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Supplementary Information

Predictive Environmental Risk Assessment from
Ontario Power Generation Inc.

In the Matter of the

Ontario Power Generation Inc.

Application for a licence to construct one BWRX-300 reactor at the Darlington New Nuclear Project Site (DNNP)

Commission Public Hearing
Part-2

January 8-10 and 13-14, 2025

Renseignements supplémentaires

Évaluation prédictive des risques environnementaux d'
Ontario Power Generation Inc.

À l'égard d'

Ontario Power Generation Inc.

Demande visant à construire 1 réacteur BWRX-300 sur le site du projet de nouvelle centrale nucléaire de Darlington (PNCND)

Audience publique de la Commission
Partie-2

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PREDICTIVE ENVIRONMENTAL RISK ASSESSMENT FOR THE DARLINGTON NEW NUCLEAR PROJECT

NK054-REP-07701-00002 R00

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PREDICTIVE ENVIRONMENTAL RISK ASSESSMENT FOR THE DARLINGTON NEW NUCLEAR PROJECT

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LAND ACKNOWLEDGEMENT

The lands and waters on which the Darlington New Nuclear Project (DNNP) is situated are the traditional and Treaty territory of the Michi Saagiig and Chippewa Nations, collectively known as the Williams Treaties First Nations.

The DNNP is within the territory of the Johnson-Butler Purchase/Gunshot Treaty (1787-1788) and the Williams Treaties of 1923. These Treaty Rights were reaffirmed in 2018 in a settlement with Canada and the Province of Ontario.

To acknowledge the Treaty and traditional territory, is to recognize the rights of the First Nations. It is to recognize the history of the land, predating the establishment of the earliest European colonies. It is also to acknowledge the significance for the Indigenous peoples who lived and continue to live upon it, to acknowledge the people whose practices and spiritualties are tied to the land and water and continue to develop in relation to the territory and its other inhabitants today.

ALDERVILLE FIRST NATION | BEAUSOLEIL FIRST NATION | CURVE LAKE FIRST NATION | GEORGINA ISLAND FIRST NATION | HIAWATHA FIRST NATION | SCUGOG ISLAND FIRST NATION | RAMA FIRST NATION

EXECUTIVE SUMMARY

This report presents the Predictive Environmental Risk Assessment (PERA) for the Darlington New Nuclear Project (DNNP), specifically the deployment of up to four BWRX-300 small modular reactors (SMR).

The DNNP is a proposed new nuclear power plant situated at the existing Darlington Nuclear (DN) site which is located on the north shore of Lake Ontario in the Municipality of Clarington, within the Regional Municipality of Durham, about 70 km east of Toronto. The lands and waters on which the DNNP is situated are the traditional and treaty territory of the Michi Saagiig and Chippewa Nations, collectively known as the Williams Treaties First Nations (WTFN).

The DNNP was subject to an environmental assessment (EA) under the Canadian Environmental Assessment Act (CEAA) and consists of the site preparation, construction, operation, and decommissioning of up to four nuclear power reactors supplying up to 4,800 megawatts of electrical generating capacity for supply to the Ontario grid. At the time the Environmental Impact Statement (EIS) was written, no specific reactor technology had been selected; rather, the EIS considered a Plant Parameter Envelope, developed based on the limiting design parameters from the reactor technologies under consideration for the DNNP at that time, as the basis for the environmental assessment (OPG, 2009a).

A federal joint review panel (JRP) concluded that "the DNNP is not likely to cause significant adverse environmental effects, provided the mitigation measures proposed and commitments made by OPG during the review, and the JRP's recommendations are implemented." In May 2012, the Government of Canada (GOC) accepted the JRP's conclusions for the DNNP's EA as well as the JRP's recommendations for the DNNP. Following that, the Canadian Nuclear Safety Commission (CNSC) issued a 10-year Power Reactor Site Preparation Licence (PRSL 18.00/2022) for the DNNP. In October 2021, the CNSC approved a renewal of the PRSL for another 10 years. The JRP's recommendations that the GOC assigned to OPG and commitments that OPG made during the EA process were consolidated in the DNNP Commitments Report (OPG, 2023a). One of the commitments listed in the DNNP Commitments Report is D-P-12.9: Health – Human and Non-Human Biota Methodology Report, which is implemented through this PERA.

In December 2021, OPG selected the BWRX-300 for deployment at the DNNP site. OPG has been working with the vendor, GE Hitachi Nuclear Energy (GEH), to progress the design of the BWRX-300.

<u>Objectives</u>

The DNNP PERA was conducted to meet the requirements of CSA N288.6:22 "Environmental Risk Assessments at Nuclear Facilities and Uranium Mines and Mills" (CSA, 2022a) and also meets the requirements for an ERA outlined in Section 4.1 of REGDOC-2.9.1 "Environmental Protection: Environmental Principles, Assessments and Protection Measures" (CNSC, 2020). The objectives of the PERA are to:

- Predict and assess the risk to representative human and ecological receptors resulting from exposure to radiological and non-radiological substances and physical stressors expected to be released throughout the Project Phases;
- Inform prioritization of monitoring and mitigation measures; and
- Meet follow-up program commitments (specifically D-P-12.9 in the DNNP Commitments Report (OPG, 2023a)) to verify no significant residual adverse effects from the DNNP and confirm the effectiveness of mitigation measures.

It is acknowledged that this PERA does not benefit from being informed by an Indigenous Knowledge Study. As of June 2024, an Indigenous Knowledge Study is in the process of being scoped by representatives of the Williams Treaties First Nations (WTFN) with support provided by OPG. Information from this Indigenous Knowledge Study, if shared with OPG, could help apply an Indigenous lens to future risk assessments. It is also noted that the PERA is an iterative process and thus could be updated to incorporate Indigenous Knowledge, if available, in a future revision.

Effluent and Emission Sources

There are no radiological releases expected to air and water during site preparation and construction of the DNNP. Site preparation and construction activities are managed through the Contractor's Site-Specific Environmental Management Plan. Best management practices will be employed to minimize and avoid potential adverse impacts, and all MECP requirements will be followed.

During operation, radiological emissions to air are anticipated to occur through the active ventilation system. A screening assessment was conducted to support a conservative selection of radionuclide constituents of potential concern (COPCs) for further assessment, such that all appreciable contributions to dose are included in the PERA.

During the site preparation and construction phases of the DNNP, air pollutants are expected to be released into the local atmosphere. Examples include fugitive dusts generated as part of typical construction activities (e.g., excavation, land clearing) and engine exhaust emissions from heavy construction vehicles, on-site personnel vehicles, and other motorized pieces of equipment. DNNP air emissions generated during the operation phase will also include emissions from the standby generators. Activities are also expected to generate additional noise levels.

During operation, any non-radiological liquid effluent will be released through the Condenser Cooling Water (CCW). The current design does not include the use of chlorination for water filtration and biofouling prevention; however, chlorine releases to surface water have been assessed to provide a bounding assessment should chlorination be considered in the future. It is anticipated that the only water stream that may use chlorination is the service water system. The de-chlorination system would be operated in a manner that ensures the concentration of total residual chlorine at the CCW duct does not exceed 0.01 mg/L. Chlorine concentrations in the lake are predicted to be below both human and ecological screening values. Therefore, no additional quantitative assessment of total residual chlorine was required for the PERA.

Predictive Human Health Risk Assessment

The human receptors selected for this PERA are consistent with the 2020 DN ERA (Ecometrix, 2022), the 2024 DN ERA Addendum (Ecometrix, 2024) and OPG's annual DN Environmental Monitoring Program reports, with the addition of the Harvester receptor included as part of this PERA. These receptors include:

- Urban Residents (Oshawa/Courtice, Bowmanville, West/East Beach)
- Farm
- Dairy Farm
- Rural Resident
- Industrial/Commercial Worker
- Sport Fisher
- Camper
- Harvester

These potential critical groups are off-site members of the public who are most exposed to the radiological and non-radiological COPCs from DNNP. A portion of some of these receptors also work near (within 5 km) of the DN site. This is accounted for in the dose calculations. On-site receptors were not addressed in the PERA since human exposure on the DNNP will be kept within safe levels through existing and future Health and Safety and Radiation Protection programs.

The results of the predictive human health risk assessment (HHRA) show that the incremental radiation dose from the DNNP to all human receptors during the operation phase is predicted to be well below the regulatory public dose limit of 1 mSv/a. The natural background dose at the DNNP site is 1.4 mSv/a, which is a constant source of ionizing radiation present in the environment and emitted from a variety of sources. The receptors with the highest dose include the Dairy Farm (infant), Farm (adult, child, infant), and the West-East Beach (infant). The highest total dose due to atmospheric radiological release from 4 SMRs is 6.55E-04 mSv/a for the Dairy Farm (infant).

Under the sensitivity analysis, if liquid radiological effluent is routinely released, the predicted total dose would increase to 9.96E-04 mSv/a for the Dairy Farm (infant) which is still well below the regulatory public dose limit of 1 mSv/a.

Overall, since the predicted radiation dose estimates are below the dose limit, no discernable health effects are anticipated due to exposure of these receptors to radioactive releases from the DNNP.

Predicted non-radiological air concentrations of selected air quality parameters during all Project phases were compared against ambient air quality criteria at human receptor locations. The air quality parameters selected are consistent with those assessed in the 2009 EIS and are based on anticipated releases from equipment and activities associated with the DNNP during the site preparation, construction and operation phases. Only benzo(a)pyrene was considered further quantitatively for human health; however, the results of that assessment indicated that both cancer and non-cancer risk were below levels that would cause adverse impacts for human health.

Predictive Ecological Risk Assessment

The assessment for the Predictive EcoRA focused on the DNNP site and surrounding areas. The assessment has been divided into five distinct assessment areas. All five assessment areas (AB – Coot's Pond, C, D – Treefrog Pond, E, and Darlington Nuclear) and their associated receptor locations have been retained from the previous 2020 DN ERA (Ecometrix, 2022) and 2024 DN ERA Addendum (Ecometrix, 2024). A new receptor location (F) has been introduced within assessment area E for this PERA to assess ecological receptors within closer proximity to the location of the future SMRs and represents a receptor location that may receive higher radiological doses than the receptor locations previously assessed.

