1E-03						=SUM(ldrat9)+Xdrat9
Absorbed Doses - Lemming - JSL @ Sissons Discharge									
Concentration	Bq/g	Crad10	3.24E-05	1.14E-03	2.26E-03	4.73E-02	6.01E-03		
Internal dose rate	mGy/d	ldrat10	4.6E-06	7.5E-05	3.6E-04	2.8E-04	4.4E-04	1.2E-03	=Crad10*ldcf
Fraction of time on site	-	fts10	1.00						
External dose rate	mGy/d	Xdrat10	9.6E-04						=Xgrat*24*fts10/1000
Internal plus external	mGy/d	tdrat10	2.1E-03						=SUM(ldrat10)+Xdrat10
Absorbed Doses - Lapland Longspur - Rock Lake Watershed									
Concentration	Bq/g	Crad11	1.15E-05	7.43E-04	1.58E-03	3.56E-02	1.28E-02		
Internal dose rate	mGy/d	ldrat11	1.6E-06	4.9E-05	2.5E-04	2.1E-04	9.5E-04	1.5E-03	=Crad11*ldcf
Fraction of time on site	-	fts11	1.00						
External dose rate	mGy/d	Xdrat11	9.6E-04						=Xgrat*24*fts11/1000
Internal plus external	mGy/d	tdrat11	2.4E-03						=SUM(ldrat11)+Xdrat11

Table H.2-4

Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

Absorbed Doses - Lapland Longspur - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad12	1.27E-05	7.45E-04	1.62E-03	3.59E-02	1.32E-02			
Internal dose rate	mGy/d	ldrat12	1.8E-06	4.9E-05	2.6E-04	2.2E-04	9.8E-04	1.5E-03	=Crad12*ldcf	
Fraction of time on site	-	fts12	1.00							
External dose rate	mGy/d	Xdrat12	9.6E-04						=Xgrat*24*fts12/1000	
Internal plus external	mGy/d	tdrat12	2.5E-03						=SUM(ldrat12)+Xdrat12	
Absorbed Doses - Lapland Longspur - Kiggavik Camp										
Concentration	Bq/g	Crad13	3.57E-06	7.44E-04	1.55E-03	3.54E-02	1.27E-02			
Internal dose rate	mGy/d	ldrat13	5.1E-07	4.9E-05	2.5E-04	2.1E-04	9.4E-04	1.4E-03	=Crad13*ldcf	
Fraction of time on site	-	fts13	1.00							
External dose rate	mGy/d	Xdrat13	9.6E-04						=Xgrat*24*fts13/1000	
Internal plus external	mGy/d	tdrat13	2.4E-03						=SUM(ldrat13)+Xdrat13	
Absorbed Doses - Lapland Longspur - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad14	1.17E-05	7.43E-04	1.58E-03	3.56E-02	1.29E-02			
Internal dose rate	mGy/d	ldrat14	1.7E-06	4.9E-05	2.5E-04	2.1E-04	9.5E-04	1.5E-03	=Crad14*ldcf	
Fraction of time on site	-	fts14	1.00							
External dose rate	mGy/d	Xdrat14	9.6E-04						=Xgrat*24*fts14/1000	
Internal plus external	mGy/d	tdrat14	2.4E-03						=SUM(ldrat14)+Xdrat14	
Absorbed Doses - Long-Tailed Duck - Rock Lake										
Concentration	Bq/g	Crad15	1.95E-05	2.01E-04	2.30E-03	1.99E-02	1.55E-02			
Internal dose rate	mGy/d	ldrat15	2.8E-06	1.3E-05	3.6E-04	1.2E-04	1.1E-03	1.6E-03	=Crad15*ldcf	
Fraction of time on site	-	fts15	1.00							
External dose rate	mGy/d	Xdrat15	9.6E-04						=Xgrat*24*fts15/1000	
Internal plus external	mGy/d	tdrat15	2.6E-03						=SUM(ldrat15)+Xdrat15	
Absorbed Doses - Long-Tailed Duck - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad16	1.85E-05	1.95E-04	2.21E-03	1.92E-02	1.49E-02			
Internal dose rate	mGy/d	ldrat16	2.6E-06	1.3E-05	3.5E-04	1.2E-04	1.1E-03	1.6E-03	=Crad16*ldcf	
Fraction of time on site	-	fts16	1.00							
External dose rate	mGy/d	Xdrat16	9.6E-04						=Xgrat*24*fts16/1000	
Internal plus external	mGy/d	tdrat16	2.5E-03						=SUM(ldrat16)+Xdrat16	
Absorbed Doses - Long-Tailed Duck - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad17	1.81E-05	1.95E-04	2.22E-03	1.93E-02	1.50E-02			
Internal dose rate	mGy/d	ldrat17	2.6E-06	1.3E-05	3.5E-04	1.2E-04	1.1E-03	1.6E-03	=Crad17*ldcf	
Fraction of time on site	-	fts17	1.00							
External dose rate	mGy/d	Xdrat17	9.6E-04						=Xgrat*24*fts17/1000	
Internal plus external	mGy/d	tdrat17	2.6E-03						=SUM(ldrat17)+Xdrat17	
Absorbed Doses - Merganser - Rock Lake										
Concentration	Bq/g	Crad18	2.29E-06	8.27E-05	1.25E-04	6.29E-03	2.11E-03			
Internal dose rate	mGy/d	ldrat18	3.3E-07	5.4E-06	2.0E-05	3.8E-05	1.6E-04	2.2E-04	=Crad18*ldcf	
Fraction of time on site	-	fts18	1.00							
External dose rate	mGy/d	Xdrat18	9.6E-04						=Xgrat*24*fts18/1000	
Internal plus external	mGy/d	tdrat18	1.2E-03						=SUM(ldrat18)+Xdrat18	
Absorbed Doses - Merganser - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad19	2.29E-06	7.96E-05	1.17E-04	6.09E-03	2.00E-03			
Internal dose rate	mGy/d	ldrat19	3.3E-07	5.2E-06	1.9E-05	3.7E-05	1.5E-04	2.1E-04	=Crad19*ldcf	
Fraction of time on site	-	fts19	1.00							
External dose rate	mGy/d	Xdrat19	9.6E-04						=Xgrat*24*fts19/1000	
Internal plus external	mGy/d	tdrat19	1.2E-03						=SUM(ldrat19)+Xdrat19	
Absorbed Doses - Merganser - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad20	2.29E-06	7.99E-05	1.18E-04	6.10E-03	2.02E-03			
Internal dose rate	mGy/d	ldrat20	3.2E-07	5.3E-06	1.9E-05	3.7E-05	1.5E-04	2.1E-04	=Crad20*ldcf	
Fraction of time on site	-	fts20	1.00							
External dose rate	mGy/d	Xdrat20	9.6E-04						=Xgrat*24*fts20/1000	
Internal plus external	mGy/d	tdrat20	1.2E-03						=SUM(ldrat20)+Xdrat20	
Absorbed Doses - Muskox - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad21	3.12E-05	5.03E-05	7.12E-05	2.23E-04	6.91E-03			
Internal dose rate	mGy/d	ldrat21	4.4E-06	3.3E-06	1.1E-05	1.3E-06	5.1E-04	5.3E-04	=Crad21*ldcf	
Fraction of time on site	-	fts21	1.00							
External dose rate	mGy/d	Xdrat21	9.6E-04						=Xgrat*24*fts21/1000	
Internal plus external	mGy/d	tdrat21	1.5E-03						=SUM(ldrat21)+Xdrat21	
Absorbed Doses - Muskox - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad22	1.17E-05	7.43E-04	1.58E-03	3.56E-02	1.29E-02			
Internal dose rate	mGy/d	ldrat22	1.7E-06	4.9E-05	2.5E-04	2.1E-04	9.5E-04	1.5E-03	=Crad22*ldcf	
Fraction of time on site	-	fts22	1.00							
External dose rate	mGy/d	Xdrat22	9.6E-04						=Xgrat*24*fts22/1000	
Internal plus external	mGy/d	tdrat22	2.4E-03						=SUM(ldrat22)+Xdrat22	
Absorbed Doses - Northern Pintail - Rock Lake										
Concentration	Bq/g	Crad23	7.17E-06	1.15E-03	6.60E-04	5.23E-02	1.76E-02			
Internal dose rate	mGy/d	ldrat23	1.0E-06	7.5E-05	1.0E-04	3.2E-04	1.3E-03	1.8E-03	=Crad23*ldcf	
Fraction of time on site	-	fts23	1.00							
External dose rate	mGy/d	Xdrat23	9.6E-04						=Xgrat*24*fts23/1000	
Internal plus external	mGy/d	tdrat23	2.8E-03						=SUM(ldrat23)+Xdrat23	

Table H.2-4

Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

Absorbed Doses - Northern Pintail - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad24	6.94E-06	1.10E-03	6.36E-04	5.04E-02	1.68E-02			
Internal dose rate	mGy/d	Idrat24	9.9E-07	7.2E-05	1.0E-04	3.0E-04	1.2E-03	1.7E-03	=Crad24*Idcf	
Fraction of time on site	-	fts24	1.00							
External dose rate	mGy/d	Xdrat24	9.6E-04						=Xgrat*24*fts24/1000	
Internal plus external	mGy/d	tdrat24	2.7E-03						=SUM(Idrat24)+Xdrat24	
Absorbed Doses - Northern Pintail - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad25	6.74E-06	1.11E-03	6.38E-04	5.06E-02	1.70E-02			
Internal dose rate	mGy/d	Idrat25	9.6E-07	7.3E-05	1.0E-04	3.1E-04	1.3E-03	1.7E-03	=Crad25*Idcf	
Fraction of time on site	-	fts25	1.00							
External dose rate	mGy/d	Xdrat25	9.6E-04						=Xgrat*24*fts25/1000	
Internal plus external	mGy/d	tdrat25	2.7E-03						=SUM(Idrat25)+Xdrat25	
Absorbed Doses - Ptarmigan - Rock Lake Watershed										
Concentration	Bq/g	Crad26	1.15E-05	2.26E-04	6.65E-04	1.38E-01	4.75E-02			
Internal dose rate	mGy/d	Idrat26	1.6E-06	1.5E-05	1.1E-04	8.3E-04	3.5E-03	4.5E-03	=Crad26*Idcf	
Fraction of time on site	-	fts26	1.00							
External dose rate	mGy/d	Xdrat26	9.6E-04						=Xgrat*24*fts26/1000	
Internal plus external	mGy/d	tdrat26	5.4E-03						=SUM(Idrat26)+Xdrat26	
Absorbed Doses - Ptarmigan - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad27	1.19E-05	2.26E-04	6.77E-04	1.38E-01	4.77E-02			
Internal dose rate	mGy/d	Idrat27	1.7E-06	1.5E-05	1.1E-04	8.3E-04	3.5E-03	4.5E-03	=Crad27*Idcf	
Fraction of time on site	-	fts27	1.00							
External dose rate	mGy/d	Xdrat27	9.6E-04						=Xgrat*24*fts27/1000	
Internal plus external	mGy/d	tdrat27	5.4E-03						=SUM(Idrat27)+Xdrat27	
Absorbed Doses - Ptarmigan - Kiggavik Camp										
Concentration	Bq/g	Crad28	9.45E-06	2.27E-04	6.56E-04	1.38E-01	4.76E-02			
Internal dose rate	mGy/d	Idrat28	1.3E-06	1.5E-05	1.0E-04	8.3E-04	3.5E-03	4.5E-03	=Crad28*Idcf	
Fraction of time on site	-	fts28	1.00							
External dose rate	mGy/d	Xdrat28	9.6E-04						=Xgrat*24*fts28/1000	
Internal plus external	mGy/d	tdrat28	5.4E-03						=SUM(Idrat28)+Xdrat28	
Absorbed Doses - Ptarmigan - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad29	1.16E-05	2.26E-04	6.64E-04	1.38E-01	4.76E-02			
Internal dose rate	mGy/d	Idrat29	1.6E-06	1.5E-05	1.1E-04	8.3E-04	3.5E-03	4.5E-03	=Crad29*Idcf	
Fraction of time on site	-	fts29	1.00							
External dose rate	mGy/d	Xdrat29	9.6E-04						=Xgrat*24*fts29/1000	
Internal plus external	mGy/d	tdrat29	5.4E-03						=SUM(Idrat29)+Xdrat29	
Absorbed Doses - Sandpiper - Rock Lake										
Concentration	Bq/g	Crad30	4.85E-05	7.57E-04	3.86E-03	5.69E-02	3.46E-02			
Internal dose rate	mGy/d	Idrat30	6.9E-06	5.0E-05	6.1E-04	3.4E-04	2.6E-03	3.6E-03	=Crad30*Idcf	
Fraction of time on site	-	fts30	1.00							
External dose rate	mGy/d	Xdrat30	9.6E-04						=Xgrat*24*fts30/1000	
Internal plus external	mGy/d	tdrat30	4.5E-03						=SUM(Idrat30)+Xdrat30	
Absorbed Doses - Sandpiper - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad31	4.69E-05	7.45E-04	3.72E-03	5.55E-02	3.32E-02			
Internal dose rate	mGy/d	Idrat31	6.7E-06	4.9E-05	5.9E-04	3.3E-04	2.5E-03	3.4E-03	=Crad31*Idcf	
Fraction of time on site	-	fts31	1.00							
External dose rate	mGy/d	Xdrat31	9.6E-04						=Xgrat*24*fts31/1000	
Internal plus external	mGy/d	tdrat31	4.4E-03						=SUM(Idrat31)+Xdrat31	
Absorbed Doses - Sandpiper - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad32	4.58E-05	7.45E-04	3.74E-03	5.55E-02	3.34E-02			
Internal dose rate	mGy/d	Idrat32	6.5E-06	4.9E-05	5.9E-04	3.3E-04	2.5E-03	3.5E-03	=Crad32*Idcf	
Fraction of time on site	-	fts32	1.00							
External dose rate	mGy/d	Xdrat32	9.6E-04						=Xgrat*24*fts32/1000	
Internal plus external	mGy/d	tdrat32	4.4E-03						=SUM(Idrat32)+Xdrat32	
Absorbed Doses - Shrew - Rock Lake Watershed										
Concentration	Bq/g	Crad33	3.27E-05	1.90E-04	1.27E-03	1.12E-02	2.07E-03			
Internal dose rate	mGy/d	Idrat33	4.6E-06	1.3E-05	2.0E-04	6.8E-05	1.5E-04	4.4E-04	=Crad33*Idcf	
Fraction of time on site	-	fts33	1.00							
External dose rate	mGy/d	Xdrat33	9.6E-04						=Xgrat*24*fts33/1000	
Internal plus external	mGy/d	tdrat33	1.4E-03						=SUM(Idrat33)+Xdrat33	
Absorbed Doses - Shrew - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad34	3.69E-05	2.00E-04	1.37E-03	1.13E-02	2.12E-03			
Internal dose rate	mGy/d	Idrat34	5.2E-06	1.3E-05	2.2E-04	6.8E-05	1.6E-04	4.6E-04	=Crad34*Idcf	
Fraction of time on site	-	fts34	1.00							
External dose rate	mGy/d	Xdrat34	9.6E-04						=Xgrat*24*fts34/1000	
Internal plus external	mGy/d	tdrat34	1.4E-03						=SUM(Idrat34)+Xdrat34	
Absorbed Doses - Shrew - Kiggavik Camp										
Concentration	Bq/g	Crad35	3.15E-06	1.85E-04	1.18E-03	1.11E-02	2.05E-03			
Internal dose rate	mGy/d	Idrat35	4.5E-07	1.2E-05	1.9E-04	6.7E-05	1.5E-04	4.2E-04	=Crad35*Idcf	
Fraction of time on site	-	fts35	1.00							
External dose rate	mGy/d	Xdrat35	9.6E-04						=Xgrat*24*fts35/1000	
Internal plus external	mGy/d	tdrat35	1.4E-03						=SUM(Idrat35)+Xdrat35	
Absorbed Doses - Shrew - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad36	3.34E-05	1.91E-04	1.26E-03	1.12E-02	2.08E-03			
Internal dose rate	mGy/d	Idrat36	4.7E-06	1.3E-05	2.0E-04	6.8E-05	1.5E-04	4.4E-04	=Crad36*Idcf	
Fraction of time on site	-	fts36	1.00							

Table H.2-4

Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

External dose rate	mGy/d	Xdrat36	2.7E-04							=Xgrat*24*fts36/3600
Internal plus external	mGy/d	tdrat36	7.1E-04							=SUM(ldrat36)+Xdrat36
Absorbed Doses - Squirrel - Rock Lake Watershed										
Concentration	Bq/g	Crad37	2.70E-05	9.88E-04	1.48E-03	1.97E-02	2.34E-03			
Internal dose rate	mGy/d	ldrat37	3.8E-06	6.5E-05	2.4E-04	1.2E-04	1.7E-04	6.0E-04		=Crad37*ldcf
Fraction of time on site	-	fts37	1.00							
External dose rate	mGy/d	Xdrat37	9.6E-04							=Xgrat*24*fts37/1000
Internal plus external	mGy/d	tdrat37	1.6E-03							=SUM(ldrat37)+Xdrat37
Absorbed Doses - Squirrel - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad38	2.70E-05	9.87E-04	1.48E-03	1.97E-02	2.34E-03			
Internal dose rate	mGy/d	ldrat38	3.8E-06	6.5E-05	2.4E-04	1.2E-04	1.7E-04	6.0E-04		=Crad38*ldcf
Fraction of time on site	-	fts38	1.00							
External dose rate	mGy/d	Xdrat38	9.6E-04							=Xgrat*24*fts38/1000
Internal plus external	mGy/d	tdrat38	1.6E-03							=SUM(ldrat38)+Xdrat38
Absorbed Doses - Squirrel - Kiggavik Camp										
Concentration	Bq/g	Crad39	2.87E-05	9.95E-04	1.49E-03	1.97E-02	2.35E-03			
Internal dose rate	mGy/d	ldrat39	4.1E-06	6.5E-05	2.4E-04	1.2E-04	1.7E-04	6.0E-04		=Crad39*ldcf
Fraction of time on site	-	fts39	1.00							
External dose rate	mGy/d	Xdrat39	9.6E-04							=Xgrat*24*fts39/1000
Internal plus external	mGy/d	tdrat39	1.6E-03							=SUM(ldrat39)+Xdrat39

Table H.2-4

Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

Absorbed Doses - Squirrel - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad40	2.71E-05	9.88E-04	1.48E-03	1.97E-02	2.34E-03			
Internal dose rate	mGy/d	ldrat40	3.8E-06	6.5E-05	2.4E-04	1.2E-04	1.7E-04	6.0E-04	=Crad40*ldcf	
Fraction of time on site	-	fts40	1.00							
External dose rate	mGy/d	Xdrat40	9.6E-04						=Xgrat*24*fts40/1000	
Internal plus external	mGy/d	tdrat40	1.6E-03						=SUM(ldrat40)+Xdrat40	
Absorbed Doses - Wolf - LSA										
Concentration	Bq/g	Crad41	1.16E-05	9.61E-06	6.02E-06	3.68E-06	1.90E-03			
Internal dose rate	mGy/d	ldrat41	1.6E-06	6.3E-07	9.6E-07	2.2E-08	1.4E-04	1.4E-04	=Crad41*ldcf	
Fraction of time on site	-	fts41	1.00							
External dose rate	mGy/d	Xdrat41	9.6E-04						=Xgrat*24*fts41/1000	
Internal plus external	mGy/d	tdrat41	1.1E-03						=SUM(ldrat41)+Xdrat41	
Absorbed Doses - Wolf - RSA										
Concentration	Bq/g	Crad42	1.16E-05	9.60E-06	6.02E-06	3.68E-06	1.90E-03			
Internal dose rate	mGy/d	ldrat42	1.6E-06	6.3E-07	9.6E-07	2.2E-08	1.4E-04	1.4E-04	=Crad42*ldcf	
Fraction of time on site	-	fts42	1.00							
External dose rate	mGy/d	Xdrat42	9.6E-04						=Xgrat*24*fts42/1000	
Internal plus external	mGy/d	tdrat42	1.1E-03						=SUM(ldrat42)+Xdrat42	
Absorbed Doses - Wolverine - LSA										
Concentration	Bq/g	Crad43	1.56E-05	3.36E-05	5.34E-05	1.05E-04	4.77E-04			
Internal dose rate	mGy/d	ldrat43	2.2E-06	2.2E-06	8.5E-06	6.3E-07	3.5E-05	4.9E-05	=Crad43*ldcf	
Fraction of time on site	-	fts43	1.00							
External dose rate	mGy/d	Xdrat43	9.6E-04						=Xgrat*24*fts43/1000	
Internal plus external	mGy/d	tdrat43	1.0E-03						=SUM(ldrat43)+Xdrat43	
Absorbed Doses - Wolverine - RSA										
Concentration	Bq/g	Crad44	1.56E-05	3.37E-05	5.34E-05	1.05E-04	4.77E-04			
Internal dose rate	mGy/d	ldrat44	2.2E-06	2.2E-06	8.5E-06	6.3E-07	3.5E-05	4.9E-05	=Crad44*ldcf	
Fraction of time on site	-	fts44	1.00							
External dose rate	mGy/d	Xdrat44	9.6E-04						=Xgrat*24*fts44/1000	
Internal plus external	mGy/d	tdrat44	1.0E-03						=SUM(ldrat44)+Xdrat44	
Equivalent Doses - Bear - LSA										
RBE for alpha	Sv/Gy	RBE	40							
High LET dose rate	mSv/d	Hletdr	7.2E-05	8.8E-05	1.4E-04	3.2E-07	5.3E-03	5.6E-03	=ldrat*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr	9.6E-04						=Xdrat	
Total dose rate	mSv/d	tdr	6.6E-03						=SUM(Hletdr)+Lletdr	
Equivalent Doses - Caribou - LSA										
High LET dose rate	mSv/d	Hletdr2	1.7E-04	1.2E-04	5.5E-04	5.5E-06	7.1E-02	7.2E-02	=ldrat2*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr2	9.6E-04						=Xdrat2	
Total dose rate	mSv/d	tdr2	7.3E-02						=SUM(Hletdr2)+Lletdr2	
Equivalent Doses - Caribou - RSA										
High LET dose rate	mSv/d	Hletdr3	1.7E-04	1.2E-04	5.5E-04	5.5E-06	7.1E-02	7.2E-02	=ldrat3*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr3	9.6E-04						=Xdrat3	
Total dose rate	mSv/d	tdr3	7.3E-02						=SUM(Hletdr3)+Lletdr3	
Equivalent Doses - Falcon - LSA										
High LET dose rate	mSv/d	Hletdr4	2.2E-05	3.2E-04	2.5E-03	8.1E-04	4.3E-02	4.7E-02	=ldrat4*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr4	9.6E-04						=Xdrat4	
Total dose rate	mSv/d	tdr4	4.8E-02						=SUM(Hletdr4)+Lletdr4	
Equivalent Doses - Falcon - RSA										
High LET dose rate	mSv/d	Hletdr5	2.2E-05	3.2E-04	2.5E-03	8.1E-04	4.3E-02	4.7E-02	=ldrat5*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr5	9.6E-04						=Xdrat5	
Total dose rate	mSv/d	tdr5	4.8E-02						=SUM(Hletdr5)+Lletdr5	
Equivalent Doses - Fox - LSA										
High LET dose rate	mSv/d	Hletdr6	4.7E-05	6.5E-05	3.4E-04	7.7E-07	3.2E-03	3.7E-03	=ldrat6*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr6	9.6E-04						=Xdrat6	
Total dose rate	mSv/d	tdr6	4.6E-03						=SUM(Hletdr6)+Lletdr6	
Equivalent Doses - Lemming - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr7	1.8E-04	3.0E-03	1.4E-02	2.8E-04	1.8E-02	3.6E-02	=ldrat7*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr7	9.6E-04						=Xdrat7	
Total dose rate	mSv/d	tdr7	3.7E-02						=SUM(Hletdr7)+Lletdr7	
Equivalent Doses - Lemming - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr8	1.8E-04	3.0E-03	1.4E-02	2.8E-04	1.8E-02	3.6E-02	=ldrat8*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr8	9.6E-04						=Xdrat8	
Total dose rate	mSv/d	tdr8	3.7E-02						=SUM(Hletdr8)+Lletdr8	
Equivalent Doses - Lemming - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr9	1.9E-04	3.0E-03	1.4E-02	2.9E-04	1.8E-02	3.6E-02	=ldrat9*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr9	9.6E-04						=Xdrat9	
Total dose rate	mSv/d	tdr9	3.7E-02						=SUM(Hletdr9)+Lletdr9	
Equivalent Doses - Lemming - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr10	1.8E-04	3.0E-03	1.4E-02	2.8E-04	1.8E-02	3.6E-02	=ldrat10*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr10	9.6E-04						=Xdrat10	
Total dose rate	mSv/d	tdr10	3.7E-02						=SUM(Hletdr10)+Lletdr10	