Ecological receptors were selected for dose and risk analysis because they are known to exist on-site, and/or are representative of major taxonomic/ecological groups, major pathways of exposure, or have a special importance or value. The list of ecological receptors assessed in this predictive EcoRA is consistent with the 2020 DN ERA (Ecometrix, 2022) and 2024 DN ERA Addendum (Ecometrix, 2024) reports. The model used for assessment of dose and risk is either specific to the selected ecological species or is a more generic biota assessment model that is appropriate to a number of ecological receptors with similar exposure characteristics. **Table ES-1** shows the selected ecological receptors, and the assessment models used in estimating their COPC exposure, dose, and risk. Protection of the selected ecological receptors implies that other species in the same ecological receptor category are also protected as the ecological receptors selected are intended to represent other species with similar trophic levels and feeding niches. Each identified Species at Risk was assigned a representative species for the EcoRA. Consistent with CSA N288.6:22, the assessment endpoint for all receptors (other than species at risk) is population abundance. The assessment endpoint for identified species at risk is the individual, since effects on even a few individuals of species at risk would not be acceptable.

Table ES-1: Summary of Ecological Receptors and their Assessment Models used in the Predictive EcoRA

Receptor Category	Assessment Model	Major Plant or Animal Group	Representative Species
Fish	Bottom Feeding Fish	Benthopelagic forage fish	Northern Redbelly Dace
		Benthic forage fish	Round Whitefish
		Benthic forage fish	White Sucker
		Benthic predator fish	American Eel

Receptor Category	Assessment Model	Major Plant or Animal Group	Representative Species
	Pelagic Fish	Pelagic forage fish	Alewife
		Pelagic predator fish	Lake Trout
Reptiles and Amphibians	Bottom Feeding Fish	Reptile	Turtles
		Amphibian	Frogs
Aquatic Plants	Aquatic Plant	Aquatic Plants	Aquatic Plants
Aquatic Invertebrates	Benthic Invertebrate	Benthic Invertebrates	Benthic Invertebrates
Riparian Birds	Bufflehead	Diving bird – omnivore	Bufflehead
	Mallard	Dabbling bird – omnivore	Mallard
	Green Heron	Piscivore	Green Heron
Riparian Mammals	Muskrat	Herbivore	Muskrat
Terrestrial Invertebrates	Soil Invertebrate	Soil-dwelling detritivore	Earthworm
Terrestrial Birds	American Robin	Ground feeding insectivore	American Robin
	Bank Swallow	Aerial insectivore	Bank Swallow
	Song Sparrow	Omnivore	Song Sparrow
	Yellow Warbler	Insectivore	Yellow Warbler
Terrestrial Plants	Terrestrial Plant	Grass	Grass
	Terrestrial Plant	Deciduous tree	Sugar Maple
Terrestrial Mammals	Eastern Cottontail	Mammalian herbivore	Eastern Cottontail
	Meadow Vole	Mammalian herbivore	Meadow Vole
	White-tailed Deer	Mammalian herbivore	White-tailed Deer
	Common Shrew	Mammalian insectivore	Common Shrew
	Raccoon	Mammalian omnivore	Raccoon
	Red Fox	Mammalian carnivore	Red Fox
	Short-tailed Weasel	Mammalian carnivore	Short-tailed Weasel

There were no predicted exceedances of the 9.6 mGy/d radiation dose benchmark for aquatic biota nor the 2.4 mGy/d radiation dose benchmark for terrestrial and riparian biota; therefore, aquatic and terrestrial receptors at the DNNP are considered protected. The maximum predicted radiation dose from the DNNP (4 SMRs) during the operation phase is 1.78E-04 mGy/d to the Song Sparrow in location F, the location closest to the SMR release. Since there were no predicted exceedances of the respective dose benchmarks for any of the aquatic or terrestrial receptors, individual species at risk are also considered protected.

Under the sensitivity analysis, if liquid effluent is routinely released, the maximum predicted radiation dose remains the same at 1.78E-04 mGy/d for the Song Sparrow in location F.

Overall, it is unlikely that there would be adverse effects on terrestrial or aquatic populations or communities as a result of radionuclide releases from the DNNP.

Air and noise impacts on ecological receptors were assessed qualitatively and based on predicted concentrations at ecological receptor locations on-site, no adverse effects were identified.

Cumulative Effects

The combined effects from the operation of facilities within the DN site and the DNNP were considered. The DNNP Commitments Report identifies as part of the Environmental Monitoring and Environmental Assessment Follow-up Program in D-P-12.4 Aquatic Environment that the thermal plume, habitat loss, impingement and entrainment, and climate change will be integrated to inform a cumulative effects assessment for the aquatic environment. The cumulative effects assessment for the aquatic environment is being performed as part of a separate assessment outside of this PERA.

The maximum predicted cumulative dose to members of the public is 1.24E-03 mSv/a for the Farm (adult). This predicted dose is well below the regulatory public dose limit. The maximum predicted cumulative dose to ecological receptors is 5.67E-04 mGy/d to grass in location F. The grass dose is a small fraction (0.02%) of the terrestrial dose benchmark. The cumulative dose is considered conservative as the dose from the DNNP is modelled from emissions, whereas in the future, environmental monitoring data will be used to calculate dose.

Future activities on the DN site include the completion of refurbishment of the DNGS, operation of the target delivery system (TDS) which produces radiopharmaceutical grade Tc-99m from Mo-99, and the Co-60 Production System which would irradiate Co-59 to produce Co-60 in order to ensure a long-term supply of Co-60 production, an isotope used for medical applications, and further expansion of Nuclear Sustainability Services – Darlington Waste Management Facility (NSS-DWMF) with construction of Storage Building 3 underway and future development of Storage Building 4.

The dose to human and ecological receptors from DNGS refurbishment and continued operation is similar to the dose from existing DNGS operations. The dose to human and ecological receptors from additional storage of used fuel at the NSS-DWMF will marginally increase; however, dose rates at the NSS-DWMF perimeter fenceline will continue to remain below regulatory limits.

The additional emissions of the Co-60 and Mo-99 Production Systems are a small fraction (approximately 1%) of existing DN emissions, and the predicted doses are well below regulatory limits. IOPG has a comprehensive Environmental Monitoring Program that provides data to confirm acceptable doses from the existing DNGS and the Co-60 and TDS facilities. These conclusions are still valid with the addition of emissions from the DNNP.

Recommendations and Overall Conclusions

Based on the results of the PERA, the following recommendations or comments are made:

- OPG's existing environmental monitoring program (EMP) includes atmospheric monitoring (active and passive samplers), terrestrial sampling (fruits and vegetables, animal feed, eggs, poultry, milk, soil), and aquatic sampling (fish, lake water, well water, municipal water, beach sand, sediment). Considering the addition of a Harvester that consumes local traditional foods, the pathways for this receptor should be reviewed as part of the next EMP design review to determine whether there should be any changes or additions to the EMP The results would be applicable for both DNGS and DNNP.

- CSA N288.4:19 (CSA, 2019) recommends that environmental monitoring focus on those radionuclides that contribute significantly to dose. Specially, radionuclides that make up at least 70% of the dose should be considered significant, and for a given radionuclide a medium that contributes 10% or more to dose is considered significant. As identified in **Section 3.2.6** and **Section 4.2.6**, depending on the receptor C-14, I-131, and Xe-138 are the major contributors to human dose, and C-14 and Xe-138 are the major contributors to ecological dose. C-14 is already part of OPG's existing EMP at the DN Site, and I-131 is modelled due to monitoring limitations. OPG currently uses noble gas detectors to measure noble gases released from DNGS including Ar-41, Xe-133, Xe-135. Considering that Xe-138 is a major contributor to total dose at DNNP for human and ecological receptors, OPG should consider the inclusion of Xe-138 as part of the next EMP design review.

- Based on the modelling conducted in this PERA, C-14 (in milk and plants) and I-131 (in milk) are significant contributors to total human dose. C-14 is already included in OPG's EMP and I-131 is currently modelled from emissions; therefore, no changes are recommended to account for these radionuclides.

- A new human receptor, the Harvester, was added to the DNNP PERA. The Harvester aims to better represent the lifestyle characteristics of an Indigenous person who may work and/or live near the DN site and also harvests traditional foods in the local area. This new receptor is assumed to hunt, fish and consume traditional foods in a greater proportion compared to the other receptors characterized in OPG's existing EMPs and ERAs. The characteristics of the Harvester were developed using publicly available information; however, it is expected that this receptor may be further refined as more site-specific information is gathered through site specific surveys and ongoing engagement activities with local Indigenous Nations and communities. Any updates to the characteristics of the Harvester will be reflected in future PERAs and ERAs, as appropriate.

Based on the results of the PERA, the DNNP is not predicted to result in any adverse effects to the human and/or ecological receptors groups evaluated.

OPG recognizes that the DNNP PERA, while it satisfies assessment of environmental impacts from the Western science perspective, may not fully address the impact of the Project on Aboriginal, Inherent and Treaty rights as they are understood today. This is particularly true in light of the 2018 settlement agreement between the seven members of the Williams Treaties

First Nations (WTFN) with the Governments of Canada and Ontario. The Settlement (Government of Canada, 2018) pertains to the lands of the DN site and reaffirms the rights of WTFN citizens, which has fundamentally shifted how WTFN is engaged and consulted on site development. OPG recognizes the importance of furthering our knowledge and understanding, in ongoing meaningful engagement with the WTFN. OPG endeavors to continue to work with the WTFN to appropriately identify the rights impacted by the DNNP and to achieve feasible mitigation measures and/or accommodation.