Table H.2-4

Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

Equivalent Doses - Lapland Longspur - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr11	6.5E-05	2.0E-03	1.0E-02	2.1E-04	3.8E-02	5.0E-02	=ldrat11*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr11	9.6E-04						=Xdrat11	
Total dose rate	mSv/d	tdr11	5.1E-02						=SUM(Hletdr11)+Lletdr11	
Equivalent Doses - Lapland Longspur - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr12	7.2E-05	2.0E-03	1.0E-02	2.2E-04	3.9E-02	5.2E-02	=ldrat12*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr12	9.6E-04						=Xdrat12	
Total dose rate	mSv/d	tdr12	5.3E-02						=SUM(Hletdr12)+Lletdr12	
Equivalent Doses - Lapland Longspur - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr13	2.0E-05	2.0E-03	9.8E-03	2.1E-04	3.7E-02	4.9E-02	=ldrat13*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr13	9.6E-04						=Xdrat13	
Total dose rate	mSv/d	tdr13	5.0E-02						=SUM(Hletdr13)+Lletdr13	
Equivalent Doses - Lapland Longspur - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr14	6.7E-05	2.0E-03	1.0E-02	2.1E-04	3.8E-02	5.0E-02	=ldrat14*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr14	9.6E-04						=Xdrat14	
Total dose rate	mSv/d	tdr14	5.1E-02						=SUM(Hletdr14)+Lletdr14	
Equivalent Doses - Long-Tailed Duck - Rock Lake										
High LET dose rate	mSv/d	Hletdr15	1.1E-04	5.3E-04	1.5E-02	1.2E-04	4.6E-02	6.1E-02	=ldrat15*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr15	9.6E-04						=Xdrat15	
Total dose rate	mSv/d	tdr15	6.2E-02						=SUM(Hletdr15)+Lletdr15	
Equivalent Doses - Long-Tailed Duck - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr16	1.1E-04	5.1E-04	1.4E-02	1.2E-04	4.4E-02	5.9E-02	=ldrat16*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr16	9.6E-04						=Xdrat16	
Total dose rate	mSv/d	tdr16	6.0E-02						=SUM(Hletdr16)+Lletdr16	
Equivalent Doses - Long-Tailed Duck - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr17	1.0E-04	5.1E-04	1.4E-02	1.2E-04	4.4E-02	5.9E-02	=ldrat17*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr17	9.6E-04						=Xdrat17	
Total dose rate	mSv/d	tdr17	6.0E-02						=SUM(Hletdr17)+Lletdr17	
Equivalent Doses - Merganser - Rock Lake										
High LET dose rate	mSv/d	Hletdr18	1.3E-05	2.2E-04	7.9E-04	3.8E-05	6.3E-03	7.3E-03	=ldrat18*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr18	9.6E-04						=Xdrat18	
Total dose rate	mSv/d	tdr18	8.3E-03						=SUM(Hletdr18)+Lletdr18	
Equivalent Doses - Merganser - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr19	1.3E-05	2.1E-04	7.5E-04	3.7E-05	5.9E-03	6.9E-03	=ldrat19*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr19	9.6E-04						=Xdrat19	
Total dose rate	mSv/d	tdr19	7.9E-03						=SUM(Hletdr19)+Lletdr19	
Equivalent Doses - Merganser - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr20	1.3E-05	2.1E-04	7.5E-04	3.7E-05	6.0E-03	7.0E-03	=ldrat20*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr20	9.6E-04						=Xdrat20	
Total dose rate	mSv/d	tdr20	8.0E-03						=SUM(Hletdr20)+Lletdr20	
Equivalent Doses - Muskox - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr21	1.8E-04	1.3E-04	4.5E-04	1.3E-06	2.0E-02	2.1E-02	=ldrat21*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr21	9.6E-04						=Xdrat21	
Total dose rate	mSv/d	tdr21	2.2E-02						=SUM(Hletdr21)+Lletdr21	
Equivalent Doses - Muskox - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr22	6.7E-05	2.0E-03	1.0E-02	2.1E-04	3.8E-02	5.0E-02	=ldrat22*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr22	9.6E-04						=Xdrat22	
Total dose rate	mSv/d	tdr22	5.1E-02						=SUM(Hletdr22)+Lletdr22	
Equivalent Doses - Northern Pintail - Rock Lake										
High LET dose rate	mSv/d	Hletdr23	4.1E-05	3.0E-03	4.2E-03	3.2E-04	5.2E-02	6.0E-02	=ldrat23*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr23	9.6E-04						=Xdrat23	
Total dose rate	mSv/d	tdr23	6.1E-02						=SUM(Hletdr23)+Lletdr23	
Equivalent Doses - Northern Pintail - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr24	3.9E-05	2.9E-03	4.0E-03	3.0E-04	5.0E-02	5.7E-02	=ldrat24*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr24	9.6E-04						=Xdrat24	
Total dose rate	mSv/d	tdr24	5.8E-02						=SUM(Hletdr24)+Lletdr24	
Equivalent Doses - Northern Pintail - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr25	3.8E-05	2.9E-03	4.1E-03	3.1E-04	5.0E-02	5.8E-02	=ldrat25*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr25	9.6E-04						=Xdrat25	
Total dose rate	mSv/d	tdr25	5.8E-02						=SUM(Hletdr25)+Lletdr25	
Equivalent Doses - Ptarmigan - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr26	6.5E-05	5.9E-04	4.2E-03	8.3E-04	1.4E-01	1.5E-01	=ldrat26*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr26	9.6E-04						=Xdrat26	
Total dose rate	mSv/d	tdr26	1.5E-01						=SUM(Hletdr26)+Lletdr26	
Equivalent Doses - Ptarmigan - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr27	6.8E-05	6.0E-04	4.3E-03	8.3E-04	1.4E-01	1.5E-01	=ldrat27*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr27	9.6E-04						=Xdrat27	
Total dose rate	mSv/d	tdr27	1.5E-01						=SUM(Hletdr27)+Lletdr27	

Table H.2-4

Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

Equivalent Doses - Ptarmigan - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr28	5.4E-05	6.0E-04	4.2E-03	8.3E-04	1.4E-01	1.5E-01	=Idrat28*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr28	9.6E-04						=Xdrat28	
Total dose rate	mSv/d	tdr28	1.5E-01						=SUM(Hletdr28)+Lletdr28	
Equivalent Doses - Ptarmigan - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr29	6.6E-05	5.9E-04	4.2E-03	8.3E-04	1.4E-01	1.5E-01	=Idrat29*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr29	9.6E-04						=Xdrat29	
Total dose rate	mSv/d	tdr29	1.5E-01						=SUM(Hletdr29)+Lletdr29	
Equivalent Doses - Sandpiper - Rock Lake										
High LET dose rate	mSv/d	Hletdr30	2.8E-04	2.0E-03	2.5E-02	3.4E-04	1.0E-01	1.3E-01	=Idrat30*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr30	9.6E-04						=Xdrat30	
Total dose rate	mSv/d	tdr30	1.3E-01						=SUM(Hletdr30)+Lletdr30	
Equivalent Doses - Sandpiper - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr31	2.7E-04	2.0E-03	2.4E-02	3.3E-04	9.8E-02	1.2E-01	=Idrat31*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr31	9.6E-04						=Xdrat31	
Total dose rate	mSv/d	tdr31	1.3E-01						=SUM(Hletdr31)+Lletdr31	
Equivalent Doses - Sandpiper - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr32	2.6E-04	2.0E-03	2.4E-02	3.3E-04	9.9E-02	1.3E-01	=Idrat32*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr32	9.6E-04						=Xdrat32	
Total dose rate	mSv/d	tdr32	1.3E-01						=SUM(Hletdr32)+Lletdr32	
Equivalent Doses - Shrew - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr33	1.9E-04	5.0E-04	8.1E-03	6.8E-05	6.1E-03	1.5E-02	=Idrat33*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr33	9.6E-04						=Xdrat33	
Total dose rate	mSv/d	tdr33	1.6E-02						=SUM(Hletdr33)+Lletdr33	
Equivalent Doses - Shrew - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr34	2.1E-04	5.3E-04	8.7E-03	6.8E-05	6.3E-03	1.6E-02	=Idrat34*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr34	9.6E-04						=Xdrat34	
Total dose rate	mSv/d	tdr34	1.7E-02						=SUM(Hletdr34)+Lletdr34	
Equivalent Doses - Shrew - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr35	1.8E-05	4.9E-04	7.5E-03	6.7E-05	6.1E-03	1.4E-02	=Idrat35*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr35	9.6E-04						=Xdrat35	
Total dose rate	mSv/d	tdr35	1.5E-02						=SUM(Hletdr35)+Lletdr35	
Equivalent Doses - Shrew - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr36	1.9E-04	5.0E-04	8.0E-03	6.8E-05	6.2E-03	1.5E-02	=Idrat36*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr36	2.7E-04						=Xdrat36	
Total dose rate	mSv/d	tdr36	1.5E-02						=SUM(Hletdr36)+Lletdr36	
Equivalent Doses - Squirrel - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr37	1.5E-04	2.6E-03	9.4E-03	1.2E-04	6.9E-03	1.9E-02	=Idrat37*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr37	9.6E-04						=Xdrat37	
Total dose rate	mSv/d	tdr37	2.0E-02						=SUM(Hletdr37)+Lletdr37	
Equivalent Doses - Squirrel - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr38	1.5E-04	2.6E-03	9.4E-03	1.2E-04	6.9E-03	1.9E-02	=Idrat38*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr38	9.6E-04						=Xdrat38	
Total dose rate	mSv/d	tdr38	2.0E-02						=SUM(Hletdr38)+Lletdr38	
Equivalent Doses - Squirrel - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr39	1.6E-04	2.6E-03	9.4E-03	1.2E-04	6.9E-03	1.9E-02	=Idrat39*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr39	9.6E-04						=Xdrat39	
Total dose rate	mSv/d	tdr39	2.0E-02						=SUM(Hletdr39)+Lletdr39	
Equivalent Doses - Squirrel - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr40	1.5E-04	2.6E-03	9.4E-03	1.2E-04	6.9E-03	1.9E-02	=Idrat40*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr40	9.6E-04						=Xdrat40	
Total dose rate	mSv/d	tdr40	2.0E-02						=SUM(Hletdr40)+Lletdr40	
Equivalent Doses - Wolf - LSA										
High LET dose rate	mSv/d	Hletdr41	6.6E-05	2.5E-05	3.8E-05	2.2E-08	5.6E-03	5.8E-03	=Idrat41*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr41	9.6E-04						=Xdrat41	
Total dose rate	mSv/d	tdr41	6.7E-03						=SUM(Hletdr41)+Lletdr41	
Equivalent Doses - Wolf - RSA										
High LET dose rate	mSv/d	Hletdr42	6.6E-05	2.5E-05	3.8E-05	2.2E-08	5.6E-03	5.8E-03	=Idrat42*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr42	9.6E-04						=Xdrat42	
Total dose rate	mSv/d	tdr42	6.7E-03						=SUM(Hletdr42)+Lletdr42	
Equivalent Doses - Wolverine - LSA										
High LET dose rate	mSv/d	Hletdr43	8.9E-05	8.9E-05	3.4E-04	6.3E-07	1.4E-03	1.9E-03	=Idrat43*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr43	9.6E-04						=Xdrat43	
Total dose rate	mSv/d	tdr43	2.9E-03						=SUM(Hletdr43)+Lletdr43	
Equivalent Doses - Wolverine - RSA										
High LET dose rate	mSv/d	Hletdr44	8.9E-05	8.9E-05	3.4E-04	6.3E-07	1.4E-03	1.9E-03	=Idrat44*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr44	9.6E-04						=Xdrat44	
Total dose rate	mSv/d	tdr44	2.9E-03						=SUM(Hletdr44)+Lletdr44	

Table H.2-4
Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

SUMMARY

3 Screening Criterion in mGy/d	Total Absorbed Dose mGy/d	Total Equivalent Dose mSv/d	Index (Absorbed Dose)	Index (Equivalent Dose)
Bear - LSA	1.1E-03	6.6E-03	3.7E-04	2.2E-03
Caribou - LSA	2.8E-03	7.3E-02	9.2E-04	2.4E-02
Caribou - RSA	2.8E-03	7.3E-02	9.2E-04	2.4E-02
Falcon - LSA	2.9E-03	4.8E-02	9.8E-04	1.6E-02
Falcon - RSA	2.9E-03	4.8E-02	9.8E-04	1.6E-02
Fox - LSA	1.1E-03	4.6E-03	3.5E-04	1.5E-03
Lemming - Rock Lake Watershed	2.1E-03	3.7E-02	7.1E-04	1.2E-02
Lemming - JSL @ Kiggavik Discharge	2.1E-03	3.7E-02	7.1E-04	1.2E-02
Lemming - Kiggavik Camp	2.1E-03	3.7E-02	7.1E-04	1.2E-02
Lemming - JSL @ Sissons Discharge	2.1E-03	3.7E-02	7.1E-04	1.2E-02
Lapland Longspur - Rock Lake Watershed	2.4E-03	5.1E-02	8.1E-04	1.7E-02
Lapland Longspur - JSL @ Kiggavik Discharge	2.5E-03	5.3E-02	8.2E-04	1.8E-02
Lapland Longspur - Kiggavik Camp	2.4E-03	5.0E-02	8.0E-04	1.7E-02
Lapland Longspur - JSL @ Sissons Discharge	2.4E-03	5.1E-02	8.1E-04	1.7E-02
Long-Tailed Duck - Rock Lake	2.6E-03	6.2E-02	8.7E-04	2.1E-02
Long-Tailed Duck - JSL @ Kiggavik Discharge	2.5E-03	6.0E-02	8.5E-04	2.0E-02
Long-Tailed Duck - JSL @ Sissons Discharge	2.6E-03	6.0E-02	8.5E-04	2.0E-02
Merganser - Rock Lake	1.2E-03	8.3E-03	3.9E-04	2.8E-03
Merganser - JSL @ Kiggavik Discharge	1.2E-03	7.9E-03	3.9E-04	2.6E-03
Merganser - JSL @ Sissons Discharge	1.2E-03	8.0E-03	3.9E-04	2.7E-03
Muskox - JSL @ Kiggavik Discharge	1.5E-03	2.2E-02	5.0E-04	7.4E-03
Muskox - JSL @ Sissons Discharge	2.4E-03	5.1E-02	8.1E-04	1.7E-02
Northern Pintail - Rock Lake	2.8E-03	6.1E-02	9.2E-04	2.0E-02
Northern Pintail - JSL @ Kiggavik Discharge	2.7E-03	5.8E-02	8.9E-04	1.9E-02
Northern Pintail - JSL @ Sissons Discharge	2.7E-03	5.8E-02	9.0E-04	1.9E-02
Ptarmigan - Rock Lake Watershed	5.4E-03	1.5E-01	1.8E-03	4.9E-02
Ptarmigan - JSL @ Kiggavik Discharge	5.4E-03	1.5E-01	1.8E-03	4.9E-02
Ptarmigan - Kiggavik Camp	5.4E-03	1.5E-01	1.8E-03	4.9E-02
Ptarmigan - JSL @ Sissons Discharge	5.4E-03	1.5E-01	1.8E-03	4.9E-02
Sandpiper - Rock Lake	4.5E-03	1.3E-01	1.5E-03	4.4E-02
Sandpiper - JSL @ Kiggavik Discharge	4.4E-03	1.3E-01	1.5E-03	4.2E-02
Sandpiper - JSL @ Sissons Discharge	4.4E-03	1.3E-01	1.5E-03	4.2E-02
Shrew - Rock Lake Watershed	1.4E-03	1.6E-02	4.7E-04	5.3E-03
Shrew - JSL @ Kiggavik Discharge	1.4E-03	1.7E-02	4.7E-04	5.6E-03
Shrew - Kiggavik Camp	1.4E-03	1.5E-02	4.6E-04	5.0E-03
Shrew - JSL @ Sissons Discharge	7.1E-04	1.5E-02	2.4E-04	5.1E-03
Squirrel - Rock Lake Watershed	1.6E-03	2.0E-02	5.2E-04	6.7E-03
Squirrel - JSL @ Kiggavik Discharge	1.6E-03	2.0E-02	5.2E-04	6.7E-03
Squirrel - Kiggavik Camp	1.6E-03	2.0E-02	5.2E-04	6.8E-03
Squirrel - JSL @ Sissons Discharge	1.6E-03	2.0E-02	5.2E-04	6.7E-03
Wolf - LSA	1.1E-03	6.7E-03	3.7E-04	2.2E-03
Wolf - RSA	1.1E-03	6.7E-03	3.7E-04	2.2E-03
Wolverine - LSA	1.0E-03	2.9E-03	3.4E-04	9.6E-04
Wolverine - RSA	1.0E-03	2.9E-03	3.4E-04	9.6E-04

U-238+ Internal U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235
Ra-226+ Internal Ra-226 + 0.3* (Rn-222 + ...Po-214)
Pb-210+ Internal Pb-210 + Bi-210

Table H.2-4

Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

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DOSES TO SELECTED VECs - 95th Percentile Total Dose

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals		
Absorbed Doses - Bear - LSA										
Concentration	Bq/g	Crad	3.88E-05	1.51E-04	6.99E-05	1.74E-04	6.44E-03			
Internal Dose Factor	mGy/d per Bq/g	ldcf	1.4E-01	6.6E-02	1.6E-01	6.0E-03	7.4E-02			
Internal dose rate	mGy/d	ldrat	5.5E-06	9.9E-06	1.1E-05	1.1E-06	4.8E-04	5.0E-04	=Crad*ldcf	
External Gamma rate	uGy/h	Xgrat	0.04							
Fraction of time on site	-	fts	1.00							
External dose rate	mGy/d	Xdrat	9.6E-04						=Xgrat*24*fts/1000	
Internal plus external	mGy/d	tdrat	1.5E-03						=SUM(ldrat)+Xdrat	
Absorbed Doses - Caribou - LSA										
Concentration	Bq/g	Crad2	8.62E-05	1.33E-04	2.95E-04	2.53E-03	7.65E-02			
Internal dose rate	mGy/d	ldrat2	1.2E-05	8.7E-06	4.7E-05	1.5E-05	5.7E-03	5.7E-03	=Crad2*ldcf	
Fraction of time on site	-	fts2	1.00							
External dose rate	mGy/d	Xdrat2	9.6E-04						=Xgrat*24*fts2/1000	
Internal plus external	mGy/d	tdrat2	6.7E-03						=SUM(ldrat2)+Xdrat2	
Absorbed Doses - Caribou - RSA										
Concentration	Bq/g	Crad3	8.62E-05	1.33E-04	2.95E-04	2.53E-03	7.65E-02			
Internal dose rate	mGy/d	ldrat3	1.2E-05	8.7E-06	4.7E-05	1.5E-05	5.7E-03	5.7E-03	=Crad3*ldcf	
Fraction of time on site	-	fts3	1.00							
External dose rate	mGy/d	Xdrat3	9.6E-04						=Xgrat*24*fts3/1000	
Internal plus external	mGy/d	tdrat3	6.7E-03						=SUM(ldrat3)+Xdrat3	
Absorbed Doses - Falcon - LSA										
Concentration	Bq/g	Crad4	1.15E-05	3.57E-04	1.38E-03	4.40E-01	5.01E-02			
Internal dose rate	mGy/d	ldrat4	1.6E-06	2.3E-05	2.2E-04	2.7E-03	3.7E-03	6.6E-03	=Crad4*ldcf	
Fraction of time on site	-	fts4	1.00							
External dose rate	mGy/d	Xdrat4	9.6E-04						=Xgrat*24*fts4/1000	
Internal plus external	mGy/d	tdrat4	7.6E-03						=SUM(ldrat4)+Xdrat4	
Absorbed Doses - Falcon - RSA										
Concentration	Bq/g	Crad5	1.14E-05	3.56E-04	1.38E-03	4.40E-01	5.00E-02			
Internal dose rate	mGy/d	ldrat5	1.6E-06	2.3E-05	2.2E-04	2.7E-03	3.7E-03	6.6E-03	=Crad5*ldcf	
Fraction of time on site	-	fts5	1.00							
External dose rate	mGy/d	Xdrat5	9.6E-04						=Xgrat*24*fts5/1000	
Internal plus external	mGy/d	tdrat5	7.6E-03						=SUM(ldrat5)+Xdrat5	
Absorbed Doses - Fox - LSA										
Concentration	Bq/g	Crad6	2.02E-05	7.95E-05	1.30E-04	5.17E-04	3.66E-03			
Internal dose rate	mGy/d	ldrat6	2.9E-06	5.2E-06	2.1E-05	3.1E-06	2.7E-04	3.0E-04	=Crad6*ldcf	
Fraction of time on site	-	fts6	1.00							
External dose rate	mGy/d	Xdrat6	9.6E-04						=Xgrat*24*fts6/1000	
Internal plus external	mGy/d	tdrat6	1.3E-03						=SUM(ldrat6)+Xdrat6	
Absorbed Doses - Lemming - Rock Lake Watershed										
Concentration	Bq/g	Crad7	1.50E-04	3.56E-03	6.36E-03	1.69E-01	2.09E-02			
Internal dose rate	mGy/d	ldrat7	2.1E-05	2.3E-04	1.0E-03	1.0E-03	1.5E-03	3.8E-03	=Crad7*ldcf	
Fraction of time on site	-	fts7	1.00							
External dose rate	mGy/d	Xdrat7	9.6E-04						=Xgrat*24*fts7/1000	
Internal plus external	mGy/d	tdrat7	4.8E-03						=SUM(ldrat7)+Xdrat7	
Absorbed Doses - Lemming - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad8	1.50E-04	3.56E-03	6.36E-03	1.69E-01	2.09E-02			
Internal dose rate	mGy/d	ldrat8	2.1E-05	2.3E-04	1.0E-03	1.0E-03	1.5E-03	3.8E-03	=Crad8*ldcf	
Fraction of time on site	-	fts8	1.00							
External dose rate	mGy/d	Xdrat8	9.6E-04						=Xgrat*24*fts8/1000	
Internal plus external	mGy/d	tdrat8	4.8E-03						=SUM(ldrat8)+Xdrat8	
Absorbed Doses - Lemming - Kiggavik Camp										
Concentration	Bq/g	Crad9	1.53E-04	3.58E-03	6.37E-03	1.69E-01	2.09E-02			
Internal dose rate	mGy/d	ldrat9	2.2E-05	2.4E-04	1.0E-03	1.0E-03	1.5E-03	3.8E-03	=Crad9*ldcf	
Fraction of time on site	-	fts9	1.00							
External dose rate	mGy/d	Xdrat9	9.6E-04						=Xgrat*24*fts9/1000	
Internal plus external	mGy/d	tdrat9	4.8E-03						=SUM(ldrat9)+Xdrat9	
Absorbed Doses - Lemming - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad10	1.51E-04	3.56E-03	6.36E-03	1.69E-01	2.09E-02			
Internal dose rate	mGy/d	ldrat10	2.1E-05	2.3E-04	1.0E-03	1.0E-03	1.5E-03	3.8E-03	=Crad10*ldcf	
Fraction of time on site	-	fts10	1.00							
External dose rate	mGy/d	Xdrat10	9.6E-04						=Xgrat*24*fts10/1000	
Internal plus external	mGy/d	tdrat10	4.8E-03						=SUM(ldrat10)+Xdrat10	
Absorbed Doses - Lapland Longspur - Rock Lake Watershed										
Concentration	Bq/g	Crad11	4.07E-05	3.37E-03	5.24E-03	1.35E-01	3.62E-02			
Internal dose rate	mGy/d	ldrat11	5.8E-06	2.2E-04	8.3E-04	8.1E-04	2.7E-03	4.6E-03	=Crad11*ldcf	
Fraction of time on site	-	fts11	1.00							
External dose rate	mGy/d	Xdrat11	9.6E-04						=Xgrat*24*fts11/1000	
Internal plus external	mGy/d	tdrat11	5.5E-03						=SUM(ldrat11)+Xdrat11	