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LIST OF ACRONYMS AND SYMBOLS

ACRONYMS

AAQC	Ambient Air Quality Criteria
ADAF	age-dependent adjustment factors
ALARA	As Low As Reasonably Achievable
AOO	anticipated operational occurrences
BAF	bioaccumulation factors
BATEA	Best Available Technology Economically Achievable
BMF	biomagnification factors
BWR	boiling water reactor
CAAQS	Canadian Ambient Air Quality Standards
CANDU	Canada Deuterium Uranium
CB	Control Building
CCME	Canadian Council of Ministers of the Environment
CCRA	climate change risk assessment
CCRT	climate change risk treatment
CCW	Condenser Cooling Water
CEAA	Canadian Environmental Assessment Act
CMIP5	Coupled Model Intercomparison Project Phase 5
CN	Canadian National Railway Company
CNSC	Canadian Nuclear Safety Commission
COG	CANDU Owners Group
COPC	constituent (contaminant) of potential concern
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CSA	CSA Group (formerly the Canadian Standards Association)
CSM	conceptual site model
CST	Condensate Storage Tanks
DCF	dose coefficients
DEC	Darlington Energy Complex
DN	Darlington Nuclear
DNGS	Darlington Nuclear Generating Station
DNNP	Darlington New Nuclear Project
DRL	derived release limits
DW/dw	dry weight
DWMF	Darlington Waste Management Facility
DYEC	Durham York Energy Centre
EA	environmental assessment
EC	Environment Canada
ECA	environmental compliance
ECCC	Environment and Climate Change Canada
EcoRA	ecological risk assessment

EIS	environmental impact statement
EMEAF	Environmental Monitoring and Environmental Assessment Follow-Up Plan
EMP	environmental monitoring program
EPP	Environmental Protection Plan
ERA	environmental risk assessment
ERICA	European Records of IFRS Consolidated Accounts database
ERP	Emergency Response Plan
ESDM	Emission Summary and Dispersion Modelling
EWE	extreme weather events
FCSAP	Federal Contaminated Sites Action Plan
FGR	federal guidance reports (U.S. EPA)
FNFNES	First Nations Food, Nutrition and Environment Study
FW/fw	fresh weight
GCC	gradual climate change
GCM	global climate models
GEH	GE Hitachi Nuclear Energy
GHG	greenhouse gases
GOC	Government of Canada
%HA	Percent highly annoyed
HC	Health Canada
HDPE	high-density polyethylene
HHRA	human health risk assessment
HLW	high level waste
HQ	hazard quotient
HT	elemental tritium
HTO	tritium oxide
IAEA	International Atomic Energy Agency
ICRP	International Commission on Radiological Protection
ILCR	Incremental Lifetime Cancer Risk
ISFSI	Independent Spent Fuel Storage Installation
IMPACT™	Integrated Model for the Probabilistic Assessment of Contaminant Transport ™
IR	Information Request
ISO	International Organization for Standardization
JRP	Joint Review Panel
LAeq	A-weighted equivalent continuous sound level
LAs90	90th-percentile of the statistical A-weighted noise level distribution
L&ILW	low and intermediate level waste
LOE	lines of evidence
LSA	local study area
LWM	Liquid Waste Management
MCR	Main Control Room
MECP	Ministry of the Environment, Conservation and Parks
MOECC	Ministry of the Environment and Climate Change
MOEE	Ministry of Environment and Energy

MWe	megawatt electric
NCRP	National Council on Radiation Protection and Measurements
NEW	nuclear energy worker
NG	noble gases
NND	New Nuclear Darlington
NSS-DWMF	Nuclear Sustainability Services – Darlington Waste Management Facility
OBT	organically bound tritium
OF	occupancy factors
ON	Ontario
ONEE	other natural external events
OPG	Ontario Power Generation
OTC	Once-Through Cooling system
PERA	predictive environmental risk assessment
PLSA	Plant Service Area
PN	Pickering Nuclear
PNGS	Pickering Nuclear Generating Station
POR	points of reception
PRSL	Power Reactor Site Preparation Licence
PWQO	Provincial Water Quality Objectives
PWR	Pressurized Water Reactor
QA	quality assurance
RB	Reactor Building
RCM	regional climate models
RCP	representative concentration pathway
REGDOC	CNSC regulatory document
RPV	Reactor Pressure Vessel
RSA	regional study area
RSL	U.S. EPA Regional Screening Levels
RWB	Radwaste Building
SAR	Species at Risk
SARA	Species at Risk Act
SARO	Species at Risk in Ontario
SCCV	Steel-plate Composite Containment Vessel
SCR	Secondary Control Room
SDS	safety data sheets
SMC	St. Marys Cement
SMR	small modular reactor
SSC	systems structures and components
SSEMP	Site-Specific Environmental Management Plan
TB	Turbine Building
TDS	Target Delivery System
TF	transfer factors
THQ	target hazard quotients
TRC	total residual chlorine

TRF	Tritium Removal Facility
TRS	IAEA Technical Report Series
TRV	toxicity reference value
TSD	technical support documents
UNSCEAR	United Nations Scientific Committee on the Effects of Atomic Radiation
U.S. EPA	United States Environmental Protection Agency
WEB	West/East Beach
WHO	World Health Organization
WO	Work Order
WPCP	water pollution control plant
WSP	water supply plant
WTFN	Williams Treaties First Nations

SYMBOLS

Human Radiological Dose Parameters

C_a	=	concentration in air (Bq/m^3)
C_f	=	concentration in food (Bq/kg fw)
C_g	=	activity in ground surface (Bq/m^2)
C_s	=	concentration in soil/sediment (Bq/kg dw)
C_w	=	concentration in water/groundwater (Bq/L)
D_C	=	correction factor to account for the finite size of a bathtub (unitless)
DC_a	=	effective dose coefficient for a semi-infinite cloud (Sv-m^3/Bq-a)
DC_f	=	dose coefficient for ingestion (Sv/Bq)
DC_g	=	effective dose coefficient for ground deposit (Sv-m^2/Bq-a)
DC_{inh}	=	dose coefficient for inhalation (Sv/Bq)
DC_w	=	dose coefficient for immersion in an infinite uniformly contaminated water medium (Sv-L/Bq-a)
$(D_f)_s$	=	dilution factor for shoreline deposits that allows for non-equilibrium between suspended sediment and shoreline deposits (unitless). For soil ingestion this term is not used.
$Dose_{diet}$	=	dose via ingestion of diet components (Sv/a)
$Dose_{groundshine}$	=	dose via groundshine (Sv/a)
$Dose_{imm}$	=	dose via immersion in contaminated air (Sv/a)
$Dose_{immersion}$	=	dose via immersion in contaminated water (Sv/a)
$Dose_{ingestion}$	=	dose via water ingestion (Sv/a)
$Dose_{inh}$	=	dose via particulate inhalation (Sv/a)
$Dose_{soil}$	=	dose via soil ingestion (Sv/a)
EF_s	=	days per year when soil/sediment ingestion could occur (days)
f_0	=	fraction of time spent at exposure location (unitless)
f_i	=	time spent indoors as fraction of time spent on-site (unitless)
f_r	=	dose reduction factor for non-uniformity of ground surface (unitless)

f_u	=	time spent outdoors as fraction of time spent on-site (unitless)
g_f	=	fraction of food from contaminated source (unitless)
I	=	inhalation rate (m^3/a)
I_f	=	intake of food (kg fw/a)
I_s	=	incidental soil/sediment intake rate (kg dw/day)
I_w	=	drinking water intake rate (L/a)
k''_w	=	fraction of drinking water intake that is contaminated (unitless)
OF_i	=	occupancy factor (unitless)
OF_w	=	fraction of year spent swimming in a surface water body (unitless)
OF_w'	=	fraction of year spent bathing (unitless)
OF_w''	=	fraction of year spent in a swimming pool (unitless)
S_b	=	building shielding factor (unitless)
S_g	=	shielding factor for groundshine (unitless)
ρ	=	removal factor for to account for processes such as sedimentation and removal of radionuclides by water treatment plants (unitless)
ρ_f	=	adjustment factor for food processing (unitless)
ρ_w	=	removal factor for water treatment (unitless)

Ecological Radiological Dose Parameters

$1\text{-}DW_a$	=	water content of the animal (L water /kg-fw)
$1\text{-}DW_p$	=	water content of the plant/food (L water /kg-fw plant)
BAF	=	bioaccumulation factor (L/kg or kg/kg)
BAF_{a_HTO}	=	aquatic BAFs for tritium oxide (L/kg-fw)
BAF_{a_OBT}	=	aquatic BAFs for organically bound tritium (L/kg-fw)
BAF_{a_C14}	=	aquatic BAFs for Carbon-14 (L/kg-fw)
BAF_{p_HTO}	=	plant BAFs for tritium oxide (L/kg-fw)
BMF	=	biomagnification factor (unitless)
BW	=	body weight (kg)
C_f	=	average concentration in food (Bq/kg-fw)
C_m	=	media concentration (Bq/L or Bq/kg)
C_s	=	soil/sediment concentration (Bq/kg fw)
C_t	=	whole body tissue concentration (Bq/kg fw)
C_w	=	water concentration (Bq/L)
C_x	=	concentration in the ingested item x (Bq/kg-fw)
DC_{ext}	=	external dose coefficient ((μGy/d)/(Bq/kg))
$DC_{ext,a}$	=	external dose coefficient (immersion in air, noble gas) ((μGy/d)/(Bq/m^3))
$DC_{ext,s}$	=	external dose coefficient (in soil/sediment) ((μGy/d)/(Bq/kg))
$DC_{ext,ss}$	=	external dose coefficient (on soil/sediment surface) (μGy/d)/(Bq/kg))
DC_{int}	=	internal dose coefficient ((μGy/d)/(Bq/kg))
D_{ext}	=	external radiation dose (μGy/d)
D_{int}	=	internal radiation dose (μGy/d)
DW_a	=	dry/fresh weight ratio for animal tissue (L water/kg-fw)

DW_{aa}	=	dry weight of aquatic animal tissue per total fresh weight (kg dw/kg fw)
DW_{ap}	=	dry weight of aquatic plant per total fresh weight (kg dw/kg fw)
DW_{p}	=	dry/fresh weight ratio for the plant/food (L water/kg-fw plant)
f_{OBT}	=	fraction of total tritium in the animal product in the form of OBT as a result of HTO ingestion
f'_{OBT}	=	OBT/HTO ratio in the animal as a result of HTO ingestion (unitless)
$f_{w\text{-}dw}$	=	fraction of the animal water intake that results from the metabolic decomposition of the organic matter in the plant/food
$f_{w\text{-}pw}$	=	fraction of the animal water intake derived from water in plant/food
$f_{w\text{-}w}$	=	fraction of the animal water intake derived from direct ingestion of water
ID_{aa}	=	isotopic discrimination factor for aquatic animal metabolism (unitless)
ID_{ap}	=	isotopic discrimination factor for aquatic plant metabolism (unitless)
I_{x}	=	ingestion rate of item x (kg-fw/d)
k_{af}	=	fraction of food from contaminated sources (assumed to be 1)
k_{aw}	=	fraction of water from contaminated sources (assumed to be 1)
OF_{a}	=	occupancy factor in contaminated air (unitless)
OF_{s}	=	occupancy factor in soil/sediment (unitless)
OF_{ss}	=	occupancy factor at soil/sediment surface (unitless)
OF_{w}	=	occupancy factor in water (unitless)
OF_{ws}	=	occupancy factor at water surface (unitless)
$P_{C14\_food(animal)}$	=	transfer of C-14 from food to animals through food ingestion
$P_{HTOfood\_animal}$	=	transfer of HTO from food to animals through food ingestion
$P_{HTOwater\_animal}$	=	transfer of HTO from drinking water to the portion of water in the animal derived from drinking water
$P_{OBTfood\_animal}$	=	transfer of OBT from food to animals through food ingestion
$P_{OBTwater\_animal}$	=	portion of HTO transferred from water to animal that is metabolically converted to OBT
S_{a}	=	stable carbon content in the aquatic animal/invertebrate/plant (gC/kg-fw)
S_{p}	=	stable carbon content in the food (gC/kg-fw), X4_C·DWp
S_{w}	=	mass of stable carbon in the dissolved inorganic phase in water (gC/L)
TF	=	ingestion transfer factor (d/kg)
WE_{a}	=	water equivalent of the animal tissue dry matter (L water/kg dw product)
WE_{aa}	=	water equivalent of the aquatic animal dry matter (L/kg dw)
WE_{ap}	=	water equivalent of the aquatic plant dry matter (L/kg dw)
WE_{p}	=	water equivalent of the plant/food dry matter (L water/kg dw product)