Table H.2-4

Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

Absorbed Doses - Lapland Longspur - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad12	4.40E-05	3.38E-03	5.39E-03	1.36E-01	3.72E-02			
Internal dose rate	mGy/d	ldrat12	6.2E-06	2.2E-04	8.6E-04	8.2E-04	2.8E-03	4.7E-03	=Crad12*ldcf	
Fraction of time on site	-	fts12	1.00							
External dose rate	mGy/d	Xdrat12	9.6E-04						=Xgrat*24*fts12/1000	
Internal plus external	mGy/d	tdrat12	5.6E-03						=SUM(ldrat12)+Xdrat12	
Absorbed Doses - Lapland Longspur - Kiggavik Camp										
Concentration	Bq/g	Crad13	1.30E-05	3.38E-03	5.10E-03	1.34E-01	3.57E-02			
Internal dose rate	mGy/d	ldrat13	1.8E-06	2.2E-04	8.1E-04	8.1E-04	2.6E-03	4.5E-03	=Crad13*ldcf	
Fraction of time on site	-	fts13	1.00							
External dose rate	mGy/d	Xdrat13	9.6E-04						=Xgrat*24*fts13/1000	
Internal plus external	mGy/d	tdrat13	5.4E-03						=SUM(ldrat13)+Xdrat13	
Absorbed Doses - Lapland Longspur - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad14	4.08E-05	3.37E-03	5.22E-03	1.35E-01	3.64E-02			
Internal dose rate	mGy/d	ldrat14	5.8E-06	2.2E-04	8.3E-04	8.1E-04	2.7E-03	4.6E-03	=Crad14*ldcf	
Fraction of time on site	-	fts14	1.00							
External dose rate	mGy/d	Xdrat14	9.6E-04						=Xgrat*24*fts14/1000	
Internal plus external	mGy/d	tdrat14	5.5E-03						=SUM(ldrat14)+Xdrat14	
Absorbed Doses - Long-Tailed Duck - Rock Lake										
Concentration	Bq/g	Crad15	5.55E-05	6.03E-04	9.26E-03	6.39E-02	5.78E-02			
Internal dose rate	mGy/d	ldrat15	7.9E-06	4.0E-05	1.5E-03	3.9E-04	4.3E-03	6.2E-03	=Crad15*ldcf	
Fraction of time on site	-	fts15	1.00							
External dose rate	mGy/d	Xdrat15	9.6E-04						=Xgrat*24*fts15/1000	
Internal plus external	mGy/d	tdrat15	7.1E-03						=SUM(ldrat15)+Xdrat15	
Absorbed Doses - Long-Tailed Duck - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad16	5.74E-05	5.83E-04	8.89E-03	6.15E-02	5.54E-02			
Internal dose rate	mGy/d	ldrat16	8.2E-06	3.8E-05	1.4E-03	3.7E-04	4.1E-03	5.9E-03	=Crad16*ldcf	
Fraction of time on site	-	fts16	1.00							
External dose rate	mGy/d	Xdrat16	9.6E-04						=Xgrat*24*fts16/1000	
Internal plus external	mGy/d	tdrat16	6.9E-03						=SUM(ldrat16)+Xdrat16	
Absorbed Doses - Long-Tailed Duck - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad17	5.29E-05	5.85E-04	8.94E-03	6.18E-02	5.58E-02			
Internal dose rate	mGy/d	ldrat17	7.5E-06	3.9E-05	1.4E-03	3.7E-04	4.1E-03	6.0E-03	=Crad17*ldcf	
Fraction of time on site	-	fts17	1.00							
External dose rate	mGy/d	Xdrat17	9.6E-04						=Xgrat*24*fts17/1000	
Internal plus external	mGy/d	tdrat17	6.9E-03						=SUM(ldrat17)+Xdrat17	
Absorbed Doses - Merganser - Rock Lake										
Concentration	Bq/g	Crad18	7.69E-06	3.15E-04	3.99E-04	1.98E-02	7.05E-03			
Internal dose rate	mGy/d	ldrat18	1.1E-06	2.1E-05	6.3E-05	1.2E-04	5.2E-04	7.3E-04	=Crad18*ldcf	
Fraction of time on site	-	fts18	1.00							
External dose rate	mGy/d	Xdrat18	9.6E-04						=Xgrat*24*fts18/1000	
Internal plus external	mGy/d	tdrat18	1.7E-03						=SUM(ldrat18)+Xdrat18	
Absorbed Doses - Merganser - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad19	7.66E-06	3.08E-04	3.71E-04	1.97E-02	6.67E-03			
Internal dose rate	mGy/d	ldrat19	1.1E-06	2.0E-05	5.9E-05	1.2E-04	4.9E-04	6.9E-04	=Crad19*ldcf	
Fraction of time on site	-	fts19	1.00							
External dose rate	mGy/d	Xdrat19	9.6E-04						=Xgrat*24*fts19/1000	
Internal plus external	mGy/d	tdrat19	1.7E-03						=SUM(ldrat19)+Xdrat19	
Absorbed Doses - Merganser - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad20	7.65E-06	3.09E-04	3.73E-04	1.97E-02	6.68E-03			
Internal dose rate	mGy/d	ldrat20	1.1E-06	2.0E-05	5.9E-05	1.2E-04	4.9E-04	6.9E-04	=Crad20*ldcf	
Fraction of time on site	-	fts20	1.00							
External dose rate	mGy/d	Xdrat20	9.6E-04						=Xgrat*24*fts20/1000	
Internal plus external	mGy/d	tdrat20	1.7E-03						=SUM(ldrat20)+Xdrat20	
Absorbed Doses - Muskox - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad21	1.18E-04	1.86E-04	2.87E-04	6.77E-04	2.04E-02			
Internal dose rate	mGy/d	ldrat21	1.7E-05	1.2E-05	4.6E-05	4.1E-06	1.5E-03	1.6E-03	=Crad21*ldcf	
Fraction of time on site	-	fts21	1.00							
External dose rate	mGy/d	Xdrat21	9.6E-04						=Xgrat*24*fts21/1000	
Internal plus external	mGy/d	tdrat21	2.6E-03						=SUM(ldrat21)+Xdrat21	
Absorbed Doses - Muskox - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad22	4.08E-05	3.37E-03	5.22E-03	1.35E-01	3.64E-02			
Internal dose rate	mGy/d	ldrat22	5.8E-06	2.2E-04	8.3E-04	8.1E-04	2.7E-03	4.6E-03	=Crad22*ldcf	
Fraction of time on site	-	fts22	1.00							
External dose rate	mGy/d	Xdrat22	9.6E-04						=Xgrat*24*fts22/1000	
Internal plus external	mGy/d	tdrat22	5.5E-03						=SUM(ldrat22)+Xdrat22	
Absorbed Doses - Northern Pintail - Rock Lake										
Concentration	Bq/g	Crad23	2.34E-05	4.59E-03	2.26E-03	1.68E-01	6.11E-02			
Internal dose rate	mGy/d	ldrat23	3.3E-06	3.0E-04	3.6E-04	1.0E-03	4.5E-03	6.2E-03	=Crad23*ldcf	
Fraction of time on site	-	fts23	1.00							
External dose rate	mGy/d	Xdrat23	9.6E-04						=Xgrat*24*fts23/1000	
Internal plus external	mGy/d	tdrat23	7.2E-03						=SUM(ldrat23)+Xdrat23	

Table H.2-4
Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

Absorbed Doses - Northern Pintail - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad24	2.14E-05	4.42E-03	2.17E-03	1.62E-01	5.85E-02			
Internal dose rate	mGy/d	Idrat24	3.0E-06	2.9E-04	3.5E-04	9.8E-04	4.3E-03	5.9E-03	=Crad24*Idcf	
Fraction of time on site	-	fts24	1.00							
External dose rate	mGy/d	Xdrat24	9.6E-04						=Xgrat*24*fts24/1000	
Internal plus external	mGy/d	tdrat24	6.9E-03						=SUM(Idrat24)+Xdrat24	
Absorbed Doses - Northern Pintail - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad25	2.14E-05	4.45E-03	2.18E-03	1.63E-01	5.90E-02			
Internal dose rate	mGy/d	Idrat25	3.0E-06	2.9E-04	3.5E-04	9.8E-04	4.4E-03	6.0E-03	=Crad25*Idcf	
Fraction of time on site	-	fts25	1.00							
External dose rate	mGy/d	Xdrat25	9.6E-04						=Xgrat*24*fts25/1000	
Internal plus external	mGy/d	tdrat25	6.9E-03						=SUM(Idrat25)+Xdrat25	
Absorbed Doses - Ptarmigan - Rock Lake Watershed										
Concentration	Bq/g	Crad26	4.26E-05	9.01E-04	2.17E-03	3.89E-01	1.43E-01			
Internal dose rate	mGy/d	Idrat26	6.0E-06	5.9E-05	3.5E-04	2.3E-03	1.1E-02	1.3E-02	=Crad26*Idcf	
Fraction of time on site	-	fts26	1.00							
External dose rate	mGy/d	Xdrat26	9.6E-04						=Xgrat*24*fts26/1000	
Internal plus external	mGy/d	tdrat26	1.4E-02						=SUM(Idrat26)+Xdrat26	
Absorbed Doses - Ptarmigan - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad27	4.35E-05	9.03E-04	2.21E-03	3.89E-01	1.43E-01			
Internal dose rate	mGy/d	Idrat27	6.2E-06	5.9E-05	3.5E-04	2.3E-03	1.1E-02	1.3E-02	=Crad27*Idcf	
Fraction of time on site	-	fts27	1.00							
External dose rate	mGy/d	Xdrat27	9.6E-04						=Xgrat*24*fts27/1000	
Internal plus external	mGy/d	tdrat27	1.4E-02						=SUM(Idrat27)+Xdrat27	
Absorbed Doses - Ptarmigan - Kiggavik Camp										
Concentration	Bq/g	Crad28	3.58E-05	9.05E-04	2.10E-03	3.89E-01	1.44E-01			
Internal dose rate	mGy/d	Idrat28	5.1E-06	6.0E-05	3.3E-04	2.3E-03	1.1E-02	1.3E-02	=Crad28*Idcf	
Fraction of time on site	-	fts28	1.00							
External dose rate	mGy/d	Xdrat28	9.6E-04						=Xgrat*24*fts28/1000	
Internal plus external	mGy/d	tdrat28	1.4E-02						=SUM(Idrat28)+Xdrat28	
Absorbed Doses - Ptarmigan - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad29	4.28E-05	9.02E-04	2.16E-03	3.89E-01	1.43E-01			
Internal dose rate	mGy/d	Idrat29	6.1E-06	5.9E-05	3.4E-04	2.3E-03	1.1E-02	1.3E-02	=Crad29*Idcf	
Fraction of time on site	-	fts29	1.00							
External dose rate	mGy/d	Xdrat29	9.6E-04						=Xgrat*24*fts29/1000	
Internal plus external	mGy/d	tdrat29	1.4E-02						=SUM(Idrat29)+Xdrat29	
Absorbed Doses - Sandpiper - Rock Lake										
Concentration	Bq/g	Crad30	1.96E-04	2.14E-03	1.53E-02	1.83E-01	1.19E-01			
Internal dose rate	mGy/d	Idrat30	2.8E-05	1.4E-04	2.4E-03	1.1E-03	8.8E-03	1.3E-02	=Crad30*Idcf	
Fraction of time on site	-	fts30	1.00							
External dose rate	mGy/d	Xdrat30	9.6E-04						=Xgrat*24*fts30/1000	
Internal plus external	mGy/d	tdrat30	1.3E-02						=SUM(Idrat30)+Xdrat30	
Absorbed Doses - Sandpiper - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad31	1.85E-04	2.11E-03	1.47E-02	1.78E-01	1.14E-01			
Internal dose rate	mGy/d	Idrat31	2.6E-05	1.4E-04	2.3E-03	1.1E-03	8.5E-03	1.2E-02	=Crad31*Idcf	
Fraction of time on site	-	fts31	1.00							
External dose rate	mGy/d	Xdrat31	9.6E-04						=Xgrat*24*fts31/1000	
Internal plus external	mGy/d	tdrat31	1.3E-02						=SUM(Idrat31)+Xdrat31	
Absorbed Doses - Sandpiper - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad32	1.84E-04	2.10E-03	1.48E-02	1.78E-01	1.15E-01			
Internal dose rate	mGy/d	Idrat32	2.6E-05	1.4E-04	2.4E-03	1.1E-03	8.5E-03	1.2E-02	=Crad32*Idcf	
Fraction of time on site	-	fts32	1.00							
External dose rate	mGy/d	Xdrat32	9.6E-04						=Xgrat*24*fts32/1000	
Internal plus external	mGy/d	tdrat32	1.3E-02						=SUM(Idrat32)+Xdrat32	
Absorbed Doses - Shrew - Rock Lake Watershed										
Concentration	Bq/g	Crad33	1.03E-04	6.31E-04	4.02E-03	3.64E-02	5.70E-03			
Internal dose rate	mGy/d	Idrat33	1.5E-05	4.2E-05	6.4E-04	2.2E-04	4.2E-04	1.3E-03	=Crad33*Idcf	
Fraction of time on site	-	fts33	1.00							
External dose rate	mGy/d	Xdrat33	9.6E-04						=Xgrat*24*fts33/1000	
Internal plus external	mGy/d	tdrat33	2.3E-03						=SUM(Idrat33)+Xdrat33	
Absorbed Doses - Shrew - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad34	1.18E-04	6.72E-04	4.37E-03	3.68E-02	5.88E-03			
Internal dose rate	mGy/d	Idrat34	1.7E-05	4.4E-05	6.9E-04	2.2E-04	4.4E-04	1.4E-03	=Crad34*Idcf	
Fraction of time on site	-	fts34	1.00							
External dose rate	mGy/d	Xdrat34	9.6E-04						=Xgrat*24*fts34/1000	
Internal plus external	mGy/d	tdrat34	2.4E-03						=SUM(Idrat34)+Xdrat34	
Absorbed Doses - Shrew - Kiggavik Camp										
Concentration	Bq/g	Crad35	9.52E-06	6.00E-04	3.72E-03	3.61E-02	5.69E-03			
Internal dose rate	mGy/d	Idrat35	1.4E-06	4.0E-05	5.9E-04	2.2E-04	4.2E-04	1.3E-03	=Crad35*Idcf	
Fraction of time on site	-	fts35	1.00							
External dose rate	mGy/d	Xdrat35	9.6E-04						=Xgrat*24*fts35/1000	
Internal plus external	mGy/d	tdrat35	2.2E-03						=SUM(Idrat35)+Xdrat35	
Absorbed Doses - Shrew - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad36	1.04E-04	6.31E-04	4.01E-03	3.64E-02	5.72E-03			
Internal dose rate	mGy/d	Idrat36	1.5E-05	4.2E-05	6.4E-04	2.2E-04	4.2E-04	1.3E-03	=Crad36*Idcf	
Fraction of time on site	-	fts36	1.00							

Table H.2-4
Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

External dose rate	mGy/d	Xdrat36	2.7E-04							=Xgrat*24*fts36/3600
Internal plus external	mGy/d	tdrat36	1.6E-03							=SUM(ldrat36)+Xdrat36
Absorbed Doses - Squirrel - Rock Lake Watershed										
Concentration	Bq/g	Crad37	8.97E-05	3.42E-03	6.40E-03	8.33E-02	1.01E-02			
Internal dose rate	mGy/d	ldrat37	1.3E-05	2.3E-04	1.0E-03	5.0E-04	7.5E-04	2.5E-03		=Crad37*ldcf
Fraction of time on site	-	fts37	1.00							
External dose rate	mGy/d	Xdrat37	9.6E-04							=Xgrat*24*fts37/1000
Internal plus external	mGy/d	tdrat37	3.5E-03							=SUM(ldrat37)+Xdrat37
Absorbed Doses - Squirrel - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad38	8.96E-05	3.42E-03	6.40E-03	8.33E-02	1.01E-02			
Internal dose rate	mGy/d	ldrat38	1.3E-05	2.3E-04	1.0E-03	5.0E-04	7.5E-04	2.5E-03		=Crad38*ldcf
Fraction of time on site	-	fts38	1.00							
External dose rate	mGy/d	Xdrat38	9.6E-04							=Xgrat*24*fts38/1000
Internal plus external	mGy/d	tdrat38	3.5E-03							=SUM(ldrat38)+Xdrat38
Absorbed Doses - Squirrel - Kiggavik Camp										
Concentration	Bq/g	Crad39	9.34E-05	3.44E-03	6.43E-03	8.34E-02	1.01E-02			
Internal dose rate	mGy/d	ldrat39	1.3E-05	2.3E-04	1.0E-03	5.0E-04	7.5E-04	2.5E-03		=Crad39*ldcf
Fraction of time on site	-	fts39	1.00							
External dose rate	mGy/d	Xdrat39	9.6E-04							=Xgrat*24*fts39/1000
Internal plus external	mGy/d	tdrat39	3.5E-03							=SUM(ldrat39)+Xdrat39

Table H.2-4
Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

Absorbed Doses - Squirrel - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad40	8.98E-05	3.42E-03	6.40E-03	8.33E-02	1.01E-02			
Internal dose rate	mGy/d	Idrat40	1.3E-05	2.3E-04	1.0E-03	5.0E-04	7.5E-04	2.5E-03	=Crad40*Idcf	
Fraction of time on site	-	fts40	1.00							
External dose rate	mGy/d	Xdrat40	9.6E-04						=Xgrat*24*fts40/1000	
Internal plus external	mGy/d	tdrat40	3.5E-03						=SUM(Idrat40)+Xdrat40	
Absorbed Doses - Wolf - LSA										
Concentration	Bq/g	Crad41	4.16E-05	2.94E-05	2.20E-05	1.44E-05	7.66E-03			
Internal dose rate	mGy/d	Idrat41	5.9E-06	1.9E-06	3.5E-06	8.7E-08	5.7E-04	5.8E-04	=Crad41*Idcf	
Fraction of time on site	-	fts41	1.00							
External dose rate	mGy/d	Xdrat41	9.6E-04						=Xgrat*24*fts41/1000	
Internal plus external	mGy/d	tdrat41	1.5E-03						=SUM(Idrat41)+Xdrat41	
Absorbed Doses - Wolf - RSA										
Concentration	Bq/g	Crad42	4.16E-05	2.93E-05	2.20E-05	1.44E-05	7.66E-03			
Internal dose rate	mGy/d	Idrat42	5.9E-06	1.9E-06	3.5E-06	8.7E-08	5.7E-04	5.8E-04	=Crad42*Idcf	
Fraction of time on site	-	fts42	1.00							
External dose rate	mGy/d	Xdrat42	9.6E-04						=Xgrat*24*fts42/1000	
Internal plus external	mGy/d	tdrat42	1.5E-03						=SUM(Idrat42)+Xdrat42	
Absorbed Doses - Wolverine - LSA										
Concentration	Bq/g	Crad43	5.83E-05	1.16E-04	2.13E-04	4.70E-04	1.79E-03			
Internal dose rate	mGy/d	Idrat43	8.3E-06	7.6E-06	3.4E-05	2.8E-06	1.3E-04	1.9E-04	=Crad43*Idcf	
Fraction of time on site	-	fts43	1.00							
External dose rate	mGy/d	Xdrat43	9.6E-04						=Xgrat*24*fts43/1000	
Internal plus external	mGy/d	tdrat43	1.1E-03						=SUM(Idrat43)+Xdrat43	
Absorbed Doses - Wolverine - RSA										
Concentration	Bq/g	Crad44	5.82E-05	1.16E-04	2.13E-04	4.70E-04	1.79E-03			
Internal dose rate	mGy/d	Idrat44	8.3E-06	7.6E-06	3.4E-05	2.8E-06	1.3E-04	1.9E-04	=Crad44*Idcf	
Fraction of time on site	-	fts44	1.00							
External dose rate	mGy/d	Xdrat44	9.6E-04						=Xgrat*24*fts44/1000	
Internal plus external	mGy/d	tdrat44	1.1E-03						=SUM(Idrat44)+Xdrat44	
Equivalent Doses - Bear - LSA										
RBE for alpha	Sv/Gy	RBE	40							
High LET dose rate	mSv/d	Hletdr	2.2E-04	4.0E-04	4.4E-04	1.1E-06	1.9E-02	2.0E-02	=Idrat*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr	9.6E-04						=Xdrat	
Total dose rate	mSv/d	tdr	2.1E-02						=SUM(Hletdr)+Lletdr	
Equivalent Doses - Caribou - LSA										
High LET dose rate	mSv/d	Hletdr2	4.9E-04	3.5E-04	1.9E-03	1.5E-05	2.3E-01	2.3E-01	=Idrat2*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr2	9.6E-04						=Xdrat2	
Total dose rate	mSv/d	tdr2	2.3E-01						=SUM(Hletdr2)+Lletdr2	
Equivalent Doses - Caribou - RSA										
High LET dose rate	mSv/d	Hletdr3	4.9E-04	3.5E-04	1.9E-03	1.5E-05	2.3E-01	2.3E-01	=Idrat3*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr3	9.6E-04						=Xdrat3	
Total dose rate	mSv/d	tdr3	2.3E-01						=SUM(Hletdr3)+Lletdr3	
Equivalent Doses - Falcon - LSA										
High LET dose rate	mSv/d	Hletdr4	6.5E-05	9.4E-04	8.8E-03	2.7E-03	1.5E-01	1.6E-01	=Idrat4*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr4	9.6E-04						=Xdrat4	
Total dose rate	mSv/d	tdr4	1.6E-01						=SUM(Hletdr4)+Lletdr4	
Equivalent Doses - Falcon - RSA										
High LET dose rate	mSv/d	Hletdr5	6.5E-05	9.4E-04	8.8E-03	2.7E-03	1.5E-01	1.6E-01	=Idrat5*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr5	9.6E-04						=Xdrat5	
Total dose rate	mSv/d	tdr5	1.6E-01						=SUM(Hletdr5)+Lletdr5	
Equivalent Doses - Fox - LSA										
High LET dose rate	mSv/d	Hletdr6	1.1E-04	2.1E-04	8.3E-04	3.1E-06	1.1E-02	1.2E-02	=Idrat6*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr6	9.6E-04						=Xdrat6	
Total dose rate	mSv/d	tdr6	1.3E-02						=SUM(Hletdr6)+Lletdr6	
Equivalent Doses - Lemming - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr7	8.5E-04	9.4E-03	4.0E-02	1.0E-03	6.2E-02	1.1E-01	=Idrat7*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr7	9.6E-04						=Xdrat7	
Total dose rate	mSv/d	tdr7	1.1E-01						=SUM(Hletdr7)+Lletdr7	
Equivalent Doses - Lemming - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr8	8.5E-04	9.4E-03	4.0E-02	1.0E-03	6.2E-02	1.1E-01	=Idrat8*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr8	9.6E-04						=Xdrat8	
Total dose rate	mSv/d	tdr8	1.1E-01						=SUM(Hletdr8)+Lletdr8	
Equivalent Doses - Lemming - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr9	8.7E-04	9.4E-03	4.1E-02	1.0E-03	6.2E-02	1.1E-01	=Idrat9*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr9	9.6E-04						=Xdrat9	
Total dose rate	mSv/d	tdr9	1.1E-01						=SUM(Hletdr9)+Lletdr9	
Equivalent Doses - Lemming - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr10	8.6E-04	9.4E-03	4.0E-02	1.0E-03	6.2E-02	1.1E-01	=Idrat10*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr10	9.6E-04						=Xdrat10	
Total dose rate	mSv/d	tdr10	1.1E-01						=SUM(Hletdr10)+Lletdr10	