1.0 Introduction

1.1 Background and Regulatory Context

The Darlington New Nuclear Project (DNNP) is situated at the existing Darlington Nuclear (DN) site which is located on the north shore of Lake Ontario in the Municipality of Clarington, within the Regional Municipality of Durham, about 70 km east of Toronto (see **Figure 1-1**). The lands and waters on which the DNNP is situated are the traditional and Treaty territory of the Michi Saagiig and Chippewa Nations, collectively known as the Williams Treaties First Nations (WTFN).

By the late1700s, the Indigenous Peoples in southeastern Ontario were compelled to cede their lands along the northern shore of Lake Ontario to the Crown. Two Treaties and agreements between the Crown and First Nations have historically related to the lands comprising the DN site: the Johnson/Butler Purchase (1787-1788) (also known as the Gunshot Treaty), and the Williams Treaties (1923). Presently, the DN site remains within the territory of the 1923 Williams Treaties.

The DNNP site is adjacent to the existing Darlington Nuclear Generating station (DNGS), the Tritium Removal Facility (TRF), and the Nuclear Sustainability Services – Darlington Waste Management Facility (NSS-DWMF).

The DNNP was subject to an environmental assessment (EA) under the Canadian Environmental Assessment Act (CEAA). The DNNP, as described in Chapter 2 of the 2009 Environmental Impact Statement (EIS) (OPG, 2009a), consists of the site preparation, construction, operation, and decommissioning of up to four nuclear power reactors supplying up to 4,800 megawatts of electrical generating capacity for supply to the Ontario grid. At the time the Environmental Impact Statement (EIS) was written, no specific reactor technology had been selected; rather, the EIS considered a Plant Parameter Envelope, developed based on the limiting design parameters from the reactor technologies under consideration for the DNNP at that time, as the basis for the environmental assessment.

A federal joint review panel (JRP) conducted a review of the EA and considered the licence application to prepare the site for the DNNP. The JRP concluded that “the DNNP is not likely to cause significant adverse environmental effects, provided the mitigation measures proposed and commitments made by OPG during the review, and the JRP’s recommendations are implemented.” In May 2012, the Government of Canada (GOC) accepted the JRP’s conclusions for the DNNP’s EA as well as the JRP’s recommendations for the DNNP. Following that, the Canadian Nuclear Safety Commission (CNSC) issued a 10-year Power Reactor Site Preparation Licence (PRSL 18.00/2022) for the DNNP. In October 2021, the CNSC approved a renewal of the PRSL for another 10 years. The JRP’s recommendations that the GOC assigned to OPG and commitments that OPG made during the EA process were consolidated in the DNNP Commitments Report (OPG, 2023a).

In December 2021, OPG selected the BWRX-300 for deployment at the DNNP site. OPG has been working with the vendor, GE Hitachi Nuclear Energy (GEH), to progress the design of the BWRX-300.

While the DNNP Licence to Construct application submitted in October 2022 is for the construction of one BWRX-300 Small Modular Reactor (SMR), the DNNP is envisaged as a build out of up to four BWRX-300 reactors. OPG has commenced planning for three additional SMRs, for a total of four SMRs. Thus, supporting infrastructure will be constructed to allow for additional nuclear capacity in the future (e.g., intake and discharge for the condenser cooling water, switchyard). A comprehensive review of the EIS for four BWRX-300 reactors was undertaken by OPG to ensure that the conclusions of the EIS remain valid (OPG, 2023b). The EIS review concluded that the deployment of four BWRX-300 at the DNNP site does not alter the EIS conclusions. In April 2024, the CNSC announced the Commission's decision that the existing environmental assessment for the DNNP is applicable to the BWRX-300 technology selected by OPG.

The illustrative DNNP roadmap is show in **Figure 1-2**. Anticipated timelines are dependent on the successful completion of all necessary commitments and receipt of CNSC approval on licence applications; the conceptual timeline shows commencement of commercial operation of the first SMR in 2029 (OPG, 2022a).

The DNNP Predictive Environmental Risk Assessment (PERA) is intended to meet the commitments OPG has made for the DNNP, specifically under Deliverable D-P-12.9 Health – Human and Non-Human Biota which include:

- The chemical emissions from the nuclear facility will be evaluated during the design process and, if necessary, the Ecological Risk Assessment and the Human Health Risk Assessment will be updated, and any identified risks or areas which require further study will be included in the Environmental Assessment Follow-up Monitoring program. [EIS IR 240 Resubmission 2]

- OPG to conduct a detailed assessment of predicted effluent releases from the Project. The assessment should include but not be limited to effluent quantity, concentration, points of release and a description of effluent treatment, including demonstration that the chosen option has been designed to achieve best available treatment technology and techniques economically achievable. [GOC Response to JRP Rec. 14] [Note: the assessment of Best Available Technology Economically Achievable (BATEA) with respect to environmental releases is a separate report outside the scope of the PERA.]

- OPG to develop a comprehensive assessment of hazardous substance releases and the required management practices for hazardous chemicals on site. [GOC Response to JRP Rec. 26]

The DNNP PERA will meet the requirements of Canadian Standards Association N288.6:22, Environmental Risk Assessments at Nuclear Facilities and Uranium Mines and Mills (CSA, 2022a) and CNSC REGDOC 2.9.1, Environmental Protection: Environmental Principles, Assessments and Protection Measures (CNSC, 2020).

OPG integrates adaptive management into its environmental management system. Specifically, adaptive management is fundamental to the environmental monitoring program (EMP) to ensure that the monitoring activities remain valid, and to enable OPG to appropriately identify and address any adverse findings or areas of risk. EMP design reviews, self-assessments and audits are regularly conducted to confirm effectiveness of environmental monitoring activities and to practice continual improvement. The ERA process is also a means for adaptive management as it is undertaken every 5 years and considers changes to site activities and environmental conditions to identify any areas where changes in mitigation or monitoring may be needed. Through the existing processes, if a risk to the environment is identified or predicted through the ERA, it can trigger changes to the EMP, supplementary studies and/or mitigation measures, as required.

Figure 1-1: Darlington Nuclear Site and Vicinity

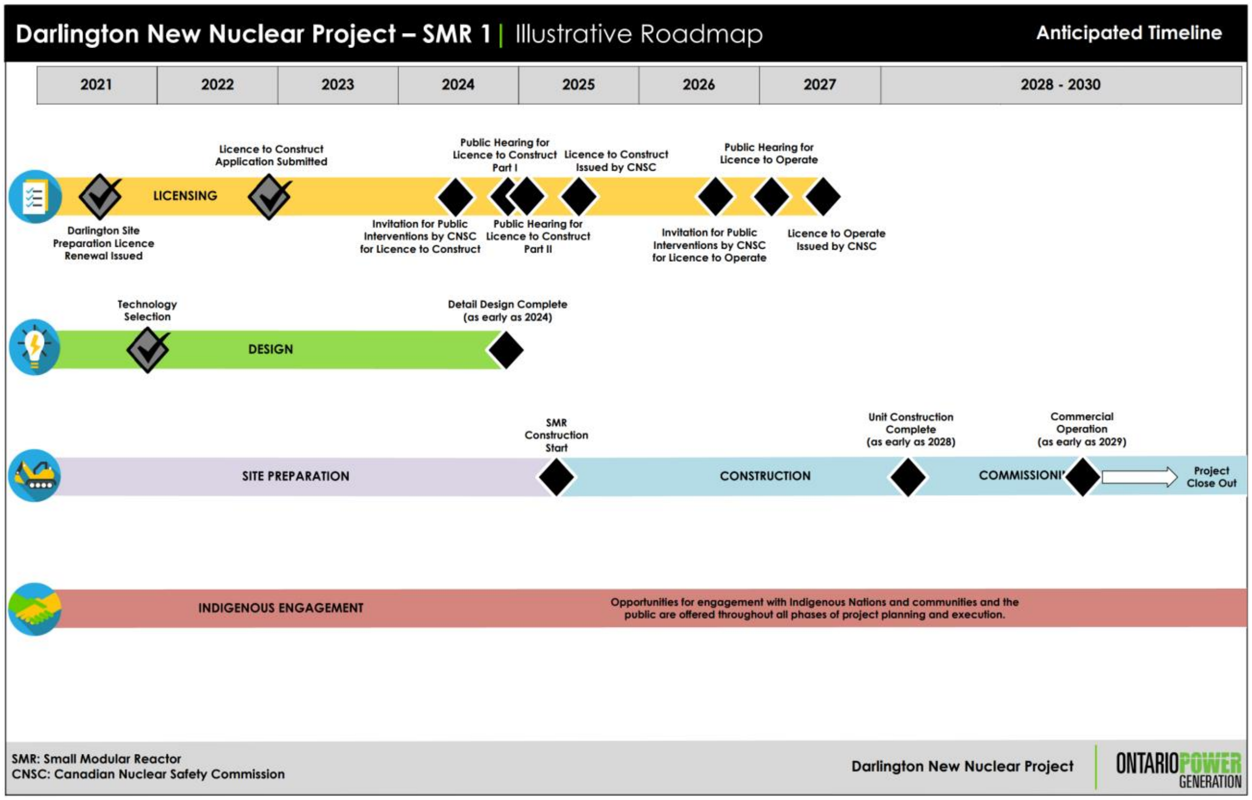


Figure 1-2: DNNP Project Roadmap

1.2 Methodology

The DNNP PERA follows the plan outlined in the D-P-12.9: Health – Human and Non-Human Biota Methodology Report that was prepared in 2022, and updated in 2023 (Ecometrix, 2023a).

The following high-level methodology steps are followed in the DNNP PERA:

1. With the 2020 DN ERA and 2024 DN ERA Addendum as representative of the existing environment, prepare a DNNP PERA using the predicted releases to air and water from the SMR during each bounding phase of the Project, as applicable.

2. Evaluate the results of the DNNP PERA to determine how concentrations/doses and physical stressors compare to Toxicity Reference Values (TRVs), public dose limits or ecological dose benchmarks.

3. Compare the dose and risk predictions from the DNNP Predictive ERA to the dose and risk predictions in the 2009 DNNP EIS documents to determine if the results of the DNNP Predictive ERA are within those predicted in the EA.

4. Assess the combined effects from the future DNNP and the existing operating facilities on DN site to determine if results are acceptable or if further mitigation is warranted

(while this step is not required as part of OPG's commitments it is considered good practice to understand any combined effects of DNNP with existing facilities).

OPG recognizes that the DNNP PERA, while it satisfies assessment of environmental impacts from the Western science perspective, may not fully address the impact of the Project on Indigenous inherent and treaty rights as they are understood today. This is particularly true in light of the 2018 settlement agreement between the seven members of the Williams Treaties First Nations (WTFN) with the Governments of Canada and Ontario. The Settlement (Government of Canada, 2018) pertains to the lands of the DN site and reaffirms the rights of WTFN citizens, which has fundamentally shifted how WTFN is engaged and consulted on site development. OPG recognizes the importance of furthering our knowledge and understanding, in ongoing meaningful engagement with the WTFN. OPG endeavors to continue to work with the WTFN to appropriate identify the rights impacted by the DNNP and to achieve feasible mitigation measures and/or accommodation.

1.3 Objectives

The objectives of this PERA are to:

- Predict and assess the risk to representative human and ecological receptors resulting from exposure to radiological and non-radiological substances and physical stressors expected to be released throughout the Project Phases;
- Inform prioritization of monitoring and mitigation measures; and
- Meet follow-up program commitments (specifically D-P-12.9 in the DNNP Commitments Report (OPG, 2023a)) to verify no significant residual adverse effects from the DNNP and confirm the effectiveness of mitigation measures.

1.4 Scope

The scope of the PERA encompasses both human and ecological health risks, and radiological and non-radiological constituents of potential concern (COPCs), and physical stressors.

1.4.1 Spatial Boundaries

For the predictive human health risk assessment (HHRA), the spatial boundary is consistent with those from the 2020 DN ERA and 2024 DN ERA Addendum and OPG's Environmental Monitoring Program, and includes human receptors within about 10 km of the DN site, and is shown on **Figure 3-2**. This is generally consistent with the local study area for human health defined in the DNNP EIS which includes the immediate neighbours and the major urbanized communities within Clarington (i.e., Courtice, Bowmanville, Newcastle and Orono) and much of the urbanized area within the City of Oshawa (OPG, 2009).

For the predictive EcoRA, the spatial boundary is consistent with those from the 2020 DN ERA and 2024 DN ERA Addendum which includes the DN site (encompassing the DNNP lands), surrounding area, and nearshore Lake Ontario, generally in the area surrounding the outfalls from the DNGS diffuser and the DNNP SMRs, and is shown on **Figure 4-1**.

1.4.2 Temporal Boundaries

The temporal boundaries for the DNNP PERA include site preparation (2 years), construction (4 years) and operation (60 years) of up to four SMRs.

At this stage, decommissioning (30 years) is only conceptually developed, and is consistent with the preliminary decommissioning plan described in the DNNP EIS (OPG, 2009a). The EIS concluded that decommissioning is not likely to cause significant adverse effects on human health and the environment. Based on growing international decommissioning experience and the protection strategies outlined in the preliminary decommissioning plan, the EIS concluded that effective mitigation measures will be available for decommissioning. Therefore, the potential environmental effects from eventual decommissioning of the SMRs would be similar to that assessed in the DNNP EIS, and decommissioning is not assessed further in this PERA.

Existing conditions are assessed in the 2020 DN ERA and 2024 DN ERA Addendum and represent the current and historical activities on the DN Site. Existing conditions are used to inform the understanding of any additional effects from the DNNP that are not already considered as part of existing conditions.

1.5 What OPG has Heard through Indigenous Engagement

This PERA has been conducted without the benefit of information that could be shared from an Indigenous Knowledge study. In early 2024, OPG initiated support for the WTFNs to carry out an Indigenous Knowledge study, including aspects of Rights impact assessment, cumulative effects assessment, and augmented monitoring, as determined by the Nations. This work is currently being scoped by the WTFNs, and when completed, the Nations will determine if and what portions may be shared with OPG.

This section describes engagement activities and meetings that have occurred with Indigenous Nations and communities related to the PERA, the discussion and feedback that arose from those meetings and how it has been considered in the PERA.

Currently, OPG is primarily meeting with the Mississauga First Nations of the Williams Treaties (WTFN) twice a month to engage on DNNP topics. Project information is shared with the Chippewa Nations, attempts to increase engagement occurs, and the DNNP is responsive and open to increased engagement at the request of the Chippewa Nations. The table below summarizes topics discussed related to the DNNP PERA at various monthly meetings.

Table 1-1: Indigenous Engagement Summary – DNNP PERA Discussions

Meeting Date and Topic	Issue Raised	Discussion and Feedback, Section in PERA where addressed
Feb 22, 2024 (WTFNs), Aug 22, 2023 (Curve Lake First Nation (CLFN), Hiawatha First Nation (HFN)), Oct 24, 2023 (CLFN,HFN) – Overview of ERA and Environmental Programs	Provided general information on OPG nuclear ERAs and environmental programs	N/A
March 28, 2024 (WTFNs) – Human Receptors for PERA	Discussion on whether an Indigenous receptor be included in the PERA.	• Received feedback that OPG has workers who are Indigenous and may be living in the area and practicing harvesting. • OPG is proposing to add a new receptor to the PERA to represent individuals living near DN site who are Indigenous and may also be harvesting and working near the site. • OPG has developed a preliminary set of assumptions for this receptor based on publicly available information. The intent is to use those assumptions as the starting point and refine with further discussions with Indigenous Nations and communities (Section 3.1.1). OPG agreed to come back to the group with more information on the proposed new receptor.

Meeting Date and Topic	Issue Raised	Discussion and Feedback, Section in PERA where addressed
May 23, 2024 (WTFNs) – Ecological Receptors for PERA	Do benthic invertebrates include all types of crustaceans? Be more precise in categorizing ecological receptors – the native species of mallards might not be considered omnivores, but herbivores. The PERA needs to acknowledge that it does not benefit from being informed by an Indigenous Knowledge Study and to provide historical context upfront.	• Clarification is provided in the PERA section 4.1.1 to explain that benthic invertebrates are assessed as a general category and not individual species. • Ecometrix looked into the mallard, which is classified as an omnivore based on the Canadian Wildlife Service and the US EPA Wildlife Exposure Factors Handbook. Based on these sources, the mallard diet consists of plant and animal material and varies depending on season. During the spring and summer the diet has a higher portion of animals (mainly aquatic invertebrates) than plants. During winter, mallards typically migrate to the southern US. Based on this information, the mallard has been kept categorized as an omnivore for the purposes of this PERA. • The PERA is updated to provide background on the history of how First Nations' treaty rights were considered or not during previous historical assessments such as the DNNP EA (Section 1.1). • The PERA acknowledges that there has not been an Indigenous Knowledge Study used to inform the PERA or selection of ecological receptors (Section 4.1.1).
July 25, 2024 (WTFNs) – Update on new human receptor group	OPG shared the current plan to use publicly available information to represent a traditional diet. OPG received feedback from WTFNs that the term "Country Food" is viewed as a settler term and that "Traditional Food" is their preferred terminology. OPG discussed use of the term Harvester for the new receptor as well as some of the conservative	• The term "traditional foods" is now used throughout the PERA to describe foods harvested from the land and used by Indigenous peoples for sustenance, medicinal and cultural purposes. • A question was raised regarding onsite workers. It was explained that OPG's radiation protection program ensures the safety of

Meeting Date and Topic	Issue Raised	Discussion and Feedback, Section in PERA where addressed
	assumptions for the characteristics of this receptor. These assumptions can and will evolve over time through surveys and engagement on each of OPG's future ERAs.	workers and includes the use of dosimeters and bioassays to determine individual worker doses. This program is outside of the public dose that is considered in the ERA.
August 22, 2024 (WTFNs)	OPG prepared to present on updates and preliminary results of the PERA, however feedback was that the Nations were not interested in receiving this presentation ahead of receiving the report and that the Nations will review the PERA report when it is shared with them.	N/A
These discussions were on other OPG ERAs and not specifically the DNNP PERA, however relevant comments are considered in this report: May and June 2024 (Alderville First Nation, HFN, CLFN, Mississaugas of Scugog Island First Nation) – Summary of DN Site ERA Addendum, Intro to PN Refurbishment and Decommissioning Predictive ERA MSIFN comments on 2022 Pickering Nuclear ERA and 2022 Addendum of the Predictive Effects Assessment for Pickering Nuclear Safe Storage project	No issues raised during May/June 2024 presentations. OPG received in 2023 comments from the Mississaugas of Scugog Island First Nation (MSIFN) on the 2022 Pickering Nuclear ERA and 2022 Addendum of the Predictive Effects Assessment Pickering Nuclear Safe Storage. A number of issues were raised related to terminology, questions on environmental monitoring data, and explanation of ERA results.	OPG has addressed some of the common concepts and suggestions identified through MSIFN's comments in this PERA. This includes: • Moved away from using the term "baseline" to describe the current environmental conditions. • Inclusion of text to describe how adaptive management is considered (Section 1.1). • Discussion added on how sensitive and vulnerable populations are considered in the human health risk assessment (HHRA) (Section 3.1.1.2). • Discussion added on large-bodied fish being protective of small-bodied fish based on 100% occupancy assumptions (Section 4.1.1) • Discussion added on assessment of benthic invertebrates as community rather than a single receptor (Section 4.1.1) • Modified external sediment occupancy factor for muskrat from 0.5 to 1 (Section 4.2.4.2)

OPG Indigenous Relations will continue to coordinate engagement on this and other ERAs, which may broaden OPG's understanding of surrounding land use and receptor selection. OPG endeavors to continue to work with Indigenous Nations and communities to develop more fulsome and ongoing engagement around ERAs.