Table H.2-4

Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

Equivalent Doses - Lapland Longspur - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr11	2.3E-04	8.9E-03	3.3E-02	8.1E-04	1.1E-01	1.5E-01	=Idrat11*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr11	9.6E-04						=Xdrat11	
Total dose rate	mSv/d	tdr11	1.5E-01						=SUM(Hletdr11)+Lletdr11	
Equivalent Doses - Lapland Longspur - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr12	2.5E-04	8.9E-03	3.4E-02	8.2E-04	1.1E-01	1.5E-01	=Idrat12*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr12	9.6E-04						=Xdrat12	
Total dose rate	mSv/d	tdr12	1.6E-01						=SUM(Hletdr12)+Lletdr12	
Equivalent Doses - Lapland Longspur - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr13	7.4E-05	8.9E-03	3.2E-02	8.1E-04	1.1E-01	1.5E-01	=Idrat13*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr13	9.6E-04						=Xdrat13	
Total dose rate	mSv/d	tdr13	1.5E-01						=SUM(Hletdr13)+Lletdr13	
Equivalent Doses - Lapland Longspur - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr14	2.3E-04	8.9E-03	3.3E-02	8.1E-04	1.1E-01	1.5E-01	=Idrat14*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr14	9.6E-04						=Xdrat14	
Total dose rate	mSv/d	tdr14	1.5E-01						=SUM(Hletdr14)+Lletdr14	
Equivalent Doses - Long-Tailed Duck - Rock Lake										
High LET dose rate	mSv/d	Hletdr15	3.2E-04	1.6E-03	5.9E-02	3.9E-04	1.7E-01	2.3E-01	=Idrat15*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr15	9.6E-04						=Xdrat15	
Total dose rate	mSv/d	tdr15	2.3E-01						=SUM(Hletdr15)+Lletdr15	
Equivalent Doses - Long-Tailed Duck - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr16	3.3E-04	1.5E-03	5.7E-02	3.7E-04	1.6E-01	2.2E-01	=Idrat16*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr16	9.6E-04						=Xdrat16	
Total dose rate	mSv/d	tdr16	2.2E-01						=SUM(Hletdr16)+Lletdr16	
Equivalent Doses - Long-Tailed Duck - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr17	3.0E-04	1.5E-03	5.7E-02	3.7E-04	1.7E-01	2.2E-01	=Idrat17*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr17	9.6E-04						=Xdrat17	
Total dose rate	mSv/d	tdr17	2.3E-01						=SUM(Hletdr17)+Lletdr17	
Equivalent Doses - Merganser - Rock Lake										
High LET dose rate	mSv/d	Hletdr18	4.4E-05	8.3E-04	2.5E-03	1.2E-04	2.1E-02	2.4E-02	=Idrat18*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr18	9.6E-04						=Xdrat18	
Total dose rate	mSv/d	tdr18	2.5E-02						=SUM(Hletdr18)+Lletdr18	
Equivalent Doses - Merganser - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr19	4.4E-05	8.1E-04	2.4E-03	1.2E-04	2.0E-02	2.3E-02	=Idrat19*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr19	9.6E-04						=Xdrat19	
Total dose rate	mSv/d	tdr19	2.4E-02						=SUM(Hletdr19)+Lletdr19	
Equivalent Doses - Merganser - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr20	4.3E-05	8.1E-04	2.4E-03	1.2E-04	2.0E-02	2.3E-02	=Idrat20*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr20	9.6E-04						=Xdrat20	
Total dose rate	mSv/d	tdr20	2.4E-02						=SUM(Hletdr20)+Lletdr20	
Equivalent Doses - Muskox - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr21	6.7E-04	4.9E-04	1.8E-03	4.1E-06	6.1E-02	6.3E-02	=Idrat21*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr21	9.6E-04						=Xdrat21	
Total dose rate	mSv/d	tdr21	6.4E-02						=SUM(Hletdr21)+Lletdr21	
Equivalent Doses - Muskox - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr22	2.3E-04	8.9E-03	3.3E-02	8.1E-04	1.1E-01	1.5E-01	=Idrat22*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr22	9.6E-04						=Xdrat22	
Total dose rate	mSv/d	tdr22	1.5E-01						=SUM(Hletdr22)+Lletdr22	
Equivalent Doses - Northern Pintail - Rock Lake										
High LET dose rate	mSv/d	Hletdr23	1.3E-04	1.2E-02	1.4E-02	1.0E-03	1.8E-01	2.1E-01	=Idrat23*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr23	9.6E-04						=Xdrat23	
Total dose rate	mSv/d	tdr23	2.1E-01						=SUM(Hletdr23)+Lletdr23	
Equivalent Doses - Northern Pintail - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr24	1.2E-04	1.2E-02	1.4E-02	9.8E-04	1.7E-01	2.0E-01	=Idrat24*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr24	9.6E-04						=Xdrat24	
Total dose rate	mSv/d	tdr24	2.0E-01						=SUM(Hletdr24)+Lletdr24	
Equivalent Doses - Northern Pintail - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr25	1.2E-04	1.2E-02	1.4E-02	9.8E-04	1.7E-01	2.0E-01	=Idrat25*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr25	9.6E-04						=Xdrat25	
Total dose rate	mSv/d	tdr25	2.0E-01						=SUM(Hletdr25)+Lletdr25	
Equivalent Doses - Ptarmigan - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr26	2.4E-04	2.4E-03	1.4E-02	2.3E-03	4.2E-01	4.4E-01	=Idrat26*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr26	9.6E-04						=Xdrat26	
Total dose rate	mSv/d	tdr26	4.4E-01						=SUM(Hletdr26)+Lletdr26	
Equivalent Doses - Ptarmigan - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr27	2.5E-04	2.4E-03	1.4E-02	2.3E-03	4.2E-01	4.4E-01	=Idrat27*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr27	9.6E-04						=Xdrat27	
Total dose rate	mSv/d	tdr27	4.4E-01						=SUM(Hletdr27)+Lletdr27	

Table H.2-4

Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

Equivalent Doses - Ptarmigan - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr28	2.0E-04	2.4E-03	1.3E-02	2.3E-03	4.3E-01	4.4E-01	=Idrat28*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr28	9.6E-04						=Xdrat28	
Total dose rate	mSv/d	tdr28	4.4E-01						=SUM(Hletdr28)+Lletdr28	
Equivalent Doses - Ptarmigan - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr29	2.4E-04	2.4E-03	1.4E-02	2.3E-03	4.2E-01	4.4E-01	=Idrat29*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr29	9.6E-04						=Xdrat29	
Total dose rate	mSv/d	tdr29	4.4E-01						=SUM(Hletdr29)+Lletdr29	
Equivalent Doses - Sandpiper - Rock Lake										
High LET dose rate	mSv/d	Hletdr30	1.1E-03	5.6E-03	9.7E-02	1.1E-03	3.5E-01	4.6E-01	=Idrat30*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr30	9.6E-04						=Xdrat30	
Total dose rate	mSv/d	tdr30	4.6E-01						=SUM(Hletdr30)+Lletdr30	
Equivalent Doses - Sandpiper - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr31	1.1E-03	5.5E-03	9.4E-02	1.1E-03	3.4E-01	4.4E-01	=Idrat31*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr31	9.6E-04						=Xdrat31	
Total dose rate	mSv/d	tdr31	4.4E-01						=SUM(Hletdr31)+Lletdr31	
Equivalent Doses - Sandpiper - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr32	1.0E-03	5.5E-03	9.4E-02	1.1E-03	3.4E-01	4.4E-01	=Idrat32*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr32	9.6E-04						=Xdrat32	
Total dose rate	mSv/d	tdr32	4.4E-01						=SUM(Hletdr32)+Lletdr32	
Equivalent Doses - Shrew - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr33	5.9E-04	1.7E-03	2.6E-02	2.2E-04	1.7E-02	4.5E-02	=Idrat33*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr33	9.6E-04						=Xdrat33	
Total dose rate	mSv/d	tdr33	4.6E-02						=SUM(Hletdr33)+Lletdr33	
Equivalent Doses - Shrew - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr34	6.7E-04	1.8E-03	2.8E-02	2.2E-04	1.7E-02	4.8E-02	=Idrat34*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr34	9.6E-04						=Xdrat34	
Total dose rate	mSv/d	tdr34	4.9E-02						=SUM(Hletdr34)+Lletdr34	
Equivalent Doses - Shrew - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr35	5.4E-05	1.6E-03	2.4E-02	2.2E-04	1.7E-02	4.2E-02	=Idrat35*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr35	9.6E-04						=Xdrat35	
Total dose rate	mSv/d	tdr35	4.3E-02						=SUM(Hletdr35)+Lletdr35	
Equivalent Doses - Shrew - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr36	5.9E-04	1.7E-03	2.5E-02	2.2E-04	1.7E-02	4.5E-02	=Idrat36*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr36	2.7E-04						=Xdrat36	
Total dose rate	mSv/d	tdr36	4.5E-02						=SUM(Hletdr36)+Lletdr36	
Equivalent Doses - Squirrel - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr37	5.1E-04	9.0E-03	4.1E-02	5.0E-04	3.0E-02	8.1E-02	=Idrat37*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr37	9.6E-04						=Xdrat37	
Total dose rate	mSv/d	tdr37	8.2E-02						=SUM(Hletdr37)+Lletdr37	
Equivalent Doses - Squirrel - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr38	5.1E-04	9.0E-03	4.1E-02	5.0E-04	3.0E-02	8.1E-02	=Idrat38*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr38	9.6E-04						=Xdrat38	
Total dose rate	mSv/d	tdr38	8.2E-02						=SUM(Hletdr38)+Lletdr38	
Equivalent Doses - Squirrel - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr39	5.3E-04	9.1E-03	4.1E-02	5.0E-04	3.0E-02	8.1E-02	=Idrat39*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr39	9.6E-04						=Xdrat39	
Total dose rate	mSv/d	tdr39	8.2E-02						=SUM(Hletdr39)+Lletdr39	
Equivalent Doses - Squirrel - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr40	5.1E-04	9.0E-03	4.1E-02	5.0E-04	3.0E-02	8.1E-02	=Idrat40*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr40	9.6E-04						=Xdrat40	
Total dose rate	mSv/d	tdr40	8.2E-02						=SUM(Hletdr40)+Lletdr40	
Equivalent Doses - Wolf - LSA										
High LET dose rate	mSv/d	Hletdr41	2.4E-04	7.7E-05	1.4E-04	8.7E-08	2.3E-02	2.3E-02	=Idrat41*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr41	9.6E-04						=Xdrat41	
Total dose rate	mSv/d	tdr41	2.4E-02						=SUM(Hletdr41)+Lletdr41	
Equivalent Doses - Wolf - RSA										
High LET dose rate	mSv/d	Hletdr42	2.4E-04	7.7E-05	1.4E-04	8.7E-08	2.3E-02	2.3E-02	=Idrat42*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr42	9.6E-04						=Xdrat42	
Total dose rate	mSv/d	tdr42	2.4E-02						=SUM(Hletdr42)+Lletdr42	
Equivalent Doses - Wolverine - LSA										
High LET dose rate	mSv/d	Hletdr43	3.3E-04	3.0E-04	1.4E-03	2.8E-06	5.3E-03	7.3E-03	=Idrat43*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr43	9.6E-04						=Xdrat43	
Total dose rate	mSv/d	tdr43	8.3E-03						=SUM(Hletdr43)+Lletdr43	
Equivalent Doses - Wolverine - RSA										
High LET dose rate	mSv/d	Hletdr44	3.3E-04	3.0E-04	1.4E-03	2.8E-06	5.3E-03	7.3E-03	=Idrat44*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr44	9.6E-04						=Xdrat44	
Total dose rate	mSv/d	tdr44	8.3E-03						=SUM(Hletdr44)+Lletdr44	

Table H.2-4
Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

SUMMARY

3 Screening Criterion in mGy/d	Total Absorbed Dose mGy/d	Total Equivalent Dose mSv/d	Index (Absorbed Dose)	Index (Equivalent Dose)
Bear - LSA	1.5E-03	2.1E-02	4.9E-04	7.0E-03
Caribou - LSA	6.7E-03	2.3E-01	2.2E-03	7.7E-02
Caribou - RSA	6.7E-03	2.3E-01	2.2E-03	7.7E-02
Falcon - LSA	7.6E-03	1.6E-01	2.5E-03	5.4E-02
Falcon - RSA	7.6E-03	1.6E-01	2.5E-03	5.4E-02
Fox - LSA	1.3E-03	1.3E-02	4.2E-04	4.3E-03
Lemming - Rock Lake Watershed	4.8E-03	1.1E-01	1.6E-03	3.8E-02
Lemming - JSL @ Kiggavik Discharge	4.8E-03	1.1E-01	1.6E-03	3.8E-02
Lemming - Kiggavik Camp	4.8E-03	1.1E-01	1.6E-03	3.8E-02
Lemming - JSL @ Sissons Discharge	4.8E-03	1.1E-01	1.6E-03	3.8E-02
Lapland Longspur - Rock Lake Watershed	5.5E-03	1.5E-01	1.8E-03	5.0E-02
Lapland Longspur - JSL @ Kiggavik Discharge	5.6E-03	1.6E-01	1.9E-03	5.2E-02
Lapland Longspur - Kiggavik Camp	5.4E-03	1.5E-01	1.8E-03	5.0E-02
Lapland Longspur - JSL @ Sissons Discharge	5.5E-03	1.5E-01	1.8E-03	5.1E-02
Long-Tailed Duck - Rock Lake	7.1E-03	2.3E-01	2.4E-03	7.8E-02
Long-Tailed Duck - JSL @ Kiggavik Discharge	6.9E-03	2.2E-01	2.3E-03	7.5E-02
Long-Tailed Duck - JSL @ Sissons Discharge	6.9E-03	2.3E-01	2.3E-03	7.5E-02
Merganser - Rock Lake	1.7E-03	2.5E-02	5.6E-04	8.5E-03
Merganser - JSL @ Kiggavik Discharge	1.7E-03	2.4E-02	5.5E-04	8.0E-03
Merganser - JSL @ Sissons Discharge	1.7E-03	2.4E-02	5.5E-04	8.0E-03
Muskox - JSL @ Kiggavik Discharge	2.6E-03	6.4E-02	8.5E-04	2.1E-02
Muskox - JSL @ Sissons Discharge	5.5E-03	1.5E-01	1.8E-03	5.1E-02
Northern Pintail - Rock Lake	7.2E-03	2.1E-01	2.4E-03	7.0E-02
Northern Pintail - JSL @ Kiggavik Discharge	6.9E-03	2.0E-01	2.3E-03	6.7E-02
Northern Pintail - JSL @ Sissons Discharge	6.9E-03	2.0E-01	2.3E-03	6.7E-02
Ptarmigan - Rock Lake Watershed	1.4E-02	4.4E-01	4.8E-03	1.5E-01
Ptarmigan - JSL @ Kiggavik Discharge	1.4E-02	4.4E-01	4.8E-03	1.5E-01
Ptarmigan - Kiggavik Camp	1.4E-02	4.4E-01	4.8E-03	1.5E-01
Ptarmigan - JSL @ Sissons Discharge	1.4E-02	4.4E-01	4.8E-03	1.5E-01
Sandpiper - Rock Lake	1.3E-02	4.6E-01	4.5E-03	1.5E-01
Sandpiper - JSL @ Kiggavik Discharge	1.3E-02	4.4E-01	4.3E-03	1.5E-01
Sandpiper - JSL @ Sissons Discharge	1.3E-02	4.4E-01	4.4E-03	1.5E-01
Shrew - Rock Lake Watershed	2.3E-03	4.6E-02	7.7E-04	1.5E-02
Shrew - JSL @ Kiggavik Discharge	2.4E-03	4.9E-02	7.9E-04	1.6E-02
Shrew - Kiggavik Camp	2.2E-03	4.3E-02	7.4E-04	1.4E-02
Shrew - JSL @ Sissons Discharge	1.6E-03	4.5E-02	5.3E-04	1.5E-02
Squirrel - Rock Lake Watershed	3.5E-03	8.2E-02	1.2E-03	2.7E-02
Squirrel - JSL @ Kiggavik Discharge	3.5E-03	8.2E-02	1.2E-03	2.7E-02
Squirrel - Kiggavik Camp	3.5E-03	8.2E-02	1.2E-03	2.7E-02
Squirrel - JSL @ Sissons Discharge	3.5E-03	8.2E-02	1.2E-03	2.7E-02
Wolf - LSA	1.5E-03	2.4E-02	5.1E-04	8.0E-03
Wolf - RSA	1.5E-03	2.4E-02	5.1E-04	8.0E-03
Wolverine - LSA	1.1E-03	8.3E-03	3.8E-04	2.8E-03
Wolverine - RSA	1.1E-03	8.3E-03	3.8E-04	2.8E-03

U-238+ Internal U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235
Ra-226+ Internal Ra-226 + 0.3* (Rn-222 + ...Po-214)
Pb-210+ Internal Pb-210 + Bi-210

Table H.2-4

Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

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DOSES TO SELECTED VECs - Average Total Dose