OPG plans to share this PERA report with Indigenous Nations and communities. As the PERA is an iterative process, input and feedback from Indigenous Nations and communities will be incorporated into this and future assessments.

1.6 Quality Assurance and Quality Control

The DNNP PERA made use of environmental monitoring data. These data are derived from chemical and radiochemical analyses of samples collected from effluent streams and environmental media around the DNNP. The environmental data provided by OPG were collected by qualified staff and analyzed by qualified laboratories under the Environmental Monitoring Program (EMP), such as the station chemistry laboratory and the Whitby Health Physics Laboratory. The EMP has its own quality assurance (QA) program that encompasses activities such as sample collection, laboratory analysis, laboratory quality control, and external laboratory comparison (OPG, 2019a). Any other environmental data collections used to support the PERA, such as terrestrial monitoring or thermal effects studies performed by a third-party, followed their own associated QA programs.

Throughout the planning and preparation of the PERA, all Ecometrix staff worked under an ISO 9001:2015 certified Quality Management System. All work was internally reviewed and verified. Reviews included verification of data and calculations, as well as review of report content and formatting. Comments have been dispositioned and addressed as appropriate by report revisions. The review process has been documented through an electronic paper trail of review comments and dispositions.

2.0 Project Description

The DNNP is located on the eastern portion of the DN Site. The DNNP involves the construction and operation of up to four small modular reactors and the associated infrastructure. In December 2021, OPG selected the BWRX-300 for deployment at the DNNP site and started working with the vendor, GE Hitachi Nuclear Energy, to progress the design of the BWRX-300. A comprehensive review of the EIS for the deployment of up to four BWRX-300 SMR for the DNNP was undertaken by OPG to ensure that the results of the EIS remain valid (OPG, 2023c). The EIS review concluded that the deployment of four BWRX-300 at the DNNP site does not alter the EIS conclusions and the CNSC Commission decided in April 2024 that the existing environmental assessment for the DNNP is applicable to the BWRX-300 technology.

The GEH BWRX-300 reactor is a SMR using boiling water reactor (BWR) technology. The electrical power output for each reactor is about 300 MWe and its design life is 60 years. The BWRX-300 is a smaller reactor when compared to the reactors considered in the EIS as well as with the currently operating reactors at the DN site, both in electrical production and in physical size. A conceptual rendering of the BWRX-300 is shown in **Figure 2-1**.

Figure 2-1: DNNP BWRX-300 Conceptual Rendering (OPG, 2022a)

2.1 Project Overview

2.1.1 Project Activities

The phases of the DNNP include site preparation, construction, operation, and decommissioning. The activities associated with each phase of the DNNP are briefly described below (OPG, 2022a, 2023c).

Site Preparation

- Mobilization and preparatory works (e.g., clearing and grubbing, services and utilities, and on-site roads and related infrastructure);
- Excavation and grading (e.g., on-land earthmoving and grading, and development of construction laydown areas);
- Marine and shoreline works (e.g., shoreline protection and some minor lake bottom dredging, including dredging of the DNGS harbour); and
- Development of administration and physical support facilities (e.g., offices, workshops, maintenance, storage).

Construction

- Additional excavation (including bedrock removal) and grading and development of construction laydown areas;
- Construction of four powerblocks, which includes the structures, systems and components (SSCs) associated with the reactor building, control building, turbine building, service building, and auxiliaries for the on-site interim storage of low and intermediate level waste (L&ILW) and high level waste (HLW) at the Independent Spent Fuel Storage Installation (ISFSI);
- Construction of the support structures for up to four BWRX-300 units which includes the plant service area, security building, lake water intake and discharge structures, cooling water system pump house;
- Construction of the Offshore Intake, Forebay and Discharge Structures;
- Additional marine and shoreline works (e.g., shoreline protection, and some minor lake bottom dredging);
- Inspection and testing of equipment, and the conduct of fuel-out commissioning (i.e. the commissioning of systems prior to loading fuel in the reactor); and

- Supply and management of construction equipment, materials and personnel to the work site, and the management of construction waste, hazardous materials, and fuels and lubricants.

Operation

- Operation of the reactor core (e.g., first fuel load and commissioning, start-up, reactivity control/operation and shutdown activities);
- Operation of the heat transport system;
- Operation of active ventilation and Radioactive Liquid Waste Management Systems (Note: No radioactive liquid waste is discharged to surface water during normal operation);
- Operation of safety and related systems (e.g., such that fundamental safety functions are ensured);
- Operation of fuel and fuel handling systems (e.g., receipt and storage of new fuel, fuelling / refuelling the reactors and transfer of used fuel from the reactors to wet storage);
- Operation of condenser and condenser cooling water, service water and cooling systems (e.g., once-through lake water cooling system);
- Operation of electrical power systems (e.g., main transformers and emergency/standby power facilities);
- Operation of site services and utilities (e.g., sewage, stormwater, domestic water);
- Testing and maintenance of equipment (e.g., diesel generators);
- Management of operational low and intermediate-level waste (e.g., including on-site storage and/or off-site transportation as applicable);
- Dry storage of used fuel (e.g., at an on-site facility pending eventual transfer to a long-term management facility);
- Management of conventional waste (e.g., including reuse and recycling); and
- Replacement / maintenance of major components and systems.

Decommissioning

- Transition from operations to a safe shutdown state (including transfer of used fuel to dry storage and eventual transfer to a long-term management facility);

- A period of storage with surveillance to allow for decay to decrease the radioactive hazard (inspection and maintenance of the facility is ongoing during this period);
- Preparation for dismantling (development of dismantling plans, decontamination as needed, acquisition of dismantling resources such as personnel, equipment, etc.);
- Dismantling, demolition, and site restoration (removal of all contaminated SSCs and restoration of the site to be available for other OPG uses); and
- Release from regulatory control.

2.1.2 Main Components of BWRX-300

The main components of the BWRX-300 include the following (OPG, 2022a):

Reactor Building (RB) - A shear wall building made of reinforced concrete, steel or steel-plate composite floors and walls. Fuel handling equipment and pools containing water needed for the BWRX-300 passive safety class cooling systems are in the above-grade portion of the RB. A portion of the RB extends below grade where the Steel-plate Composite Containment Vessel (SCCV) and the Reactor Pressure Vessel (RPV) mostly reside. The below-grade portion also houses reactor support and safety class systems and most essential power supplies and equipment. The Secondary Control Room (SCR) located in the RB provides safe shutdown capability as a backup to the Main Control Room (MCR).

Control Building (CB) - Houses the MCR and electrical, control and instrumentation equipment. It is also the entrance and exit for the BWRX-300 powerblock during normal operations.

Turbine Building (TB) – Houses the steam turbine generator, main condenser, condensate and feedwater systems, condensate purification system, turbine-generator support systems, bridge crane, and parts of the off-gas system. Standby diesel generators are housed in an auxiliary building to the TB.

Service Building (SB) – A three-storey structure located southeast of the RB. On the first floor it houses a new fuel storage and fuel handling area. On the second floor, it houses non-control room related support functions, shop space, and a Health Physics area. On the third floor, it houses owner configurable office space.

Radwaste Building (RWB) – Houses equipment associated with the handling, processing, and packaging of solid and liquid radioactive waste generated by the nuclear facility. The RWB is used to house equipment and processes that package waste into approved containers sent for storage in radwaste auxiliary buildings.

Security building – Controls access to the Protected Area and includes a vehicle inspection area.

Lake Water Intake/Discharge Structures - The BWRX-300 at DNNP will use a once-through lake water cooling system. The water intake will be supplied from Lake Ontario to circulate through the condenser and then discharge non-radioactive water to the lake through a discharge duct and outfall structure. The once-through lake water cooling system does not interact with the active liquid waste management system and does not contain radioactive liquid effluent. Additionally, the shoreline of the lake will include shoreline protection to control erosion. Note that these structures are sized adequately to support up to four BWRX-300 units.

Cooling Water System Pump House – Contains the cooling water system pumps and auxiliary equipment needed to cool the nuclear facility.

Switchyard – A temporary switchyard will be built by Hydro One on the north side of the nuclear facility for electrical distribution to the Ontario grid. Note that these structures are sized adequately to support one BWRX-300 unit. It is expected that Hydro One may expand the Bowmanville Switching Station to accommodate four BWRX-300 units in the early 2030s.

The DNNP site may share some infrastructure with the existing DNGS site, such as the distribution systems for provided site-wide electricity and communications, domestic and firewater supply systems, lake current monitoring system, meteorological tower, sewage lift station, roads, etc.

The cross section of the powerblock including the RB, CB, and TB is shown on **Figure 2-2**.

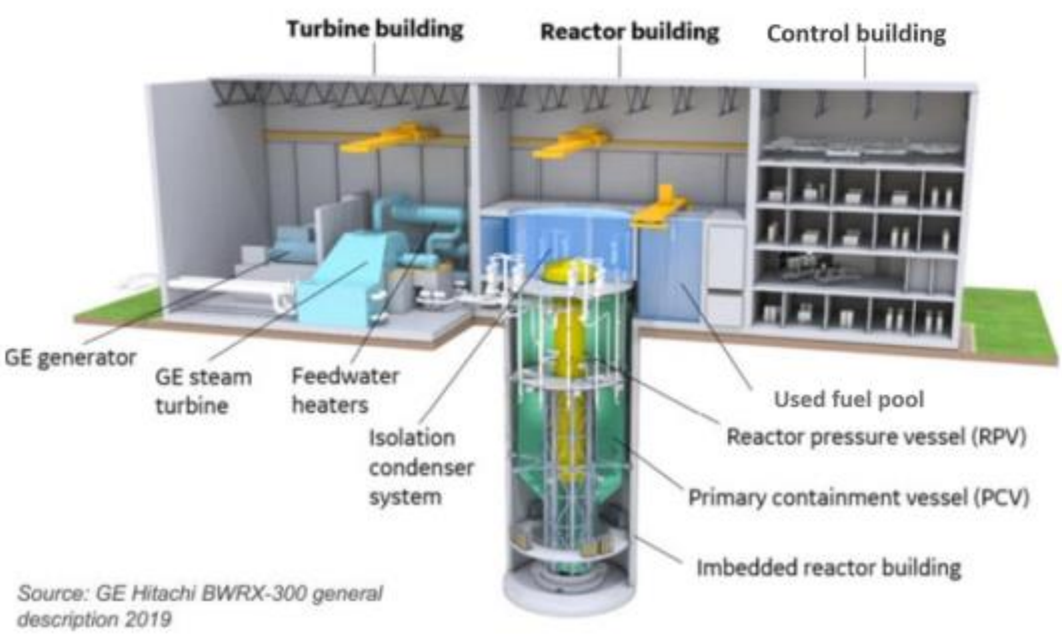


Figure 2-2: BWRX-300 Turbine Building, Reactor Building and Control Building (OPG, 2023c)

2.2 Effluent and Emission Sources

2.2.1 Liquid Effluent

2.2.1.1 Radiological Liquid Effluent

During site preparation and construction, no radiological effluent will be released to Lake Ontario.