			U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Absorbed Doses - Bear - LSA									
Concentration	Bq/g	Crad	1.27E-05	3.35E-05	2.28E-05	5.31E-05	1.79E-03		
Internal Dose Factor	mGy/d per Bq/g	ldcf	1.4E-01	6.6E-02	1.6E-01	6.0E-03	7.4E-02		
Internal dose rate	mGy/d	ldrat	1.8E-06	2.2E-06	3.6E-06	3.2E-07	1.3E-04	1.4E-04	=Crad*ldcf
External Gamma rate	uGy/h	Xgrat	0.04						
Fraction of time on site	-	fts	1.00						
External dose rate	mGy/d	Xdrat	9.6E-04						=Xgrat*24*fts/1000
Internal plus external	mGy/d	tdrat	1.1E-03						=SUM(ldrat)+Xdrat
Absorbed Doses - Caribou - LSA									
Concentration	Bq/g	Crad2	2.99E-05	4.43E-05	8.68E-05	9.05E-04	2.39E-02		
Internal dose rate	mGy/d	ldrat2	4.3E-06	2.9E-06	1.4E-05	5.5E-06	1.8E-03	1.8E-03	=Crad2*ldcf
Fraction of time on site	-	fts2	1.00						
External dose rate	mGy/d	Xdrat2	9.6E-04						=Xgrat*24*fts2/1000
Internal plus external	mGy/d	tdrat2	2.8E-03						=SUM(ldrat2)+Xdrat2
Absorbed Doses - Caribou - RSA									
Concentration	Bq/g	Crad3	2.99E-05	4.43E-05	8.68E-05	9.05E-04	2.39E-02		
Internal dose rate	mGy/d	ldrat3	4.3E-06	2.9E-06	1.4E-05	5.5E-06	1.8E-03	1.8E-03	=Crad3*ldcf
Fraction of time on site	-	fts3	1.00						
External dose rate	mGy/d	Xdrat3	9.6E-04						=Xgrat*24*fts3/1000
Internal plus external	mGy/d	tdrat3	2.8E-03						=SUM(ldrat3)+Xdrat3
Absorbed Doses - Falcon - LSA									
Concentration	Bq/g	Crad4	3.80E-06	1.20E-04	3.99E-04	1.34E-01	1.47E-02		
Internal dose rate	mGy/d	ldrat4	5.4E-07	7.9E-06	6.3E-05	8.1E-04	1.1E-03	2.0E-03	=Crad4*ldcf
Fraction of time on site	-	fts4	1.00						
External dose rate	mGy/d	Xdrat4	9.6E-04						=Xgrat*24*fts4/1000
Internal plus external	mGy/d	tdrat4	2.9E-03						=SUM(ldrat4)+Xdrat4
Absorbed Doses - Falcon - RSA									
Concentration	Bq/g	Crad5	3.79E-06	1.20E-04	3.98E-04	1.34E-01	1.47E-02		
Internal dose rate	mGy/d	ldrat5	5.4E-07	7.9E-06	6.3E-05	8.1E-04	1.1E-03	2.0E-03	=Crad5*ldcf
Fraction of time on site	-	fts5	1.00						
External dose rate	mGy/d	Xdrat5	9.6E-04						=Xgrat*24*fts5/1000
Internal plus external	mGy/d	tdrat5	2.9E-03						=SUM(ldrat5)+Xdrat5
Absorbed Doses - Fox - LSA									
Concentration	Bq/g	Crad6	8.18E-06	2.48E-05	5.34E-05	1.29E-04	1.09E-03		
Internal dose rate	mGy/d	ldrat6	1.2E-06	1.6E-06	8.5E-06	7.8E-07	8.0E-05	9.2E-05	=Crad6*ldcf
Fraction of time on site	-	fts6	1.00						
External dose rate	mGy/d	Xdrat6	9.6E-04						=Xgrat*24*fts6/1000
Internal plus external	mGy/d	tdrat6	1.1E-03						=SUM(ldrat6)+Xdrat6
Absorbed Doses - Lemming - Rock Lake Watershed									
Concentration	Bq/g	Crad7	3.23E-05	1.14E-03	2.26E-03	4.73E-02	6.02E-03		
Internal dose rate	mGy/d	ldrat7	4.6E-06	7.5E-05	3.6E-04	2.9E-04	4.5E-04	1.2E-03	=Crad7*ldcf
Fraction of time on site	-	fts7	1.00						
External dose rate	mGy/d	Xdrat7	9.6E-04						=Xgrat*24*fts7/1000
Internal plus external	mGy/d	tdrat7	2.1E-03						=SUM(ldrat7)+Xdrat7
Absorbed Doses - Lemming - JSL @ Kiggavik Discharge									
Concentration	Bq/g	Crad8	3.23E-05	1.14E-03	2.26E-03	4.73E-02	6.02E-03		
Internal dose rate	mGy/d	ldrat8	4.6E-06	7.5E-05	3.6E-04	2.9E-04	4.5E-04	1.2E-03	=Crad8*ldcf
Fraction of time on site	-	fts8	1.00						
External dose rate	mGy/d	Xdrat8	9.6E-04						=Xgrat*24*fts8/1000
Internal plus external	mGy/d	tdrat8	2.1E-03						=SUM(ldrat8)+Xdrat8
Absorbed Doses - Lemming - Kiggavik Camp									
Concentration	Bq/g	Crad9	3.40E-05	1.15E-03	2.27E-03	4.73E-02	6.02E-03		
Internal dose rate	mGy/d	ldrat9	4.8E-06	7.6E-05	3.6E-04	2.9E-04	4.5E-04	1.2E-03	=Crad9*ldcf
Fraction of time on site	-	fts9	1.00						
External dose rate	mGy/d	Xdrat9	9.6E-04						=Xgrat*24*fts9/1000
Internal plus external	mGy/d	tdrat9	2.1E-03						=SUM(ldrat9)+Xdrat9
Absorbed Doses - Lemming - JSL @ Sissons Discharge									
Concentration	Bq/g	Crad10	3.24E-05	1.14E-03	2.26E-03	4.73E-02	6.02E-03		
Internal dose rate	mGy/d	ldrat10	4.6E-06	7.5E-05	3.6E-04	2.9E-04	4.5E-04	1.2E-03	=Crad10*ldcf
Fraction of time on site	-	fts10	1.00						
External dose rate	mGy/d	Xdrat10	9.6E-04						=Xgrat*24*fts10/1000
Internal plus external	mGy/d	tdrat10	2.1E-03						=SUM(ldrat10)+Xdrat10
Absorbed Doses - Lapland Longspur - Rock Lake Watershed									
Concentration	Bq/g	Crad11	1.15E-05	7.43E-04	1.58E-03	3.56E-02	1.28E-02		
Internal dose rate	mGy/d	ldrat11	1.6E-06	4.9E-05	2.5E-04	2.1E-04	9.5E-04	1.5E-03	=Crad11*ldcf
Fraction of time on site	-	fts11	1.00						
External dose rate	mGy/d	Xdrat11	9.6E-04						=Xgrat*24*fts11/1000
Internal plus external	mGy/d	tdrat11	2.4E-03						=SUM(ldrat11)+Xdrat11

Table H.2-4
Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

Absorbed Doses - Lapland Longspur - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad12	1.24E-05	7.45E-04	1.62E-03	3.59E-02	1.32E-02			
Internal dose rate	mGy/d	ldrat12	1.8E-06	4.9E-05	2.6E-04	2.2E-04	9.8E-04	1.5E-03	=Crad12*ldcf	
Fraction of time on site	-	fts12	1.00							
External dose rate	mGy/d	Xdrat12	9.6E-04						=Xgrat*24*fts12/1000	
Internal plus external	mGy/d	tdrat12	2.5E-03						=SUM(ldrat12)+Xdrat12	
Absorbed Doses - Lapland Longspur - Kiggavik Camp										
Concentration	Bq/g	Crad13	3.56E-06	7.44E-04	1.55E-03	3.54E-02	1.27E-02			
Internal dose rate	mGy/d	ldrat13	5.1E-07	4.9E-05	2.5E-04	2.1E-04	9.4E-04	1.4E-03	=Crad13*ldcf	
Fraction of time on site	-	fts13	1.00							
External dose rate	mGy/d	Xdrat13	9.6E-04						=Xgrat*24*fts13/1000	
Internal plus external	mGy/d	tdrat13	2.4E-03						=SUM(ldrat13)+Xdrat13	
Absorbed Doses - Lapland Longspur - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad14	1.17E-05	7.44E-04	1.58E-03	3.56E-02	1.29E-02			
Internal dose rate	mGy/d	ldrat14	1.7E-06	4.9E-05	2.5E-04	2.1E-04	9.5E-04	1.5E-03	=Crad14*ldcf	
Fraction of time on site	-	fts14	1.00							
External dose rate	mGy/d	Xdrat14	9.6E-04						=Xgrat*24*fts14/1000	
Internal plus external	mGy/d	tdrat14	2.4E-03						=SUM(ldrat14)+Xdrat14	
Absorbed Doses - Long-Tailed Duck - Rock Lake										
Concentration	Bq/g	Crad15	1.95E-05	2.01E-04	2.30E-03	1.99E-02	1.55E-02			
Internal dose rate	mGy/d	ldrat15	2.8E-06	1.3E-05	3.6E-04	1.2E-04	1.1E-03	1.6E-03	=Crad15*ldcf	
Fraction of time on site	-	fts15	1.00							
External dose rate	mGy/d	Xdrat15	9.6E-04						=Xgrat*24*fts15/1000	
Internal plus external	mGy/d	tdrat15	2.6E-03						=SUM(ldrat15)+Xdrat15	
Absorbed Doses - Long-Tailed Duck - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad16	1.76E-05	1.95E-04	2.21E-03	1.92E-02	1.49E-02			
Internal dose rate	mGy/d	ldrat16	2.5E-06	1.3E-05	3.5E-04	1.2E-04	1.1E-03	1.6E-03	=Crad16*ldcf	
Fraction of time on site	-	fts16	1.00							
External dose rate	mGy/d	Xdrat16	9.6E-04						=Xgrat*24*fts16/1000	
Internal plus external	mGy/d	tdrat16	2.5E-03						=SUM(ldrat16)+Xdrat16	
Absorbed Doses - Long-Tailed Duck - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad17	1.79E-05	1.95E-04	2.22E-03	1.93E-02	1.50E-02			
Internal dose rate	mGy/d	ldrat17	2.5E-06	1.3E-05	3.5E-04	1.2E-04	1.1E-03	1.6E-03	=Crad17*ldcf	
Fraction of time on site	-	fts17	1.00							
External dose rate	mGy/d	Xdrat17	9.6E-04						=Xgrat*24*fts17/1000	
Internal plus external	mGy/d	tdrat17	2.6E-03						=SUM(ldrat17)+Xdrat17	
Absorbed Doses - Merganser - Rock Lake										
Concentration	Bq/g	Crad18	2.29E-06	8.27E-05	1.25E-04	6.29E-03	2.11E-03			
Internal dose rate	mGy/d	ldrat18	3.3E-07	5.4E-06	2.0E-05	3.8E-05	1.6E-04	2.2E-04	=Crad18*ldcf	
Fraction of time on site	-	fts18	1.00							
External dose rate	mGy/d	Xdrat18	9.6E-04						=Xgrat*24*fts18/1000	
Internal plus external	mGy/d	tdrat18	1.2E-03						=SUM(ldrat18)+Xdrat18	
Absorbed Doses - Merganser - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad19	2.29E-06	7.95E-05	1.17E-04	6.08E-03	2.00E-03			
Internal dose rate	mGy/d	ldrat19	3.3E-07	5.2E-06	1.9E-05	3.7E-05	1.5E-04	2.1E-04	=Crad19*ldcf	
Fraction of time on site	-	fts19	1.00							
External dose rate	mGy/d	Xdrat19	9.6E-04						=Xgrat*24*fts19/1000	
Internal plus external	mGy/d	tdrat19	1.2E-03						=SUM(ldrat19)+Xdrat19	
Absorbed Doses - Merganser - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad20	2.29E-06	7.99E-05	1.18E-04	6.10E-03	2.02E-03			
Internal dose rate	mGy/d	ldrat20	3.2E-07	5.3E-06	1.9E-05	3.7E-05	1.5E-04	2.1E-04	=Crad20*ldcf	
Fraction of time on site	-	fts20	1.00							
External dose rate	mGy/d	Xdrat20	9.6E-04						=Xgrat*24*fts20/1000	
Internal plus external	mGy/d	tdrat20	1.2E-03						=SUM(ldrat20)+Xdrat20	
Absorbed Doses - Muskox - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad21	3.12E-05	5.03E-05	7.12E-05	2.23E-04	6.91E-03			
Internal dose rate	mGy/d	ldrat21	4.4E-06	3.3E-06	1.1E-05	1.3E-06	5.1E-04	5.3E-04	=Crad21*ldcf	
Fraction of time on site	-	fts21	1.00							
External dose rate	mGy/d	Xdrat21	9.6E-04						=Xgrat*24*fts21/1000	
Internal plus external	mGy/d	tdrat21	1.5E-03						=SUM(ldrat21)+Xdrat21	
Absorbed Doses - Muskox - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad22	1.17E-05	7.44E-04	1.58E-03	3.56E-02	1.29E-02			
Internal dose rate	mGy/d	ldrat22	1.7E-06	4.9E-05	2.5E-04	2.1E-04	9.5E-04	1.5E-03	=Crad22*ldcf	
Fraction of time on site	-	fts22	1.00							
External dose rate	mGy/d	Xdrat22	9.6E-04						=Xgrat*24*fts22/1000	
Internal plus external	mGy/d	tdrat22	2.4E-03						=SUM(ldrat22)+Xdrat22	
Absorbed Doses - Northern Pintail - Rock Lake										
Concentration	Bq/g	Crad23	7.17E-06	1.15E-03	6.60E-04	5.23E-02	1.76E-02			
Internal dose rate	mGy/d	ldrat23	1.0E-06	7.5E-05	1.0E-04	3.2E-04	1.3E-03	1.8E-03	=Crad23*ldcf	
Fraction of time on site	-	fts23	1.00							
External dose rate	mGy/d	Xdrat23	9.6E-04						=Xgrat*24*fts23/1000	
Internal plus external	mGy/d	tdrat23	2.8E-03						=SUM(ldrat23)+Xdrat23	

Table H.2-4
Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

Absorbed Doses - Northern Pintail - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad24	6.58E-06	1.10E-03	6.36E-04	5.04E-02	1.68E-02			
Internal dose rate	mGy/d	Idrat24	9.3E-07	7.2E-05	1.0E-04	3.0E-04	1.2E-03	1.7E-03	=Crad24*Idcf	
Fraction of time on site	-	fts24	1.00							
External dose rate	mGy/d	Xdrat24	9.6E-04						=Xgrat*24*fts24/1000	
Internal plus external	mGy/d	tdrat24	2.7E-03						=SUM(Idrat24)+Xdrat24	
Absorbed Doses - Northern Pintail - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad25	6.68E-06	1.11E-03	6.38E-04	5.06E-02	1.70E-02			
Internal dose rate	mGy/d	Idrat25	9.5E-07	7.3E-05	1.0E-04	3.1E-04	1.3E-03	1.7E-03	=Crad25*Idcf	
Fraction of time on site	-	fts25	1.00							
External dose rate	mGy/d	Xdrat25	9.6E-04						=Xgrat*24*fts25/1000	
Internal plus external	mGy/d	tdrat25	2.7E-03						=SUM(Idrat25)+Xdrat25	
Absorbed Doses - Ptarmigan - Rock Lake Watershed										
Concentration	Bq/g	Crad26	1.15E-05	2.26E-04	6.65E-04	1.38E-01	4.76E-02			
Internal dose rate	mGy/d	Idrat26	1.6E-06	1.5E-05	1.1E-04	8.3E-04	3.5E-03	4.5E-03	=Crad26*Idcf	
Fraction of time on site	-	fts26	1.00							
External dose rate	mGy/d	Xdrat26	9.6E-04						=Xgrat*24*fts26/1000	
Internal plus external	mGy/d	tdrat26	5.4E-03						=SUM(Idrat26)+Xdrat26	
Absorbed Doses - Ptarmigan - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad27	1.18E-05	2.26E-04	6.77E-04	1.38E-01	4.77E-02			
Internal dose rate	mGy/d	Idrat27	1.7E-06	1.5E-05	1.1E-04	8.3E-04	3.5E-03	4.5E-03	=Crad27*Idcf	
Fraction of time on site	-	fts27	1.00							
External dose rate	mGy/d	Xdrat27	9.6E-04						=Xgrat*24*fts27/1000	
Internal plus external	mGy/d	tdrat27	5.4E-03						=SUM(Idrat27)+Xdrat27	
Absorbed Doses - Ptarmigan - Kiggavik Camp										
Concentration	Bq/g	Crad28	9.38E-06	2.27E-04	6.56E-04	1.38E-01	4.76E-02			
Internal dose rate	mGy/d	Idrat28	1.3E-06	1.5E-05	1.0E-04	8.3E-04	3.5E-03	4.5E-03	=Crad28*Idcf	
Fraction of time on site	-	fts28	1.00							
External dose rate	mGy/d	Xdrat28	9.6E-04						=Xgrat*24*fts28/1000	
Internal plus external	mGy/d	tdrat28	5.4E-03						=SUM(Idrat28)+Xdrat28	
Absorbed Doses - Ptarmigan - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad29	1.16E-05	2.26E-04	6.64E-04	1.38E-01	4.76E-02			
Internal dose rate	mGy/d	Idrat29	1.6E-06	1.5E-05	1.1E-04	8.3E-04	3.5E-03	4.5E-03	=Crad29*Idcf	
Fraction of time on site	-	fts29	1.00							
External dose rate	mGy/d	Xdrat29	9.6E-04						=Xgrat*24*fts29/1000	
Internal plus external	mGy/d	tdrat29	5.4E-03						=SUM(Idrat29)+Xdrat29	
Absorbed Doses - Sandpiper - Rock Lake										
Concentration	Bq/g	Crad30	4.85E-05	7.57E-04	3.86E-03	5.69E-02	3.46E-02			
Internal dose rate	mGy/d	Idrat30	6.9E-06	5.0E-05	6.1E-04	3.4E-04	2.6E-03	3.6E-03	=Crad30*Idcf	
Fraction of time on site	-	fts30	1.00							
External dose rate	mGy/d	Xdrat30	9.6E-04						=Xgrat*24*fts30/1000	
Internal plus external	mGy/d	tdrat30	4.5E-03						=SUM(Idrat30)+Xdrat30	
Absorbed Doses - Sandpiper - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad31	4.49E-05	7.45E-04	3.72E-03	5.55E-02	3.32E-02			
Internal dose rate	mGy/d	Idrat31	6.4E-06	4.9E-05	5.9E-04	3.3E-04	2.5E-03	3.4E-03	=Crad31*Idcf	
Fraction of time on site	-	fts31	1.00							
External dose rate	mGy/d	Xdrat31	9.6E-04						=Xgrat*24*fts31/1000	
Internal plus external	mGy/d	tdrat31	4.4E-03						=SUM(Idrat31)+Xdrat31	
Absorbed Doses - Sandpiper - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad32	4.56E-05	7.45E-04	3.74E-03	5.55E-02	3.34E-02			
Internal dose rate	mGy/d	Idrat32	6.5E-06	4.9E-05	5.9E-04	3.3E-04	2.5E-03	3.5E-03	=Crad32*Idcf	
Fraction of time on site	-	fts32	1.00							
External dose rate	mGy/d	Xdrat32	9.6E-04						=Xgrat*24*fts32/1000	
Internal plus external	mGy/d	tdrat32	4.4E-03						=SUM(Idrat32)+Xdrat32	
Absorbed Doses - Shrew - Rock Lake Watershed										
Concentration	Bq/g	Crad33	3.27E-05	1.90E-04	1.27E-03	1.12E-02	2.07E-03			
Internal dose rate	mGy/d	Idrat33	4.6E-06	1.3E-05	2.0E-04	6.8E-05	1.5E-04	4.4E-04	=Crad33*Idcf	
Fraction of time on site	-	fts33	1.00							
External dose rate	mGy/d	Xdrat33	9.6E-04						=Xgrat*24*fts33/1000	
Internal plus external	mGy/d	tdrat33	1.4E-03						=SUM(Idrat33)+Xdrat33	
Absorbed Doses - Shrew - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad34	3.58E-05	2.00E-04	1.37E-03	1.13E-02	2.12E-03			
Internal dose rate	mGy/d	Idrat34	5.1E-06	1.3E-05	2.2E-04	6.8E-05	1.6E-04	4.6E-04	=Crad34*Idcf	
Fraction of time on site	-	fts34	1.00							
External dose rate	mGy/d	Xdrat34	9.6E-04						=Xgrat*24*fts34/1000	
Internal plus external	mGy/d	tdrat34	1.4E-03						=SUM(Idrat34)+Xdrat34	
Absorbed Doses - Shrew - Kiggavik Camp										
Concentration	Bq/g	Crad35	3.13E-06	1.85E-04	1.18E-03	1.11E-02	2.05E-03			
Internal dose rate	mGy/d	Idrat35	4.4E-07	1.2E-05	1.9E-04	6.7E-05	1.5E-04	4.2E-04	=Crad35*Idcf	
Fraction of time on site	-	fts35	1.00							
External dose rate	mGy/d	Xdrat35	9.6E-04						=Xgrat*24*fts35/1000	
Internal plus external	mGy/d	tdrat35	1.4E-03						=SUM(Idrat35)+Xdrat35	
Absorbed Doses - Shrew - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad36	3.31E-05	1.91E-04	1.26E-03	1.12E-02	2.08E-03			
Internal dose rate	mGy/d	Idrat36	4.7E-06	1.3E-05	2.0E-04	6.8E-05	1.5E-04	4.4E-04	=Crad36*Idcf	
Fraction of time on site	-	fts36	1.00							

Table H.2-4

Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

External dose rate	mGy/d	Xdrat36	2.7E-04							=Xgrat*24*fts36/3600
Internal plus external	mGy/d	tdrat36	7.1E-04							=SUM(ldrat36)+Xdrat36
Absorbed Doses - Squirrel - Rock Lake Watershed										
Concentration	Bq/g	Crad37	2.70E-05	9.88E-04	1.48E-03	1.97E-02	2.34E-03			
Internal dose rate	mGy/d	ldrat37	3.8E-06	6.5E-05	2.4E-04	1.2E-04	1.7E-04	6.0E-04		=Crad37*ldcf
Fraction of time on site	-	fts37	1.00							
External dose rate	mGy/d	Xdrat37	9.6E-04							=Xgrat*24*fts37/1000
Internal plus external	mGy/d	tdrat37	1.6E-03							=SUM(ldrat37)+Xdrat37
Absorbed Doses - Squirrel - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad38	2.70E-05	9.88E-04	1.48E-03	1.97E-02	2.34E-03			
Internal dose rate	mGy/d	ldrat38	3.8E-06	6.5E-05	2.4E-04	1.2E-04	1.7E-04	6.0E-04		=Crad38*ldcf
Fraction of time on site	-	fts38	1.00							
External dose rate	mGy/d	Xdrat38	9.6E-04							=Xgrat*24*fts38/1000
Internal plus external	mGy/d	tdrat38	1.6E-03							=SUM(ldrat38)+Xdrat38
Absorbed Doses - Squirrel - Kiggavik Camp										
Concentration	Bq/g	Crad39	2.85E-05	9.98E-04	1.49E-03	1.98E-02	2.35E-03			
Internal dose rate	mGy/d	ldrat39	4.1E-06	6.6E-05	2.4E-04	1.2E-04	1.7E-04	6.0E-04		=Crad39*ldcf
Fraction of time on site	-	fts39	1.00							
External dose rate	mGy/d	Xdrat39	9.6E-04							=Xgrat*24*fts39/1000
Internal plus external	mGy/d	tdrat39	1.6E-03							=SUM(ldrat39)+Xdrat39

Table H.2-4

Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

Absorbed Doses - Squirrel - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad40	2.71E-05	9.88E-04	1.48E-03	1.97E-02	2.34E-03			
Internal dose rate	mGy/d	Idrat40	3.8E-06	6.5E-05	2.4E-04	1.2E-04	1.7E-04	6.0E-04	=Crad40*Idcf	
Fraction of time on site	-	fts40	1.00							
External dose rate	mGy/d	Xdrat40	9.6E-04						=Xgrat*24*fts40/1000	
Internal plus external	mGy/d	tdrat40	1.6E-03						=SUM(Idrat40)+Xdrat40	
Absorbed Doses - Wolf - LSA										
Concentration	Bq/g	Crad41	1.16E-05	9.61E-06	6.02E-06	3.68E-06	1.90E-03			
Internal dose rate	mGy/d	Idrat41	1.6E-06	6.3E-07	9.6E-07	2.2E-08	1.4E-04	1.4E-04	=Crad41*Idcf	
Fraction of time on site	-	fts41	1.00							
External dose rate	mGy/d	Xdrat41	9.6E-04						=Xgrat*24*fts41/1000	
Internal plus external	mGy/d	tdrat41	1.1E-03						=SUM(Idrat41)+Xdrat41	
Absorbed Doses - Wolf - RSA										
Concentration	Bq/g	Crad42	1.16E-05	9.60E-06	6.02E-06	3.68E-06	1.90E-03			
Internal dose rate	mGy/d	Idrat42	1.6E-06	6.3E-07	9.6E-07	2.2E-08	1.4E-04	1.4E-04	=Crad42*Idcf	
Fraction of time on site	-	fts42	1.00							
External dose rate	mGy/d	Xdrat42	9.6E-04						=Xgrat*24*fts42/1000	
Internal plus external	mGy/d	tdrat42	1.1E-03						=SUM(Idrat42)+Xdrat42	
Absorbed Doses - Wolverine - LSA										
Concentration	Bq/g	Crad43	1.56E-05	3.36E-05	5.34E-05	1.05E-04	4.77E-04			
Internal dose rate	mGy/d	Idrat43	2.2E-06	2.2E-06	8.5E-06	6.3E-07	3.5E-05	4.9E-05	=Crad43*Idcf	
Fraction of time on site	-	fts43	1.00							
External dose rate	mGy/d	Xdrat43	9.6E-04						=Xgrat*24*fts43/1000	
Internal plus external	mGy/d	tdrat43	1.0E-03						=SUM(Idrat43)+Xdrat43	
Absorbed Doses - Wolverine - RSA										
Concentration	Bq/g	Crad44	1.56E-05	3.37E-05	5.34E-05	1.05E-04	4.77E-04			
Internal dose rate	mGy/d	Idrat44	2.2E-06	2.2E-06	8.5E-06	6.4E-07	3.5E-05	4.9E-05	=Crad44*Idcf	
Fraction of time on site	-	fts44	1.00							
External dose rate	mGy/d	Xdrat44	9.6E-04						=Xgrat*24*fts44/1000	
Internal plus external	mGy/d	tdrat44	1.0E-03						=SUM(Idrat44)+Xdrat44	
Equivalent Doses - Bear - LSA										
RBE for alpha	Sv/Gy	RBE	40							
High LET dose rate	mSv/d	Hletdr	7.2E-05	8.8E-05	1.4E-04	3.2E-07	5.3E-03	5.6E-03	=Idrat*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr	9.6E-04						=Xdrat	
Total dose rate	mSv/d	tdr	6.6E-03						=SUM(Hletdr)+Lletdr	
Equivalent Doses - Caribou - LSA										
High LET dose rate	mSv/d	Hletdr2	1.7E-04	1.2E-04	5.5E-04	5.5E-06	7.1E-02	7.2E-02	=Idrat2*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr2	9.6E-04						=Xdrat2	
Total dose rate	mSv/d	tdr2	7.3E-02						=SUM(Hletdr2)+Lletdr2	
Equivalent Doses - Caribou - RSA										
High LET dose rate	mSv/d	Hletdr3	1.7E-04	1.2E-04	5.5E-04	5.5E-06	7.1E-02	7.2E-02	=Idrat3*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr3	9.6E-04						=Xdrat3	
Total dose rate	mSv/d	tdr3	7.3E-02						=SUM(Hletdr3)+Lletdr3	
Equivalent Doses - Falcon - LSA										
High LET dose rate	mSv/d	Hletdr4	2.2E-05	3.2E-04	2.5E-03	8.1E-04	4.3E-02	4.7E-02	=Idrat4*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr4	9.6E-04						=Xdrat4	
Total dose rate	mSv/d	tdr4	4.8E-02						=SUM(Hletdr4)+Lletdr4	
Equivalent Doses - Falcon - RSA										
High LET dose rate	mSv/d	Hletdr5	2.2E-05	3.2E-04	2.5E-03	8.1E-04	4.3E-02	4.7E-02	=Idrat5*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr5	9.6E-04						=Xdrat5	
Total dose rate	mSv/d	tdr5	4.8E-02						=SUM(Hletdr5)+Lletdr5	
Equivalent Doses - Fox - LSA										
High LET dose rate	mSv/d	Hletdr6	4.6E-05	6.5E-05	3.4E-04	7.8E-07	3.2E-03	3.7E-03	=Idrat6*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr6	9.6E-04						=Xdrat6	
Total dose rate	mSv/d	tdr6	4.6E-03						=SUM(Hletdr6)+Lletdr6	
Equivalent Doses - Lemming - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr7	1.8E-04	3.0E-03	1.4E-02	2.9E-04	1.8E-02	3.6E-02	=Idrat7*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr7	9.6E-04						=Xdrat7	
Total dose rate	mSv/d	tdr7	3.7E-02						=SUM(Hletdr7)+Lletdr7	
Equivalent Doses - Lemming - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr8	1.8E-04	3.0E-03	1.4E-02	2.9E-04	1.8E-02	3.6E-02	=Idrat8*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr8	9.6E-04						=Xdrat8	
Total dose rate	mSv/d	tdr8	3.7E-02						=SUM(Hletdr8)+Lletdr8	
Equivalent Doses - Lemming - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr9	1.9E-04	3.0E-03	1.4E-02	2.9E-04	1.8E-02	3.6E-02	=Idrat9*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr9	9.6E-04						=Xdrat9	
Total dose rate	mSv/d	tdr9	3.7E-02						=SUM(Hletdr9)+Lletdr9	
Equivalent Doses - Lemming - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr10	1.8E-04	3.0E-03	1.4E-02	2.9E-04	1.8E-02	3.6E-02	=Idrat10*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr10	9.6E-04						=Xdrat10	
Total dose rate	mSv/d	tdr10	3.7E-02						=SUM(Hletdr10)+Lletdr10	

Table H.2-4

Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

Equivalent Doses - Lapland Longspur - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr11	6.5E-05	2.0E-03	1.0E-02	2.1E-04	3.8E-02	5.0E-02	=Idrat11*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr11	9.6E-04						=Xdrat11	
Total dose rate	mSv/d	tdr11	5.1E-02						=SUM(Hletdr11)+Lletdr11	
Equivalent Doses - Lapland Longspur - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr12	7.0E-05	2.0E-03	1.0E-02	2.2E-04	3.9E-02	5.2E-02	=Idrat12*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr12	9.6E-04						=Xdrat12	
Total dose rate	mSv/d	tdr12	5.3E-02						=SUM(Hletdr12)+Lletdr12	
Equivalent Doses - Lapland Longspur - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr13	2.0E-05	2.0E-03	9.8E-03	2.1E-04	3.7E-02	4.9E-02	=Idrat13*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr13	9.6E-04						=Xdrat13	
Total dose rate	mSv/d	tdr13	5.0E-02						=SUM(Hletdr13)+Lletdr13	
Equivalent Doses - Lapland Longspur - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr14	6.6E-05	2.0E-03	1.0E-02	2.1E-04	3.8E-02	5.0E-02	=Idrat14*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr14	9.6E-04						=Xdrat14	
Total dose rate	mSv/d	tdr14	5.1E-02						=SUM(Hletdr14)+Lletdr14	
Equivalent Doses - Long-Tailed Duck - Rock Lake										
High LET dose rate	mSv/d	Hletdr15	1.1E-04	5.3E-04	1.5E-02	1.2E-04	4.6E-02	6.1E-02	=Idrat15*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr15	9.6E-04						=Xdrat15	
Total dose rate	mSv/d	tdr15	6.2E-02						=SUM(Hletdr15)+Lletdr15	
Equivalent Doses - Long-Tailed Duck - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr16	1.0E-04	5.1E-04	1.4E-02	1.2E-04	4.4E-02	5.9E-02	=Idrat16*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr16	9.6E-04						=Xdrat16	
Total dose rate	mSv/d	tdr16	6.0E-02						=SUM(Hletdr16)+Lletdr16	
Equivalent Doses - Long-Tailed Duck - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr17	1.0E-04	5.1E-04	1.4E-02	1.2E-04	4.4E-02	5.9E-02	=Idrat17*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr17	9.6E-04						=Xdrat17	
Total dose rate	mSv/d	tdr17	6.0E-02						=SUM(Hletdr17)+Lletdr17	
Equivalent Doses - Merganser - Rock Lake										
High LET dose rate	mSv/d	Hletdr18	1.3E-05	2.2E-04	7.9E-04	3.8E-05	6.3E-03	7.3E-03	=Idrat18*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr18	9.6E-04						=Xdrat18	
Total dose rate	mSv/d	tdr18	8.3E-03						=SUM(Hletdr18)+Lletdr18	
Equivalent Doses - Merganser - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr19	1.3E-05	2.1E-04	7.5E-04	3.7E-05	5.9E-03	6.9E-03	=Idrat19*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr19	9.6E-04						=Xdrat19	
Total dose rate	mSv/d	tdr19	7.9E-03						=SUM(Hletdr19)+Lletdr19	
Equivalent Doses - Merganser - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr20	1.3E-05	2.1E-04	7.5E-04	3.7E-05	6.0E-03	7.0E-03	=Idrat20*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr20	9.6E-04						=Xdrat20	
Total dose rate	mSv/d	tdr20	8.0E-03						=SUM(Hletdr20)+Lletdr20	
Equivalent Doses - Muskox - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr21	1.8E-04	1.3E-04	4.5E-04	1.3E-06	2.0E-02	2.1E-02	=Idrat21*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr21	9.6E-04						=Xdrat21	
Total dose rate	mSv/d	tdr21	2.2E-02						=SUM(Hletdr21)+Lletdr21	
Equivalent Doses - Muskox - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr22	6.6E-05	2.0E-03	1.0E-02	2.1E-04	3.8E-02	5.0E-02	=Idrat22*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr22	9.6E-04						=Xdrat22	
Total dose rate	mSv/d	tdr22	5.1E-02						=SUM(Hletdr22)+Lletdr22	
Equivalent Doses - Northern Pintail - Rock Lake										
High LET dose rate	mSv/d	Hletdr23	4.1E-05	3.0E-03	4.2E-03	3.2E-04	5.2E-02	6.0E-02	=Idrat23*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr23	9.6E-04						=Xdrat23	
Total dose rate	mSv/d	tdr23	6.1E-02						=SUM(Hletdr23)+Lletdr23	
Equivalent Doses - Northern Pintail - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr24	3.7E-05	2.9E-03	4.0E-03	3.0E-04	5.0E-02	5.7E-02	=Idrat24*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr24	9.6E-04						=Xdrat24	
Total dose rate	mSv/d	tdr24	5.8E-02						=SUM(Hletdr24)+Lletdr24	
Equivalent Doses - Northern Pintail - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr25	3.8E-05	2.9E-03	4.1E-03	3.1E-04	5.0E-02	5.8E-02	=Idrat25*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr25	9.6E-04						=Xdrat25	
Total dose rate	mSv/d	tdr25	5.8E-02						=SUM(Hletdr25)+Lletdr25	
Equivalent Doses - Ptarmigan - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr26	6.5E-05	5.9E-04	4.2E-03	8.3E-04	1.4E-01	1.5E-01	=Idrat26*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr26	9.6E-04						=Xdrat26	
Total dose rate	mSv/d	tdr26	1.5E-01						=SUM(Hletdr26)+Lletdr26	
Equivalent Doses - Ptarmigan - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr27	6.7E-05	6.0E-04	4.3E-03	8.3E-04	1.4E-01	1.5E-01	=Idrat27*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr27	9.6E-04						=Xdrat27	
Total dose rate	mSv/d	tdr27	1.5E-01						=SUM(Hletdr27)+Lletdr27	

Table H.2-4

Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

Equivalent Doses - Ptarmigan - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr28	5.3E-05	6.0E-04	4.2E-03	8.3E-04	1.4E-01	1.5E-01	=Idrat28*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr28	9.6E-04						=Xdrat28	
Total dose rate	mSv/d	tdr28	1.5E-01						=SUM(Hletdr28)+Lletdr28	
Equivalent Doses - Ptarmigan - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr29	6.6E-05	5.9E-04	4.2E-03	8.3E-04	1.4E-01	1.5E-01	=Idrat29*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr29	9.6E-04						=Xdrat29	
Total dose rate	mSv/d	tdr29	1.5E-01						=SUM(Hletdr29)+Lletdr29	
Equivalent Doses - Sandpiper - Rock Lake										
High LET dose rate	mSv/d	Hletdr30	2.8E-04	2.0E-03	2.5E-02	3.4E-04	1.0E-01	1.3E-01	=Idrat30*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr30	9.6E-04						=Xdrat30	
Total dose rate	mSv/d	tdr30	1.3E-01						=SUM(Hletdr30)+Lletdr30	
Equivalent Doses - Sandpiper - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr31	2.6E-04	2.0E-03	2.4E-02	3.3E-04	9.8E-02	1.2E-01	=Idrat31*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr31	9.6E-04						=Xdrat31	
Total dose rate	mSv/d	tdr31	1.3E-01						=SUM(Hletdr31)+Lletdr31	
Equivalent Doses - Sandpiper - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr32	2.6E-04	2.0E-03	2.4E-02	3.3E-04	9.9E-02	1.3E-01	=Idrat32*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr32	9.6E-04						=Xdrat32	
Total dose rate	mSv/d	tdr32	1.3E-01						=SUM(Hletdr32)+Lletdr32	
Equivalent Doses - Shrew - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr33	1.9E-04	5.0E-04	8.1E-03	6.8E-05	6.1E-03	1.5E-02	=Idrat33*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr33	9.6E-04						=Xdrat33	
Total dose rate	mSv/d	tdr33	1.6E-02						=SUM(Hletdr33)+Lletdr33	
Equivalent Doses - Shrew - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr34	2.0E-04	5.3E-04	8.7E-03	6.8E-05	6.3E-03	1.6E-02	=Idrat34*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr34	9.6E-04						=Xdrat34	
Total dose rate	mSv/d	tdr34	1.7E-02						=SUM(Hletdr34)+Lletdr34	
Equivalent Doses - Shrew - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr35	1.8E-05	4.9E-04	7.5E-03	6.7E-05	6.1E-03	1.4E-02	=Idrat35*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr35	9.6E-04						=Xdrat35	
Total dose rate	mSv/d	tdr35	1.5E-02						=SUM(Hletdr35)+Lletdr35	
Equivalent Doses - Shrew - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr36	1.9E-04	5.0E-04	8.0E-03	6.8E-05	6.2E-03	1.5E-02	=Idrat36*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr36	2.7E-04						=Xdrat36	
Total dose rate	mSv/d	tdr36	1.5E-02						=SUM(Hletdr36)+Lletdr36	
Equivalent Doses - Squirrel - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr37	1.5E-04	2.6E-03	9.4E-03	1.2E-04	6.9E-03	1.9E-02	=Idrat37*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr37	9.6E-04						=Xdrat37	
Total dose rate	mSv/d	tdr37	2.0E-02						=SUM(Hletdr37)+Lletdr37	
Equivalent Doses - Squirrel - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr38	1.5E-04	2.6E-03	9.4E-03	1.2E-04	6.9E-03	1.9E-02	=Idrat38*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr38	9.6E-04						=Xdrat38	
Total dose rate	mSv/d	tdr38	2.0E-02						=SUM(Hletdr38)+Lletdr38	
Equivalent Doses - Squirrel - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr39	1.6E-04	2.6E-03	9.5E-03	1.2E-04	7.0E-03	1.9E-02	=Idrat39*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr39	9.6E-04						=Xdrat39	
Total dose rate	mSv/d	tdr39	2.0E-02						=SUM(Hletdr39)+Lletdr39	
Equivalent Doses - Squirrel - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr40	1.5E-04	2.6E-03	9.4E-03	1.2E-04	6.9E-03	1.9E-02	=Idrat40*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr40	9.6E-04						=Xdrat40	
Total dose rate	mSv/d	tdr40	2.0E-02						=SUM(Hletdr40)+Lletdr40	
Equivalent Doses - Wolf - LSA										
High LET dose rate	mSv/d	Hletdr41	6.6E-05	2.5E-05	3.8E-05	2.2E-08	5.6E-03	5.8E-03	=Idrat41*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr41	9.6E-04						=Xdrat41	
Total dose rate	mSv/d	tdr41	6.7E-03						=SUM(Hletdr41)+Lletdr41	
Equivalent Doses - Wolf - RSA										
High LET dose rate	mSv/d	Hletdr42	6.6E-05	2.5E-05	3.8E-05	2.2E-08	5.6E-03	5.8E-03	=Idrat42*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr42	9.6E-04						=Xdrat42	
Total dose rate	mSv/d	tdr42	6.7E-03						=SUM(Hletdr42)+Lletdr42	
Equivalent Doses - Wolverine - LSA										
High LET dose rate	mSv/d	Hletdr43	8.9E-05	8.9E-05	3.4E-04	6.3E-07	1.4E-03	1.9E-03	=Idrat43*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr43	9.6E-04						=Xdrat43	
Total dose rate	mSv/d	tdr43	2.9E-03						=SUM(Hletdr43)+Lletdr43	
Equivalent Doses - Wolverine - RSA										
High LET dose rate	mSv/d	Hletdr44	8.9E-05	8.9E-05	3.4E-04	6.4E-07	1.4E-03	1.9E-03	=Idrat44*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr44	9.6E-04						=Xdrat44	
Total dose rate	mSv/d	tdr44	2.9E-03						=SUM(Hletdr44)+Lletdr44	

Table H.2-4
Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

SUMMARY

3 Screening Criterion in mGy/d	Total Absorbed Dose mGy/d	Total Equivalent Dose mSv/d	Index (Absorbed Dose)	Index (Equivalent Dose)
Bear - LSA	1.1E-03	6.6E-03	3.7E-04	2.2E-03
Caribou - LSA	2.8E-03	7.3E-02	9.2E-04	2.4E-02
Caribou - RSA	2.8E-03	7.3E-02	9.2E-04	2.4E-02
Falcon - LSA	2.9E-03	4.8E-02	9.8E-04	1.6E-02
Falcon - RSA	2.9E-03	4.8E-02	9.8E-04	1.6E-02
Fox - LSA	1.1E-03	4.6E-03	3.5E-04	1.5E-03
Lemming - Rock Lake Watershed	2.1E-03	3.7E-02	7.1E-04	1.2E-02
Lemming - JSL @ Kiggavik Discharge	2.1E-03	3.7E-02	7.1E-04	1.2E-02
Lemming - Kiggavik Camp	2.1E-03	3.7E-02	7.1E-04	1.2E-02
Lemming - JSL @ Sissons Discharge	2.1E-03	3.7E-02	7.1E-04	1.2E-02
Lapland Longspur - Rock Lake Watershed	2.4E-03	5.1E-02	8.1E-04	1.7E-02
Lapland Longspur - JSL @ Kiggavik Discharge	2.5E-03	5.3E-02	8.2E-04	1.8E-02
Lapland Longspur - Kiggavik Camp	2.4E-03	5.0E-02	8.0E-04	1.7E-02
Lapland Longspur - JSL @ Sissons Discharge	2.4E-03	5.1E-02	8.1E-04	1.7E-02
Long-Tailed Duck - Rock Lake	2.6E-03	6.2E-02	8.7E-04	2.1E-02
Long-Tailed Duck - JSL @ Kiggavik Discharge	2.5E-03	6.0E-02	8.5E-04	2.0E-02
Long-Tailed Duck - JSL @ Sissons Discharge	2.6E-03	6.0E-02	8.5E-04	2.0E-02
Merganser - Rock Lake	1.2E-03	8.3E-03	3.9E-04	2.8E-03
Merganser - JSL @ Kiggavik Discharge	1.2E-03	7.9E-03	3.9E-04	2.6E-03
Merganser - JSL @ Sissons Discharge	1.2E-03	8.0E-03	3.9E-04	2.7E-03
Muskox - JSL @ Kiggavik Discharge	1.5E-03	2.2E-02	5.0E-04	7.4E-03
Muskox - JSL @ Sissons Discharge	2.4E-03	5.1E-02	8.1E-04	1.7E-02
Northern Pintail - Rock Lake	2.8E-03	6.1E-02	9.2E-04	2.0E-02
Northern Pintail - JSL @ Kiggavik Discharge	2.7E-03	5.8E-02	8.9E-04	1.9E-02
Northern Pintail - JSL @ Sissons Discharge	2.7E-03	5.8E-02	9.0E-04	1.9E-02
Ptarmigan - Rock Lake Watershed	5.4E-03	1.5E-01	1.8E-03	4.9E-02
Ptarmigan - JSL @ Kiggavik Discharge	5.4E-03	1.5E-01	1.8E-03	4.9E-02
Ptarmigan - Kiggavik Camp	5.4E-03	1.5E-01	1.8E-03	4.9E-02
Ptarmigan - JSL @ Sissons Discharge	5.4E-03	1.5E-01	1.8E-03	4.9E-02
Sandpiper - Rock Lake	4.5E-03	1.3E-01	1.5E-03	4.4E-02
Sandpiper - JSL @ Kiggavik Discharge	4.4E-03	1.3E-01	1.5E-03	4.2E-02
Sandpiper - JSL @ Sissons Discharge	4.4E-03	1.3E-01	1.5E-03	4.2E-02
Shrew - Rock Lake Watershed	1.4E-03	1.6E-02	4.7E-04	5.3E-03
Shrew - JSL @ Kiggavik Discharge	1.4E-03	1.7E-02	4.7E-04	5.6E-03
Shrew - Kiggavik Camp	1.4E-03	1.5E-02	4.6E-04	5.0E-03
Shrew - JSL @ Sissons Discharge	7.1E-04	1.5E-02	2.4E-04	5.1E-03
Squirrel - Rock Lake Watershed	1.6E-03	2.0E-02	5.2E-04	6.7E-03
Squirrel - JSL @ Kiggavik Discharge	1.6E-03	2.0E-02	5.2E-04	6.7E-03
Squirrel - Kiggavik Camp	1.6E-03	2.0E-02	5.2E-04	6.8E-03
Squirrel - JSL @ Sissons Discharge	1.6E-03	2.0E-02	5.2E-04	6.7E-03
Wolf - LSA	1.1E-03	6.7E-03	3.7E-04	2.2E-03
Wolf - RSA	1.1E-03	6.7E-03	3.7E-04	2.2E-03
Wolverine - LSA	1.0E-03	2.9E-03	3.4E-04	9.6E-04
Wolverine - RSA	1.0E-03	2.9E-03	3.4E-04	9.6E-04

U-238+ Internal U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235
Ra-226+ Internal Ra-226 + 0.3* (Rn-222 + ...Po-214)
Pb-210+ Internal Pb-210 + Bi-210