The BWRX-300 is expected to operate on a zero liquid release philosophy for radiological liquid waste. During operation, radiological liquid waste is processed and recycled back into the system. More specifically, radiological liquid waste is managed through the Liquid Waste Management (LWM) system. Radiological liquid waste generated during normal operations is collected from floor drains, equipment drains, and process drains waste and sent to the LWM. The waste streams are collected into two collection tanks, and then filtered through a reverse osmosis process. The processed waste is then stored in two sample tanks for radiological testing to ensure condensate quality limits are met, after which it is subsequently transferred to the Condensate Storage Tanks (CST) for reuse in the plant.

The BWRX-300 LWM implements a zero liquid release philosophy, meaning that no processed water from the LWM will not be routinely released to Lake Ontario since all water can be reused in the plant. However, to provide a bounding assessment, a sensitivity analysis is completed in **Section 7.0** to assess the impacts on human health and the environment for the scenario where DNNP is operated with routine liquid radiological releases rather than as a zero liquid release facility.

2.2.1.2 Non-Radiological Liquid Effluent

During site preparation and construction, a Stormwater Management Plan and Dewatering Management Plan will be developed and implemented to minimize impacts to surface and groundwater. Dewatering activities will occur during site preparation and construction, but not during operation. Dewatering will follow the requirements in the Dewatering Management Plan and meet Ontario Ministry of Environment, Conservation and Parks (MECP) requirements. Water taking will follow regulatory approval requirements depending on water volume, including registration as per the Water Taking Environmental Activity and Sector Registry (O. Reg. 63/16), obtaining a Permit to Take Water, as applicable.

Surface runoff will be collected in stormwater management ponds and then will be discharged to an existing drainage course or directly to Lake Ontario. A Stormwater Management Plan will be developed to provide the plans for mitigating erosion and sediment transport during site preparation and construction. OPG will employ best practices for stormwater management that would meet MECP requirements and industrial sewage works rules.

During operation, non-radiological liquid effluent will be released through the Condenser Cooling Water (CCW). The current design does not include the use of chlorination for water filtration and biofouling prevention; however, chlorine releases to surface water have been assessed to provide a bounding assessment should chlorination be considered in the future. The CCW at DNNP is an improved design to the existing DNGS plant with improvements to reduce aquatic impingement and entrainment as well as biofouling. Similar to DNGS, water will be pulled through a deep-water intake located over 1 km offshore, travel through a tunnel to an onshore covered forebay (pumphouse), through the main condenser and closed loop cooling water heat exchanger; then discharged back to the lake through a series of diffuser ports.

It is anticipated that the only water stream that may use chlorination is the service water system. The DNNP service water design will be comprised of High-Density Polyethylene (HDPE) piping with a lower friction coefficient than concrete and other traditional pipe materials to reduce the opportunity for zebra mussels and biofilm attachment to pipe walls. Additionally, the system will include rotating travelling water screens with zero carryover and a microfilter. The service water system is a once through system with only one heat exchanger as the load.

To reduce environmental impact, the design is planned to be comprised of only mechanical means for water filtration and biofouling control, both actively and passively. However, there will be provisions in the design for chlorine injection, if required. The design provisions include injection nozzles as well as space for chlorine skids and monitors.

To bound the assessment, DNGS was used as the reference for determining a conservative amount of chlorine dosing, scaled back based on the smaller reactor size and flows. It is assumed that chlorination would be needed continuously during the summer months with warmer intake water. The specific chemicals that would be used include:

- Chlorination: Sodium Hypochlorite nominal 12wt%
- De-chlorination: Calcium Thiosulphate 24wt%

The maximum flowrate for chlorination is 1,820 L/day (4-unit DNNP Service Water flow of 40,000 US gpm).

The DNNP de-chlorination systems are operated in a manner that ensures the concentration of total residual chlorine (TRC) at the CCW duct never exceeds 0.01 mg/L, which is the MECP limit, with a station target of 0.002 mg/L.

2.2.2 Atmospheric Emissions

2.2.2.1 Radiological Emissions

During site preparation and construction there will be no radiological emissions to air.

During operation, radiological emissions to air are anticipated to occur through the active ventilation system and are shown in **Table 2-1** for one and four BWRX-300 SMRs. Emissions from anticipated operational occurrences (AOOs) are included.

Table 2-1: Annual Airborne Release from BWRX-300 SMR

Isotope	Airborne Source Term – One SMR (Bq/a)	Airborne Source Term – Four SMRs (Bq/a)
Ag-110m	2.40E+04	9.60E+04
Ar-41	3.20E+08	1.28E+09
Ba-140	7.10E+06	2.84E+07
C-14	4.00E+11	1.60E+12
Ce-141	4.50E+05	1.80E+06
Ce-144	7.20E+04	2.88E+05
Co-58	5.20E+06	2.08E+07
Co-60	1.10E+07	4.40E+07
Cr-51	2.00E+07	8.00E+07
Cs-134	6.60E+05	2.64E+06
Cs-136	3.70E+05	1.48E+06
Cs-137	1.00E+06	4.00E+06
Cs-138	1.10E+05	4.40E+05
Cu-64*	5.80E+06	2.32E+07
Fe-55	2.40E+07	9.60E+07
Fe-59	5.80E+06	2.32E+07
H-3	9.70E+11	3.88E+12
I-131	5.20E+08	2.08E+09
I-132	3.10E+09	1.24E+10
I-133	2.40E+09	9.60E+09
I-134	8.70E+09	3.48E+10
I-135	4.60E+09	1.84E+10
Kr-83m	3.30E+11	1.32E+12
Kr-85	2.20E+12	8.80E+12
Kr-85m	3.40E+10	1.36E+11
Kr-87	1.20E+11	4.80E+11
Kr-88	1.20E+11	4.80E+11
Kr-89	1.20E+13	4.80E+13
La-140	1.60E+06	6.40E+06
Mn-54	1.20E+07	4.80E+07
Mn-56*	4.50E+05	1.80E+06
Mo-99	2.60E+06	1.04E+07
Na-24	1.40E+06	5.60E+06
Nb-95	1.80E+06	7.20E+06
Ni-63	2.50E+04	1.00E+05
Np-239	1.80E+06	7.20E+06
P-32	6.90E+05	2.76E+06
Pr-144*	8.40E+01	3.36E+02
Rb-89*	4.40E+04	1.76E+05
Rh-103m*	1.90E+03	7.60E+03
Rh-106	1.00E+04	4.00E+04
Ru-103	4.50E+05	1.80E+06
Ru-106	7.30E+04	2.92E+05
Sb-124	4.90E+02	1.96E+03
Sr-89	8.00E+04	3.20E+05
Sr-90	3.60E+03	1.44E+04
Sr-91*	1.70E+06	6.80E+06
Sr-92*	1.00E+06	4.00E+06
Tc-99m*	2.20E+05	8.80E+05
Te-129m*	8.40E+05	3.36E+06

Isotope	Airborne Source Term – One SMR (Bq/a)	Airborne Source Term – Four SMRs (Bq/a)
Te-131m*	1.50E+05	6.00E+05
Te-132	6.80E+04	2.72E+05
W-187*	5.30E+05	2.12E+06
Xe-131m	3.80E+10	1.52E+11
Xe-133	1.60E+12	6.40E+12
Xe-133m	1.10E+09	4.40E+09
Xe-135	1.30E+12	5.20E+12
Xe-135m	1.20E+12	4.80E+12
Xe-137	1.70E+12	6.80E+12
Xe-138	2.40E+12	9.60E+12
Y-90*	8.80E+02	3.52E+03
Y-91	8.90E+05	3.56E+06
Y-92*	4.10E+05	1.64E+06
Y-93*	1.30E+05	5.20E+05
Zn-65	4.90E+06	1.96E+07
Zr-95	1.90E+06	7.60E+06

2.2.2.1.1 Constituents of Potential Concern

A screening evaluation for the constituents of potential concern (COPC) was conducted in order to estimate the relative importance of each radionuclide with respect to public dose, and to support a conservative selection of radionuclide COPCs for further assessment, such that all appreciable contributions to dose are included in the PERA.

It is noted that radionuclides were not retained as COPCs if they are sufficiently short-lived to be essentially removed by the time they reach a human receptor (i.e., if 5 half-lives pass within travel time to a human receptor; travel time is conservatively taken as 30 mins based on N288.1:20). The travel times provided in CSA N288.1:20 (CSA, 2020) are conservative travel times.

For the purposes of the screening assessment the release rates for one SMR were used from **Table 2-1**; however, the results of relative importance of each radionuclide apply as well to four SMRs.

The effective dose[1] per annum from inhalation[2] ($Dose_i$) and immersion[3] ($Dose_a$) from screening of air releases, for adults, was calculated as follows:

$$Dose_{\,i}\left(\frac{Sv}{a}\right) = Airborne\ release\ \left(\frac{Bq}{s}\right) \times Dispersion\ Factor\ \left(\frac{s}{m^3}\right) \times Inhalation\ Rate\,\frac{m^3}{a} \times Inhalation\ DCF\ \left(\frac{Sv}{Bq}\right)$$

$$Dose_{\,a}\left(\frac{Sv}{a}\right) = Airborne\ release\ \left(\frac{Bq}{s}\right) \times Dispersion\ Factor\ \left(\frac{s}{m^3}\right) \times Immersion\ DCF\ \left(\frac{Sv}{a}\,per\,\frac{Bq}{m^3}\right)$$

The total effective dose from air was calculated as the sum of inhalation and immersion doses. The immersion dose is usually minor, except for noble gases, where all the dose is accounted for in the immersion dose conversion factor (DCF).