Table H.2-4

Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

2065

DOSES TO SELECTED VECs - 95th Percentile Total Dose

		U-238+	Th-230	Ra-226+	Pb-210+	Po-210	Subtotals	
Absorbed Doses - Bear - LSA								
Concentration	Bq/g	Crad	3.88E-05	1.51E-04	6.99E-05	1.74E-04	6.45E-03	
Internal Dose Factor	mGy/d per Bq/g	ldcf	1.4E-01	6.6E-02	1.6E-01	6.0E-03	7.4E-02	
Internal dose rate	mGy/d	ldrat	5.5E-06	9.9E-06	1.1E-05	1.1E-06	4.8E-04	5.0E-04 =Crad*ldcf
External Gamma rate	uGy/h	Xgrat	0.04					
Fraction of time on site	-	fts	1.00					
External dose rate	mGy/d	Xdrat	9.6E-04					=Xgrat*24*fts/1000
Internal plus external	mGy/d	tdrat	1.5E-03					=SUM(ldrat)+Xdrat
Absorbed Doses - Caribou - LSA								
Concentration	Bq/g	Crad2	8.62E-05	1.33E-04	2.95E-04	2.53E-03	7.65E-02	
Internal dose rate	mGy/d	ldrat2	1.2E-05	8.7E-06	4.7E-05	1.5E-05	5.7E-03	=Crad2*ldcf
Fraction of time on site	-	fts2	1.00					
External dose rate	mGy/d	Xdrat2	9.6E-04					=Xgrat*24*fts2/1000
Internal plus external	mGy/d	tdrat2	6.7E-03					=SUM(ldrat2)+Xdrat2
Absorbed Doses - Caribou - RSA								
Concentration	Bq/g	Crad3	8.62E-05	1.33E-04	2.95E-04	2.53E-03	7.65E-02	
Internal dose rate	mGy/d	ldrat3	1.2E-05	8.7E-06	4.7E-05	1.5E-05	5.7E-03	=Crad3*ldcf
Fraction of time on site	-	fts3	1.00					
External dose rate	mGy/d	Xdrat3	9.6E-04					=Xgrat*24*fts3/1000
Internal plus external	mGy/d	tdrat3	6.7E-03					=SUM(ldrat3)+Xdrat3
Absorbed Doses - Falcon - LSA								
Concentration	Bq/g	Crad4	1.15E-05	3.57E-04	1.38E-03	4.40E-01	5.01E-02	
Internal dose rate	mGy/d	ldrat4	1.6E-06	2.3E-05	2.2E-04	2.7E-03	3.7E-03	6.6E-03 =Crad4*ldcf
Fraction of time on site	-	fts4	1.00					
External dose rate	mGy/d	Xdrat4	9.6E-04					=Xgrat*24*fts4/1000
Internal plus external	mGy/d	tdrat4	7.6E-03					=SUM(ldrat4)+Xdrat4
Absorbed Doses - Falcon - RSA								
Concentration	Bq/g	Crad5	1.14E-05	3.56E-04	1.38E-03	4.40E-01	5.00E-02	
Internal dose rate	mGy/d	ldrat5	1.6E-06	2.3E-05	2.2E-04	2.7E-03	3.7E-03	6.6E-03 =Crad5*ldcf
Fraction of time on site	-	fts5	1.00					
External dose rate	mGy/d	Xdrat5	9.6E-04					=Xgrat*24*fts5/1000
Internal plus external	mGy/d	tdrat5	7.6E-03					=SUM(ldrat5)+Xdrat5
Absorbed Doses - Fox - LSA								
Concentration	Bq/g	Crad6	2.01E-05	7.95E-05	1.30E-04	5.17E-04	3.67E-03	
Internal dose rate	mGy/d	ldrat6	2.9E-06	5.2E-06	2.1E-05	3.1E-06	2.7E-04	3.0E-04 =Crad6*ldcf
Fraction of time on site	-	fts6	1.00					
External dose rate	mGy/d	Xdrat6	9.6E-04					=Xgrat*24*fts6/1000
Internal plus external	mGy/d	tdrat6	1.3E-03					=SUM(ldrat6)+Xdrat6
Absorbed Doses - Lemming - Rock Lake Watershed								
Concentration	Bq/g	Crad7	1.50E-04	3.56E-03	6.36E-03	1.69E-01	2.09E-02	
Internal dose rate	mGy/d	ldrat7	2.1E-05	2.3E-04	1.0E-03	1.0E-03	1.5E-03	3.8E-03 =Crad7*ldcf
Fraction of time on site	-	fts7	1.00					
External dose rate	mGy/d	Xdrat7	9.6E-04					=Xgrat*24*fts7/1000
Internal plus external	mGy/d	tdrat7	4.8E-03					=SUM(ldrat7)+Xdrat7
Absorbed Doses - Lemming - JSL @ Kiggavik Discharge								
Concentration	Bq/g	Crad8	1.50E-04	3.56E-03	6.36E-03	1.69E-01	2.09E-02	
Internal dose rate	mGy/d	ldrat8	2.1E-05	2.3E-04	1.0E-03	1.0E-03	1.5E-03	3.8E-03 =Crad8*ldcf
Fraction of time on site	-	fts8	1.00					
External dose rate	mGy/d	Xdrat8	9.6E-04					=Xgrat*24*fts8/1000
Internal plus external	mGy/d	tdrat8	4.8E-03					=SUM(ldrat8)+Xdrat8
Absorbed Doses - Lemming - Kiggavik Camp								
Concentration	Bq/g	Crad9	1.53E-04	3.58E-03	6.37E-03	1.69E-01	2.09E-02	
Internal dose rate	mGy/d	ldrat9	2.2E-05	2.4E-04	1.0E-03	1.0E-03	1.5E-03	3.8E-03 =Crad9*ldcf
Fraction of time on site	-	fts9	1.00					
External dose rate	mGy/d	Xdrat9	9.6E-04					=Xgrat*24*fts9/1000
Internal plus external	mGy/d	tdrat9	4.8E-03					=SUM(ldrat9)+Xdrat9
Absorbed Doses - Lemming - JSL @ Sissons Discharge								
Concentration	Bq/g	Crad10	1.50E-04	3.56E-03	6.36E-03	1.69E-01	2.09E-02	
Internal dose rate	mGy/d	ldrat10	2.1E-05	2.3E-04	1.0E-03	1.0E-03	1.5E-03	3.8E-03 =Crad10*ldcf
Fraction of time on site	-	fts10	1.00					
External dose rate	mGy/d	Xdrat10	9.6E-04					=Xgrat*24*fts10/1000
Internal plus external	mGy/d	tdrat10	4.8E-03					=SUM(ldrat10)+Xdrat10
Absorbed Doses - Lapland Longspur - Rock Lake Watershed								
Concentration	Bq/g	Crad11	4.07E-05	3.37E-03	5.24E-03	1.35E-01	3.62E-02	
Internal dose rate	mGy/d	ldrat11	5.8E-06	2.2E-04	8.3E-04	8.1E-04	2.7E-03	4.6E-03 =Crad11*ldcf
Fraction of time on site	-	fts11	1.00					
External dose rate	mGy/d	Xdrat11	9.6E-04					=Xgrat*24*fts11/1000
Internal plus external	mGy/d	tdrat11	5.5E-03					=SUM(ldrat11)+Xdrat11

Table H.2-4

Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

Absorbed Doses - Lapland Longspur - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad12	4.32E-05	3.38E-03	5.39E-03	1.36E-01	3.72E-02			
Internal dose rate	mGy/d	ldrat12	6.1E-06	2.2E-04	8.6E-04	8.2E-04	2.8E-03	4.7E-03	=Crad12*ldcf	
Fraction of time on site	-	fts12	1.00							
External dose rate	mGy/d	Xdrat12	9.6E-04						=Xgrat*24*fts12/1000	
Internal plus external	mGy/d	tdrat12	5.6E-03						=SUM(ldrat12)+Xdrat12	
Absorbed Doses - Lapland Longspur - Kiggavik Camp										
Concentration	Bq/g	Crad13	1.30E-05	3.38E-03	5.10E-03	1.34E-01	3.57E-02			
Internal dose rate	mGy/d	ldrat13	1.8E-06	2.2E-04	8.1E-04	8.1E-04	2.6E-03	4.5E-03	=Crad13*ldcf	
Fraction of time on site	-	fts13	1.00							
External dose rate	mGy/d	Xdrat13	9.6E-04						=Xgrat*24*fts13/1000	
Internal plus external	mGy/d	tdrat13	5.4E-03						=SUM(ldrat13)+Xdrat13	
Absorbed Doses - Lapland Longspur - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad14	4.07E-05	3.37E-03	5.22E-03	1.35E-01	3.64E-02			
Internal dose rate	mGy/d	ldrat14	5.8E-06	2.2E-04	8.3E-04	8.1E-04	2.7E-03	4.6E-03	=Crad14*ldcf	
Fraction of time on site	-	fts14	1.00							
External dose rate	mGy/d	Xdrat14	9.6E-04						=Xgrat*24*fts14/1000	
Internal plus external	mGy/d	tdrat14	5.5E-03						=SUM(ldrat14)+Xdrat14	
Absorbed Doses - Long-Tailed Duck - Rock Lake										
Concentration	Bq/g	Crad15	5.55E-05	6.03E-04	9.26E-03	6.39E-02	5.78E-02			
Internal dose rate	mGy/d	ldrat15	7.9E-06	4.0E-05	1.5E-03	3.9E-04	4.3E-03	6.2E-03	=Crad15*ldcf	
Fraction of time on site	-	fts15	1.00							
External dose rate	mGy/d	Xdrat15	9.6E-04						=Xgrat*24*fts15/1000	
Internal plus external	mGy/d	tdrat15	7.1E-03						=SUM(ldrat15)+Xdrat15	
Absorbed Doses - Long-Tailed Duck - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad16	4.99E-05	5.82E-04	8.89E-03	6.15E-02	5.54E-02			
Internal dose rate	mGy/d	ldrat16	7.1E-06	3.8E-05	1.4E-03	3.7E-04	4.1E-03	5.9E-03	=Crad16*ldcf	
Fraction of time on site	-	fts16	1.00							
External dose rate	mGy/d	Xdrat16	9.6E-04						=Xgrat*24*fts16/1000	
Internal plus external	mGy/d	tdrat16	6.9E-03						=SUM(ldrat16)+Xdrat16	
Absorbed Doses - Long-Tailed Duck - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad17	5.11E-05	5.85E-04	8.94E-03	6.18E-02	5.58E-02			
Internal dose rate	mGy/d	ldrat17	7.2E-06	3.9E-05	1.4E-03	3.7E-04	4.1E-03	6.0E-03	=Crad17*ldcf	
Fraction of time on site	-	fts17	1.00							
External dose rate	mGy/d	Xdrat17	9.6E-04						=Xgrat*24*fts17/1000	
Internal plus external	mGy/d	tdrat17	6.9E-03						=SUM(ldrat17)+Xdrat17	
Absorbed Doses - Merganser - Rock Lake										
Concentration	Bq/g	Crad18	7.69E-06	3.15E-04	3.99E-04	1.98E-02	7.05E-03			
Internal dose rate	mGy/d	ldrat18	1.1E-06	2.1E-05	6.3E-05	1.2E-04	5.2E-04	7.3E-04	=Crad18*ldcf	
Fraction of time on site	-	fts18	1.00							
External dose rate	mGy/d	Xdrat18	9.6E-04						=Xgrat*24*fts18/1000	
Internal plus external	mGy/d	tdrat18	1.7E-03						=SUM(ldrat18)+Xdrat18	
Absorbed Doses - Merganser - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad19	7.65E-06	3.08E-04	3.71E-04	1.97E-02	6.67E-03			
Internal dose rate	mGy/d	ldrat19	1.1E-06	2.0E-05	5.9E-05	1.2E-04	4.9E-04	6.9E-04	=Crad19*ldcf	
Fraction of time on site	-	fts19	1.00							
External dose rate	mGy/d	Xdrat19	9.6E-04						=Xgrat*24*fts19/1000	
Internal plus external	mGy/d	tdrat19	1.7E-03						=SUM(ldrat19)+Xdrat19	
Absorbed Doses - Merganser - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad20	7.64E-06	3.09E-04	3.73E-04	1.97E-02	6.68E-03			
Internal dose rate	mGy/d	ldrat20	1.1E-06	2.0E-05	5.9E-05	1.2E-04	4.9E-04	6.9E-04	=Crad20*ldcf	
Fraction of time on site	-	fts20	1.00							
External dose rate	mGy/d	Xdrat20	9.6E-04						=Xgrat*24*fts20/1000	
Internal plus external	mGy/d	tdrat20	1.7E-03						=SUM(ldrat20)+Xdrat20	
Absorbed Doses - Muskox - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad21	1.18E-04	1.86E-04	2.87E-04	6.77E-04	2.04E-02			
Internal dose rate	mGy/d	ldrat21	1.7E-05	1.2E-05	4.6E-05	4.1E-06	1.5E-03	1.6E-03	=Crad21*ldcf	
Fraction of time on site	-	fts21	1.00							
External dose rate	mGy/d	Xdrat21	9.6E-04						=Xgrat*24*fts21/1000	
Internal plus external	mGy/d	tdrat21	2.6E-03						=SUM(ldrat21)+Xdrat21	
Absorbed Doses - Muskox - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad22	4.07E-05	3.37E-03	5.22E-03	1.35E-01	3.64E-02			
Internal dose rate	mGy/d	ldrat22	5.8E-06	2.2E-04	8.3E-04	8.1E-04	2.7E-03	4.6E-03	=Crad22*ldcf	
Fraction of time on site	-	fts22	1.00							
External dose rate	mGy/d	Xdrat22	9.6E-04						=Xgrat*24*fts22/1000	
Internal plus external	mGy/d	tdrat22	5.5E-03						=SUM(ldrat22)+Xdrat22	
Absorbed Doses - Northern Pintail - Rock Lake										
Concentration	Bq/g	Crad23	2.34E-05	4.59E-03	2.26E-03	1.68E-01	6.11E-02			
Internal dose rate	mGy/d	ldrat23	3.3E-06	3.0E-04	3.6E-04	1.0E-03	4.5E-03	6.2E-03	=Crad23*ldcf	
Fraction of time on site	-	fts23	1.00							
External dose rate	mGy/d	Xdrat23	9.6E-04						=Xgrat*24*fts23/1000	
Internal plus external	mGy/d	tdrat23	7.2E-03						=SUM(ldrat23)+Xdrat23	

Table H.2-4
Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

Absorbed Doses - Northern Pintail - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad24	2.11E-05	4.42E-03	2.17E-03	1.62E-01	5.85E-02			
Internal dose rate	mGy/d	Idrat24	3.0E-06	2.9E-04	3.5E-04	9.8E-04	4.3E-03	5.9E-03	=Crad24*Idcf	
Fraction of time on site	-	fts24	1.00							
External dose rate	mGy/d	Xdrat24	9.6E-04						=Xgrat*24*fts24/1000	
Internal plus external	mGy/d	tdrat24	6.9E-03						=SUM(Idrat24)+Xdrat24	
Absorbed Doses - Northern Pintail - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad25	2.14E-05	4.45E-03	2.18E-03	1.63E-01	5.90E-02			
Internal dose rate	mGy/d	Idrat25	3.0E-06	2.9E-04	3.5E-04	9.8E-04	4.4E-03	6.0E-03	=Crad25*Idcf	
Fraction of time on site	-	fts25	1.00							
External dose rate	mGy/d	Xdrat25	9.6E-04						=Xgrat*24*fts25/1000	
Internal plus external	mGy/d	tdrat25	6.9E-03						=SUM(Idrat25)+Xdrat25	
Absorbed Doses - Ptarmigan - Rock Lake Watershed										
Concentration	Bq/g	Crad26	4.26E-05	9.02E-04	2.17E-03	3.89E-01	1.43E-01			
Internal dose rate	mGy/d	Idrat26	6.0E-06	5.9E-05	3.5E-04	2.3E-03	1.1E-02	1.3E-02	=Crad26*Idcf	
Fraction of time on site	-	fts26	1.00							
External dose rate	mGy/d	Xdrat26	9.6E-04						=Xgrat*24*fts26/1000	
Internal plus external	mGy/d	tdrat26	1.4E-02						=SUM(Idrat26)+Xdrat26	
Absorbed Doses - Ptarmigan - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad27	4.32E-05	9.03E-04	2.21E-03	3.89E-01	1.43E-01			
Internal dose rate	mGy/d	Idrat27	6.1E-06	5.9E-05	3.5E-04	2.3E-03	1.1E-02	1.3E-02	=Crad27*Idcf	
Fraction of time on site	-	fts27	1.00							
External dose rate	mGy/d	Xdrat27	9.6E-04						=Xgrat*24*fts27/1000	
Internal plus external	mGy/d	tdrat27	1.4E-02						=SUM(Idrat27)+Xdrat27	
Absorbed Doses - Ptarmigan - Kiggavik Camp										
Concentration	Bq/g	Crad28	3.52E-05	9.07E-04	2.10E-03	3.89E-01	1.44E-01			
Internal dose rate	mGy/d	Idrat28	5.0E-06	6.0E-05	3.3E-04	2.3E-03	1.1E-02	1.3E-02	=Crad28*Idcf	
Fraction of time on site	-	fts28	1.00							
External dose rate	mGy/d	Xdrat28	9.6E-04						=Xgrat*24*fts28/1000	
Internal plus external	mGy/d	tdrat28	1.4E-02						=SUM(Idrat28)+Xdrat28	
Absorbed Doses - Ptarmigan - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad29	4.27E-05	9.02E-04	2.16E-03	3.89E-01	1.43E-01			
Internal dose rate	mGy/d	Idrat29	6.1E-06	5.9E-05	3.4E-04	2.3E-03	1.1E-02	1.3E-02	=Crad29*Idcf	
Fraction of time on site	-	fts29	1.00							
External dose rate	mGy/d	Xdrat29	9.6E-04						=Xgrat*24*fts29/1000	
Internal plus external	mGy/d	tdrat29	1.4E-02						=SUM(Idrat29)+Xdrat29	
Absorbed Doses - Sandpiper - Rock Lake										
Concentration	Bq/g	Crad30	1.96E-04	2.14E-03	1.53E-02	1.83E-01	1.19E-01			
Internal dose rate	mGy/d	Idrat30	2.8E-05	1.4E-04	2.4E-03	1.1E-03	8.8E-03	1.3E-02	=Crad30*Idcf	
Fraction of time on site	-	fts30	1.00							
External dose rate	mGy/d	Xdrat30	9.6E-04						=Xgrat*24*fts30/1000	
Internal plus external	mGy/d	tdrat30	1.3E-02						=SUM(Idrat30)+Xdrat30	
Absorbed Doses - Sandpiper - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad31	1.81E-04	2.11E-03	1.47E-02	1.78E-01	1.14E-01			
Internal dose rate	mGy/d	Idrat31	2.6E-05	1.4E-04	2.3E-03	1.1E-03	8.5E-03	1.2E-02	=Crad31*Idcf	
Fraction of time on site	-	fts31	1.00							
External dose rate	mGy/d	Xdrat31	9.6E-04						=Xgrat*24*fts31/1000	
Internal plus external	mGy/d	tdrat31	1.3E-02						=SUM(Idrat31)+Xdrat31	
Absorbed Doses - Sandpiper - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad32	1.84E-04	2.10E-03	1.48E-02	1.78E-01	1.15E-01			
Internal dose rate	mGy/d	Idrat32	2.6E-05	1.4E-04	2.4E-03	1.1E-03	8.5E-03	1.2E-02	=Crad32*Idcf	
Fraction of time on site	-	fts32	1.00							
External dose rate	mGy/d	Xdrat32	9.6E-04						=Xgrat*24*fts32/1000	
Internal plus external	mGy/d	tdrat32	1.3E-02						=SUM(Idrat32)+Xdrat32	
Absorbed Doses - Shrew - Rock Lake Watershed										
Concentration	Bq/g	Crad33	1.03E-04	6.31E-04	4.02E-03	3.64E-02	5.70E-03			
Internal dose rate	mGy/d	Idrat33	1.5E-05	4.2E-05	6.4E-04	2.2E-04	4.2E-04	1.3E-03	=Crad33*Idcf	
Fraction of time on site	-	fts33	1.00							
External dose rate	mGy/d	Xdrat33	9.6E-04						=Xgrat*24*fts33/1000	
Internal plus external	mGy/d	tdrat33	2.3E-03						=SUM(Idrat33)+Xdrat33	
Absorbed Doses - Shrew - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad34	1.13E-04	6.72E-04	4.37E-03	3.68E-02	5.88E-03			
Internal dose rate	mGy/d	Idrat34	1.6E-05	4.4E-05	6.9E-04	2.2E-04	4.4E-04	1.4E-03	=Crad34*Idcf	
Fraction of time on site	-	fts34	1.00							
External dose rate	mGy/d	Xdrat34	9.6E-04						=Xgrat*24*fts34/1000	
Internal plus external	mGy/d	tdrat34	2.4E-03						=SUM(Idrat34)+Xdrat34	
Absorbed Doses - Shrew - Kiggavik Camp										
Concentration	Bq/g	Crad35	9.48E-06	6.01E-04	3.72E-03	3.61E-02	5.69E-03			
Internal dose rate	mGy/d	Idrat35	1.3E-06	4.0E-05	5.9E-04	2.2E-04	4.2E-04	1.3E-03	=Crad35*Idcf	
Fraction of time on site	-	fts35	1.00							
External dose rate	mGy/d	Xdrat35	9.6E-04						=Xgrat*24*fts35/1000	
Internal plus external	mGy/d	tdrat35	2.2E-03						=SUM(Idrat35)+Xdrat35	
Absorbed Doses - Shrew - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad36	1.04E-04	6.31E-04	4.01E-03	3.64E-02	5.72E-03			
Internal dose rate	mGy/d	Idrat36	1.5E-05	4.2E-05	6.4E-04	2.2E-04	4.2E-04	1.3E-03	=Crad36*Idcf	
Fraction of time on site	-	fts36	1.00							

Table H.2-4

Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

External dose rate	mGy/d	Xdrat36	2.7E-04							=Xgrat*24*fts36/3600
Internal plus external	mGy/d	tdrat36	1.6E-03							=SUM(ldrat36)+Xdrat36
Absorbed Doses - Squirrel - Rock Lake Watershed										
Concentration	Bq/g	Crad37	8.97E-05	3.42E-03	6.40E-03	8.34E-02	1.01E-02			
Internal dose rate	mGy/d	ldrat37	1.3E-05	2.3E-04	1.0E-03	5.0E-04	7.5E-04	2.5E-03		=Crad37*ldcf
Fraction of time on site	-	fts37	1.00							
External dose rate	mGy/d	Xdrat37	9.6E-04							=Xgrat*24*fts37/1000
Internal plus external	mGy/d	tdrat37	3.5E-03							=SUM(ldrat37)+Xdrat37
Absorbed Doses - Squirrel - JSL @ Kiggavik Discharge										
Concentration	Bq/g	Crad38	8.96E-05	3.42E-03	6.40E-03	8.34E-02	1.01E-02			
Internal dose rate	mGy/d	ldrat38	1.3E-05	2.3E-04	1.0E-03	5.0E-04	7.5E-04	2.5E-03		=Crad38*ldcf
Fraction of time on site	-	fts38	1.00							
External dose rate	mGy/d	Xdrat38	9.6E-04							=Xgrat*24*fts38/1000
Internal plus external	mGy/d	tdrat38	3.5E-03							=SUM(ldrat38)+Xdrat38
Absorbed Doses - Squirrel - Kiggavik Camp										
Concentration	Bq/g	Crad39	9.30E-05	3.45E-03	6.44E-03	8.35E-02	1.01E-02			
Internal dose rate	mGy/d	ldrat39	1.3E-05	2.3E-04	1.0E-03	5.0E-04	7.5E-04	2.5E-03		=Crad39*ldcf
Fraction of time on site	-	fts39	1.00							
External dose rate	mGy/d	Xdrat39	9.6E-04							=Xgrat*24*fts39/1000
Internal plus external	mGy/d	tdrat39	3.5E-03							=SUM(ldrat39)+Xdrat39

Table H.2-4

Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

Absorbed Doses - Squirrel - JSL @ Sissons Discharge										
Concentration	Bq/g	Crad40	8.97E-05	3.42E-03	6.40E-03	8.34E-02	1.01E-02			
Internal dose rate	mGy/d	Idrat40	1.3E-05	2.3E-04	1.0E-03	5.0E-04	7.5E-04	2.5E-03	=Crad40*Idcf	
Fraction of time on site	-	fts40	1.00							
External dose rate	mGy/d	Xdrat40	9.6E-04						=Xgrat*24*fts40/1000	
Internal plus external	mGy/d	tdrat40	3.5E-03						=SUM(Idrat40)+Xdrat40	
Absorbed Doses - Wolf - LSA										
Concentration	Bq/g	Crad41	4.16E-05	2.94E-05	2.20E-05	1.44E-05	7.66E-03			
Internal dose rate	mGy/d	Idrat41	5.9E-06	1.9E-06	3.5E-06	8.7E-08	5.7E-04	5.8E-04	=Crad41*Idcf	
Fraction of time on site	-	fts41	1.00							
External dose rate	mGy/d	Xdrat41	9.6E-04						=Xgrat*24*fts41/1000	
Internal plus external	mGy/d	tdrat41	1.5E-03						=SUM(Idrat41)+Xdrat41	
Absorbed Doses - Wolf - RSA										
Concentration	Bq/g	Crad42	4.16E-05	2.94E-05	2.20E-05	1.44E-05	7.66E-03			
Internal dose rate	mGy/d	Idrat42	5.9E-06	1.9E-06	3.5E-06	8.7E-08	5.7E-04	5.8E-04	=Crad42*Idcf	
Fraction of time on site	-	fts42	1.00							
External dose rate	mGy/d	Xdrat42	9.6E-04						=Xgrat*24*fts42/1000	
Internal plus external	mGy/d	tdrat42	1.5E-03						=SUM(Idrat42)+Xdrat42	
Absorbed Doses - Wolverine - LSA										
Concentration	Bq/g	Crad43	5.82E-05	1.16E-04	2.13E-04	4.70E-04	1.79E-03			
Internal dose rate	mGy/d	Idrat43	8.3E-06	7.6E-06	3.4E-05	2.8E-06	1.3E-04	1.9E-04	=Crad43*Idcf	
Fraction of time on site	-	fts43	1.00							
External dose rate	mGy/d	Xdrat43	9.6E-04						=Xgrat*24*fts43/1000	
Internal plus external	mGy/d	tdrat43	1.1E-03						=SUM(Idrat43)+Xdrat43	
Absorbed Doses - Wolverine - RSA										
Concentration	Bq/g	Crad44	5.82E-05	1.16E-04	2.13E-04	4.70E-04	1.80E-03			
Internal dose rate	mGy/d	Idrat44	8.3E-06	7.6E-06	3.4E-05	2.8E-06	1.3E-04	1.9E-04	=Crad44*Idcf	
Fraction of time on site	-	fts44	1.00							
External dose rate	mGy/d	Xdrat44	9.6E-04						=Xgrat*24*fts44/1000	
Internal plus external	mGy/d	tdrat44	1.1E-03						=SUM(Idrat44)+Xdrat44	
Equivalent Doses - Bear - LSA										
RBE for alpha	Sv/Gy	RBE	40							
High LET dose rate	mSv/d	Hletdr	2.2E-04	4.0E-04	4.4E-04	1.1E-06	1.9E-02	2.0E-02	=Idrat*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr	9.6E-04						=Xdrat	
Total dose rate	mSv/d	tdr	2.1E-02						=SUM(Hletdr)+Lletdr	
Equivalent Doses - Caribou - LSA										
High LET dose rate	mSv/d	Hletdr2	4.9E-04	3.5E-04	1.9E-03	1.5E-05	2.3E-01	2.3E-01	=Idrat2*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr2	9.6E-04						=Xdrat2	
Total dose rate	mSv/d	tdr2	2.3E-01						=SUM(Hletdr2)+Lletdr2	
Equivalent Doses - Caribou - RSA										
High LET dose rate	mSv/d	Hletdr3	4.9E-04	3.5E-04	1.9E-03	1.5E-05	2.3E-01	2.3E-01	=Idrat3*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr3	9.6E-04						=Xdrat3	
Total dose rate	mSv/d	tdr3	2.3E-01						=SUM(Hletdr3)+Lletdr3	
Equivalent Doses - Falcon - LSA										
High LET dose rate	mSv/d	Hletdr4	6.5E-05	9.4E-04	8.8E-03	2.7E-03	1.5E-01	1.6E-01	=Idrat4*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr4	9.6E-04						=Xdrat4	
Total dose rate	mSv/d	tdr4	1.6E-01						=SUM(Hletdr4)+Lletdr4	
Equivalent Doses - Falcon - RSA										
High LET dose rate	mSv/d	Hletdr5	6.5E-05	9.4E-04	8.8E-03	2.7E-03	1.5E-01	1.6E-01	=Idrat5*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr5	9.6E-04						=Xdrat5	
Total dose rate	mSv/d	tdr5	1.6E-01						=SUM(Hletdr5)+Lletdr5	
Equivalent Doses - Fox - LSA										
High LET dose rate	mSv/d	Hletdr6	1.1E-04	2.1E-04	8.3E-04	3.1E-06	1.1E-02	1.2E-02	=Idrat6*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr6	9.6E-04						=Xdrat6	
Total dose rate	mSv/d	tdr6	1.3E-02						=SUM(Hletdr6)+Lletdr6	
Equivalent Doses - Lemming - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr7	8.5E-04	9.4E-03	4.0E-02	1.0E-03	6.2E-02	1.1E-01	=Idrat7*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr7	9.6E-04						=Xdrat7	
Total dose rate	mSv/d	tdr7	1.1E-01						=SUM(Hletdr7)+Lletdr7	
Equivalent Doses - Lemming - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr8	8.5E-04	9.4E-03	4.0E-02	1.0E-03	6.2E-02	1.1E-01	=Idrat8*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr8	9.6E-04						=Xdrat8	
Total dose rate	mSv/d	tdr8	1.1E-01						=SUM(Hletdr8)+Lletdr8	
Equivalent Doses - Lemming - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr9	8.7E-04	9.4E-03	4.1E-02	1.0E-03	6.2E-02	1.1E-01	=Idrat9*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr9	9.6E-04						=Xdrat9	
Total dose rate	mSv/d	tdr9	1.1E-01						=SUM(Hletdr9)+Lletdr9	
Equivalent Doses - Lemming - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr10	8.5E-04	9.4E-03	4.0E-02	1.0E-03	6.2E-02	1.1E-01	=Idrat10*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr10	9.6E-04						=Xdrat10	
Total dose rate	mSv/d	tdr10	1.1E-01						=SUM(Hletdr10)+Lletdr10	

Table H.2-4

Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

Equivalent Doses - Lapland Longspur - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr11	2.3E-04	8.9E-03	3.3E-02	8.1E-04	1.1E-01	1.5E-01	=Idrat11*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr11	9.6E-04						=Xdrat11	
Total dose rate	mSv/d	tdr11	1.5E-01						=SUM(Hletdr11)+Lletdr11	
Equivalent Doses - Lapland Longspur - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr12	2.5E-04	8.9E-03	3.4E-02	8.2E-04	1.1E-01	1.5E-01	=Idrat12*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr12	9.6E-04						=Xdrat12	
Total dose rate	mSv/d	tdr12	1.6E-01						=SUM(Hletdr12)+Lletdr12	
Equivalent Doses - Lapland Longspur - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr13	7.4E-05	8.9E-03	3.2E-02	8.1E-04	1.1E-01	1.5E-01	=Idrat13*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr13	9.6E-04						=Xdrat13	
Total dose rate	mSv/d	tdr13	1.5E-01						=SUM(Hletdr13)+Lletdr13	
Equivalent Doses - Lapland Longspur - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr14	2.3E-04	8.9E-03	3.3E-02	8.1E-04	1.1E-01	1.5E-01	=Idrat14*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr14	9.6E-04						=Xdrat14	
Total dose rate	mSv/d	tdr14	1.5E-01						=SUM(Hletdr14)+Lletdr14	
Equivalent Doses - Long-Tailed Duck - Rock Lake										
High LET dose rate	mSv/d	Hletdr15	3.2E-04	1.6E-03	5.9E-02	3.9E-04	1.7E-01	2.3E-01	=Idrat15*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr15	9.6E-04						=Xdrat15	
Total dose rate	mSv/d	tdr15	2.3E-01						=SUM(Hletdr15)+Lletdr15	
Equivalent Doses - Long-Tailed Duck - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr16	2.8E-04	1.5E-03	5.7E-02	3.7E-04	1.6E-01	2.2E-01	=Idrat16*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr16	9.6E-04						=Xdrat16	
Total dose rate	mSv/d	tdr16	2.2E-01						=SUM(Hletdr16)+Lletdr16	
Equivalent Doses - Long-Tailed Duck - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr17	2.9E-04	1.5E-03	5.7E-02	3.7E-04	1.7E-01	2.2E-01	=Idrat17*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr17	9.6E-04						=Xdrat17	
Total dose rate	mSv/d	tdr17	2.3E-01						=SUM(Hletdr17)+Lletdr17	
Equivalent Doses - Merganser - Rock Lake										
High LET dose rate	mSv/d	Hletdr18	4.4E-05	8.3E-04	2.5E-03	1.2E-04	2.1E-02	2.4E-02	=Idrat18*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr18	9.6E-04						=Xdrat18	
Total dose rate	mSv/d	tdr18	2.5E-02						=SUM(Hletdr18)+Lletdr18	
Equivalent Doses - Merganser - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr19	4.3E-05	8.1E-04	2.4E-03	1.2E-04	2.0E-02	2.3E-02	=Idrat19*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr19	9.6E-04						=Xdrat19	
Total dose rate	mSv/d	tdr19	2.4E-02						=SUM(Hletdr19)+Lletdr19	
Equivalent Doses - Merganser - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr20	4.3E-05	8.1E-04	2.4E-03	1.2E-04	2.0E-02	2.3E-02	=Idrat20*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr20	9.6E-04						=Xdrat20	
Total dose rate	mSv/d	tdr20	2.4E-02						=SUM(Hletdr20)+Lletdr20	
Equivalent Doses - Muskox - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr21	6.7E-04	4.9E-04	1.8E-03	4.1E-06	6.1E-02	6.4E-02	=Idrat21*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr21	9.6E-04						=Xdrat21	
Total dose rate	mSv/d	tdr21	6.4E-02						=SUM(Hletdr21)+Lletdr21	
Equivalent Doses - Muskox - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr22	2.3E-04	8.9E-03	3.3E-02	8.1E-04	1.1E-01	1.5E-01	=Idrat22*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr22	9.6E-04						=Xdrat22	
Total dose rate	mSv/d	tdr22	1.5E-01						=SUM(Hletdr22)+Lletdr22	
Equivalent Doses - Northern Pintail - Rock Lake										
High LET dose rate	mSv/d	Hletdr23	1.3E-04	1.2E-02	1.4E-02	1.0E-03	1.8E-01	2.1E-01	=Idrat23*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr23	9.6E-04						=Xdrat23	
Total dose rate	mSv/d	tdr23	2.1E-01						=SUM(Hletdr23)+Lletdr23	
Equivalent Doses - Northern Pintail - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr24	1.2E-04	1.2E-02	1.4E-02	9.8E-04	1.7E-01	2.0E-01	=Idrat24*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr24	9.6E-04						=Xdrat24	
Total dose rate	mSv/d	tdr24	2.0E-01						=SUM(Hletdr24)+Lletdr24	
Equivalent Doses - Northern Pintail - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr25	1.2E-04	1.2E-02	1.4E-02	9.8E-04	1.7E-01	2.0E-01	=Idrat25*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr25	9.6E-04						=Xdrat25	
Total dose rate	mSv/d	tdr25	2.0E-01						=SUM(Hletdr25)+Lletdr25	
Equivalent Doses - Ptarmigan - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr26	2.4E-04	2.4E-03	1.4E-02	2.3E-03	4.2E-01	4.4E-01	=Idrat26*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr26	9.6E-04						=Xdrat26	
Total dose rate	mSv/d	tdr26	4.4E-01						=SUM(Hletdr26)+Lletdr26	
Equivalent Doses - Ptarmigan - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr27	2.5E-04	2.4E-03	1.4E-02	2.3E-03	4.2E-01	4.4E-01	=Idrat27*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr27	9.6E-04						=Xdrat27	
Total dose rate	mSv/d	tdr27	4.4E-01						=SUM(Hletdr27)+Lletdr27	

Table H.2-4

Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

Equivalent Doses - Ptarmigan - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr28	2.0E-04	2.4E-03	1.3E-02	2.3E-03	4.3E-01	4.4E-01	=Idrat28*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr28	9.6E-04						=Xdrat28	
Total dose rate	mSv/d	tdr28	4.5E-01						=SUM(Hletdr28)+Lletdr28	
Equivalent Doses - Ptarmigan - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr29	2.4E-04	2.4E-03	1.4E-02	2.3E-03	4.2E-01	4.4E-01	=Idrat29*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr29	9.6E-04						=Xdrat29	
Total dose rate	mSv/d	tdr29	4.4E-01						=SUM(Hletdr29)+Lletdr29	
Equivalent Doses - Sandpiper - Rock Lake										
High LET dose rate	mSv/d	Hletdr30	1.1E-03	5.6E-03	9.7E-02	1.1E-03	3.5E-01	4.6E-01	=Idrat30*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr30	9.6E-04						=Xdrat30	
Total dose rate	mSv/d	tdr30	4.6E-01						=SUM(Hletdr30)+Lletdr30	
Equivalent Doses - Sandpiper - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr31	1.0E-03	5.5E-03	9.4E-02	1.1E-03	3.4E-01	4.4E-01	=Idrat31*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr31	9.6E-04						=Xdrat31	
Total dose rate	mSv/d	tdr31	4.4E-01						=SUM(Hletdr31)+Lletdr31	
Equivalent Doses - Sandpiper - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr32	1.0E-03	5.5E-03	9.4E-02	1.1E-03	3.4E-01	4.4E-01	=Idrat32*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr32	9.6E-04						=Xdrat32	
Total dose rate	mSv/d	tdr32	4.4E-01						=SUM(Hletdr32)+Lletdr32	
Equivalent Doses - Shrew - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr33	5.9E-04	1.7E-03	2.6E-02	2.2E-04	1.7E-02	4.5E-02	=Idrat33*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr33	9.6E-04						=Xdrat33	
Total dose rate	mSv/d	tdr33	4.6E-02						=SUM(Hletdr33)+Lletdr33	
Equivalent Doses - Shrew - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr34	6.4E-04	1.8E-03	2.8E-02	2.2E-04	1.7E-02	4.8E-02	=Idrat34*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr34	9.6E-04						=Xdrat34	
Total dose rate	mSv/d	tdr34	4.9E-02						=SUM(Hletdr34)+Lletdr34	
Equivalent Doses - Shrew - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr35	5.4E-05	1.6E-03	2.4E-02	2.2E-04	1.7E-02	4.2E-02	=Idrat35*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr35	9.6E-04						=Xdrat35	
Total dose rate	mSv/d	tdr35	4.3E-02						=SUM(Hletdr35)+Lletdr35	
Equivalent Doses - Shrew - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr36	5.9E-04	1.7E-03	2.5E-02	2.2E-04	1.7E-02	4.5E-02	=Idrat36*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr36	2.7E-04						=Xdrat36	
Total dose rate	mSv/d	tdr36	4.5E-02						=SUM(Hletdr36)+Lletdr36	
Equivalent Doses - Squirrel - Rock Lake Watershed										
High LET dose rate	mSv/d	Hletdr37	5.1E-04	9.0E-03	4.1E-02	5.0E-04	3.0E-02	8.1E-02	=Idrat37*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr37	9.6E-04						=Xdrat37	
Total dose rate	mSv/d	tdr37	8.2E-02						=SUM(Hletdr37)+Lletdr37	
Equivalent Doses - Squirrel - JSL @ Kiggavik Discharge										
High LET dose rate	mSv/d	Hletdr38	5.1E-04	9.0E-03	4.1E-02	5.0E-04	3.0E-02	8.1E-02	=Idrat38*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr38	9.6E-04						=Xdrat38	
Total dose rate	mSv/d	tdr38	8.2E-02						=SUM(Hletdr38)+Lletdr38	
Equivalent Doses - Squirrel - Kiggavik Camp										
High LET dose rate	mSv/d	Hletdr39	5.3E-04	9.1E-03	4.1E-02	5.0E-04	3.0E-02	8.1E-02	=Idrat39*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr39	9.6E-04						=Xdrat39	
Total dose rate	mSv/d	tdr39	8.2E-02						=SUM(Hletdr39)+Lletdr39	
Equivalent Doses - Squirrel - JSL @ Sissons Discharge										
High LET dose rate	mSv/d	Hletdr40	5.1E-04	9.0E-03	4.1E-02	5.0E-04	3.0E-02	8.1E-02	=Idrat40*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr40	9.6E-04						=Xdrat40	
Total dose rate	mSv/d	tdr40	8.2E-02						=SUM(Hletdr40)+Lletdr40	
Equivalent Doses - Wolf - LSA										
High LET dose rate	mSv/d	Hletdr41	2.4E-04	7.7E-05	1.4E-04	8.7E-08	2.3E-02	2.3E-02	=Idrat41*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr41	9.6E-04						=Xdrat41	
Total dose rate	mSv/d	tdr41	2.4E-02						=SUM(Hletdr41)+Lletdr41	
Equivalent Doses - Wolf - RSA										
High LET dose rate	mSv/d	Hletdr42	2.4E-04	7.7E-05	1.4E-04	8.7E-08	2.3E-02	2.3E-02	=Idrat42*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr42	9.6E-04						=Xdrat42	
Total dose rate	mSv/d	tdr42	2.4E-02						=SUM(Hletdr42)+Lletdr42	
Equivalent Doses - Wolverine - LSA										
High LET dose rate	mSv/d	Hletdr43	3.3E-04	3.0E-04	1.4E-03	2.8E-06	5.3E-03	7.3E-03	=Idrat43*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr43	9.6E-04						=Xdrat43	
Total dose rate	mSv/d	tdr43	8.3E-03						=SUM(Hletdr43)+Lletdr43	
Equivalent Doses - Wolverine - RSA										
High LET dose rate	mSv/d	Hletdr44	3.3E-04	3.0E-04	1.4E-03	2.8E-06	5.3E-03	7.3E-03	=Idrat44*RBE , except Pb-210	
Low LET dose rate	mSv/d	Lletdr44	9.6E-04						=Xdrat44	
Total dose rate	mSv/d	tdr44	8.3E-03						=SUM(Hletdr44)+Lletdr44	

Table H.2-4
Terrestrial Dose Calculations RBE 40 and Dose Limit of 3 mGy/d

SUMMARY

3 Screening Criterion in mGy/d	Total Absorbed Dose mGy/d	Total Equivalent Dose mSv/d	Index (Absorbed Dose)	Index (Equivalent Dose)
Bear - LSA	1.5E-03	2.1E-02	4.9E-04	7.0E-03
Caribou - LSA	6.7E-03	2.3E-01	2.2E-03	7.7E-02
Caribou - RSA	6.7E-03	2.3E-01	2.2E-03	7.7E-02
Falcon - LSA	7.6E-03	1.6E-01	2.5E-03	5.4E-02
Falcon - RSA	7.6E-03	1.6E-01	2.5E-03	5.4E-02
Fox - LSA	1.3E-03	1.3E-02	4.2E-04	4.3E-03
Lemming - Rock Lake Watershed	4.8E-03	1.1E-01	1.6E-03	3.8E-02
Lemming - JSL @ Kiggavik Discharge	4.8E-03	1.1E-01	1.6E-03	3.8E-02
Lemming - Kiggavik Camp	4.8E-03	1.1E-01	1.6E-03	3.8E-02
Lemming - JSL @ Sissons Discharge	4.8E-03	1.1E-01	1.6E-03	3.8E-02
Lapland Longspur - Rock Lake Watershed	5.5E-03	1.5E-01	1.8E-03	5.0E-02
Lapland Longspur - JSL @ Kiggavik Discharge	5.6E-03	1.6E-01	1.9E-03	5.2E-02
Lapland Longspur - Kiggavik Camp	5.4E-03	1.5E-01	1.8E-03	5.0E-02
Lapland Longspur - JSL @ Sissons Discharge	5.5E-03	1.5E-01	1.8E-03	5.1E-02
Long-Tailed Duck - Rock Lake	7.1E-03	2.3E-01	2.4E-03	7.8E-02
Long-Tailed Duck - JSL @ Kiggavik Discharge	6.9E-03	2.2E-01	2.3E-03	7.5E-02
Long-Tailed Duck - JSL @ Sissons Discharge	6.9E-03	2.3E-01	2.3E-03	7.5E-02
Merganser - Rock Lake	1.7E-03	2.5E-02	5.6E-04	8.5E-03
Merganser - JSL @ Kiggavik Discharge	1.7E-03	2.4E-02	5.5E-04	8.0E-03
Merganser - JSL @ Sissons Discharge	1.7E-03	2.4E-02	5.5E-04	8.0E-03
Muskox - JSL @ Kiggavik Discharge	2.6E-03	6.4E-02	8.5E-04	2.1E-02
Muskox - JSL @ Sissons Discharge	5.5E-03	1.5E-01	1.8E-03	5.1E-02
Northern Pintail - Rock Lake	7.2E-03	2.1E-01	2.4E-03	7.0E-02
Northern Pintail - JSL @ Kiggavik Discharge	6.9E-03	2.0E-01	2.3E-03	6.7E-02
Northern Pintail - JSL @ Sissons Discharge	6.9E-03	2.0E-01	2.3E-03	6.7E-02
Ptarmigan - Rock Lake Watershed	1.4E-02	4.4E-01	4.8E-03	1.5E-01
Ptarmigan - JSL @ Kiggavik Discharge	1.4E-02	4.4E-01	4.8E-03	1.5E-01
Ptarmigan - Kiggavik Camp	1.4E-02	4.5E-01	4.8E-03	1.5E-01
Ptarmigan - JSL @ Sissons Discharge	1.4E-02	4.4E-01	4.8E-03	1.5E-01
Sandpiper - Rock Lake	1.3E-02	4.6E-01	4.5E-03	1.5E-01
Sandpiper - JSL @ Kiggavik Discharge	1.3E-02	4.4E-01	4.3E-03	1.5E-01
Sandpiper - JSL @ Sissons Discharge	1.3E-02	4.4E-01	4.4E-03	1.5E-01
Shrew - Rock Lake Watershed	2.3E-03	4.6E-02	7.7E-04	1.5E-02
Shrew - JSL @ Kiggavik Discharge	2.4E-03	4.9E-02	7.9E-04	1.6E-02
Shrew - Kiggavik Camp	2.2E-03	4.3E-02	7.4E-04	1.4E-02
Shrew - JSL @ Sissons Discharge	1.6E-03	4.5E-02	5.3E-04	1.5E-02
Squirrel - Rock Lake Watershed	3.5E-03	8.2E-02	1.2E-03	2.7E-02
Squirrel - JSL @ Kiggavik Discharge	3.5E-03	8.2E-02	1.2E-03	2.7E-02
Squirrel - Kiggavik Camp	3.5E-03	8.2E-02	1.2E-03	2.7E-02
Squirrel - JSL @ Sissons Discharge	3.5E-03	8.2E-02	1.2E-03	2.7E-02
Wolf - LSA	1.5E-03	2.4E-02	5.1E-04	8.0E-03
Wolf - RSA	1.5E-03	2.4E-02	5.1E-04	8.0E-03
Wolverine - LSA	1.1E-03	8.3E-03	3.8E-04	2.8E-03
Wolverine - RSA	1.1E-03	8.3E-03	3.8E-04	2.8E-03

U-238+ Internal U-238 + Th-234 + Pa-234m+ U-234 + 0.045 U-235
Ra-226+ Internal Ra-226 + 0.3* (Rn-222 + ...Po-214)
Pb-210+ Internal Pb-210 + Bi-210