The dispersion factor used was 10^{-6} s/m^3, a conservative value for the peak ground-level air concentration for a 30 to 40 m stack (the stack height is reasonable for DNNP based on information from GEH, see **Table 2-4**), multiplied by a decay term [exp(-λ_r t)], with λ_r = decay constant (s^{-1}) and t =1800 s (for a 30 min travel time (CSA, 2020)). The inhalation rate used was a 95th percentile adult value of 8400 m^3/a (CSA, 2020). The DCFs were taken from CSA N288.1:20 (CSA, 2020), which generally follows the International Commission on Radiological Protection (ICRP) Publication 72 (ICRP, 1996), as well as ICRP 72 itself for radionuclides that were not addressed in CSA N288.1:20 (CSA, 2020).

The resulting effective doses for screening purposes both for inhalation and immersion (assuming a single SMR) are presented in **Table 2-2**.

An air release estimated dose greater than 1E-10 Sv/a (1.0E-04 µSv/a) was used as a minimum cut-off for COPC selection, which accounted for nearly 100% of total dose from airborne

[1] Effective dose is the sum of the products, in sievert, obtained by multiplying the equivalent dose of radiation received by and committed to each organ or tissue by the weighting factor of that item. (Source: REGDOC-3.6 Glossary of CNSC Terminology)

[2] Inhalation is the intake of material by humans or animals by way of the respiratory system (including the portion that eventually goes to the intestinal system). (Source: CSA N288.1:20)

[3] Immersion is the external exposure to a radioactive cloud in air.

emissions. In addition, while not initially screened in, three radionuclides of historical importance at DNGS (Co-60, Cs-134, Cs-137) were added as COPCs. Based on the screening process described and shown in **Table 2-2**, and inclusion of Co-60, Cs-134, and Cs-137, the 18 radionuclides to be modelled in the ERA are summarized in **Table 2-3** below for one SMR and four SMRs.

Table 2-2: Screening of Radionuclides for 1 SMR from the Ventilation System

Isotope	Airborne Source Term(s) (Bq/a)	Airborne Source Term (Bq/s)	Half-Life (s)	Decay constant (s^{-1})	Air Concentration (Bq/m^3)	DCF Inhalation (Sv/Bq)	DCF Immersion (Sv/a per Bq/m^3)	Dose from Inhalation (Sv/a)	Dose from Immersion (Sv/a)	Total Dose (Sv/a)
Ag-110m	2.40E+04	7.61E-04	2.16E+07	3.21E-08	7.61E-10	7.60E-09	4.01E-06	4.86E-14	3.05E-15	5.16E-14
Ar-41	3.20E+08	1.01E+01	6.58E+03	1.05E-04	8.40E-06	NG	1.93E-06	-	1.62E-11	1.62E-11
Ba-140	7.10E+06	2.25E-01	1.10E+06	6.29E-07	2.25E-07	5.10E-09	2.55E-07	9.63E-12	5.73E-14	9.69E-12
C-14	4.00E+11	1.27E+04	1.80E+11	3.85E-12	1.27E-02	2.00E-09	8.21E-11	2.13E-07	1.04E-12	2.13E-07
Ce-141	4.50E+05	1.43E-02	2.81E+06	2.47E-07	1.43E-08	3.20E-09	9.78E-08	3.83E-13	1.39E-15	3.85E-13
Ce-144	7.20E+04	2.28E-03	2.46E+07	2.82E-08	2.28E-09	3.60E-08	2.41E-08	6.90E-13	5.50E-17	6.90E-13
Co-58	5.20E+06	1.65E-01	6.12E+06	1.13E-07	1.65E-07	1.60E-09	1.40E-06	2.22E-12	2.31E-13	2.45E-12
Co-60	1.10E+07	3.49E-01	1.66E+08	4.17E-09	3.49E-07	1.00E-08	3.76E-06	2.93E-11	1.31E-12	3.06E-11
Cr-51	2.00E+07	6.34E-01	2.39E+06	2.90E-07	6.34E-07	3.70E-11	4.36E-08	1.97E-13	2.76E-14	2.25E-13
Cs-134	6.60E+05	2.09E-02	6.52E+07	1.06E-08	2.09E-08	6.60E-09	2.23E-06	1.16E-12	4.67E-14	1.21E-12
Cs-136	3.70E+05	1.17E-02	1.14E+06	6.10E-07	1.17E-08	1.20E-09	3.14E-06	1.18E-13	3.68E-14	1.55E-13
Cs-137	1.00E+06	3.17E-02	9.49E+08	7.30E-10	3.17E-08	4.60E-09	2.93E-09	1.23E-12	9.29E-17	1.23E-12
Cs-138	1.10E+05	3.49E-03	2.00E+03	3.46E-04	1.87E-09	2.40E-11	3.62E-06	3.77E-16	6.77E-15	7.15E-15
Cu-64*	5.80E+06	1.84E-01	4.57E+04	1.52E-05	1.79E-07	1.20E-10	-	1.80E-13	-	1.80E-13
Fe-55	2.40E+07	7.61E-01	8.66E+07	8.01E-09	7.61E-07	3.80E-10	0.00E+00	2.43E-12	0.00E+00	2.43E-12
Fe-59	5.80E+06	1.84E-01	3.85E+06	1.80E-07	1.84E-07	3.70E-09	1.77E-06	5.71E-12	3.25E-13	6.04E-12
H-3	9.70E+11	3.08E+04	3.89E+08	1.78E-09	3.08E-02	3.00E-11	0.00E+00	7.75E-09	0.00E+00	7.75E-09
I-131	5.20E+08	1.65E+01	6.93E+05	1.00E-06	1.65E-05	2.00E-08	5.33E-07	2.77E-09	8.77E-12	2.77E-09
I-132	3.10E+09	9.83E+01	8.26E+03	8.39E-05	8.45E-05	3.10E-10	3.31E-06	2.20E-10	2.80E-10	5.00E-10
I-133	2.40E+09	7.61E+01	7.49E+04	9.26E-06	7.48E-05	4.00E-09	8.71E-07	2.51E-09	6.52E-11	2.58E-09
I-134	8.70E+09	2.76E+02	3.15E+03	2.20E-04	1.86E-04	1.50E-10	3.85E-06	2.34E-10	7.15E-10	9.49E-10
I-135	4.60E+09	1.46E+02	2.37E+04	2.93E-05	1.38E-04	9.20E-10	2.38E-06	1.07E-09	3.29E-10	1.40E-09
Kr-83m	3.30E+11	1.05E+04	6.59E+03	1.05E-04	8.66E-03	NG	7.67E-11	-	6.64E-13	6.64E-13
Kr-85	2.20E+12	6.98E+04	3.40E+08	2.04E-09	6.98E-02	NG	8.05E-09	-	5.62E-10	5.62E-10
Kr-85m	3.40E+10	1.08E+03	1.61E+04	4.30E-05	9.98E-04	NG	2.16E-07	-	2.16E-10	2.16E-10
Kr-87	1.20E+11	3.81E+03	4.58E+03	1.51E-04	2.90E-03	NG	1.24E-06	-	3.60E-09	3.60E-09
Kr-88	1.20E+11	3.81E+03	1.02E+04	6.78E-05	3.37E-03	NG	3.07E-06	-	1.03E-08	1.03E-08
Kr-89	1.20E+13	3.81E+05	1.89E+02(b)	3.67E-03	5.17E-04	NG	-	-	-	0.00E+00
La-140	1.60E+06	5.07E-02	1.45E+05	4.78E-06	5.03E-08	1.10E-09	3.50E-06	4.65E-13	1.76E-13	6.41E-13
Mn-54	1.20E+07	3.81E-01	2.70E+07	2.57E-08	3.80E-07	1.50E-09	1.21E-06	4.79E-12	4.60E-13	5.25E-12
Mn-56*	4.50E+05	1.43E-02	9.28E+03	7.47E-05	1.25E-08	1.20E-10	-	1.26E-14	-	1.26E-14
Mo-99	2.60E+06	8.24E-02	2.38E+05	2.92E-06	8.20E-08	8.90E-10	2.21E-07	6.13E-13	1.81E-14	6.31E-13
Na-24	1.40E+06	4.44E-02	5.40E+04	1.28E-05	4.34E-08	2.70E-10	6.56E-06	9.84E-14	2.85E-13	3.83E-13
Nb-95	1.80E+06	5.71E-02	3.02E+06	2.29E-07	5.71E-08	1.50E-09	1.10E-06	7.19E-13	6.28E-14	7.82E-13

Isotope	Airborne Source Term(s) (Bq/a)	Airborne Source Term (Bq/s)	Half-Life (s)	Decay constant (s^{-1})	Air Concentration (Bq/m^3)	DCF Inhalation (Sv/Bq)	DCF Immersion (Sv/a per Bq/m^3)	Dose from Inhalation (Sv/a)	Dose from Immersion (Sv/a)	Total Dose (Sv/a)
Ni-63	2.50E+04	7.93E-04	3.19E+09	2.17E-10	7.93E-10	4.80E-10	0.00E+00	3.20E-15	0.00E+00	3.20E-15
Np-239	1.80E+06	5.71E-02	2.04E+05	3.41E-06	5.67E-08	9.30E-10	2.19E-07	4.43E-13	1.24E-14	4.56E-13
P-32	6.90E+05	2.19E-02	1.23E+06	5.63E-07	2.19E-08	3.40E-09	1.69E-08	6.24E-13	3.69E-16	6.25E-13
Pr-144*	8.40E+01	2.66E-06	1.04E+03	6.69E-04	7.99E-13	1.80E-11	8.36E-08	1.21E-19	6.68E-20	1.88E-19
Rb-89*	4.40E+04	1.40E-03	9.09E+02	7.63E-04	3.54E-10	1.40E-11	-	4.16E-17	-	4.16E-17
Rh-103m*	1.90E+03	6.02E-05	3.37E+03	2.06E-04	4.16E-11	2.70E-12	-	9.43E-19	-	9.43E-19
Rh-106	1.00E+04	3.17E-04	3.01E+01(b)	2.30E-02	3.32E-28	-	3.34E-07	-	1.11E-34	1.11E-34
Ru-103	4.50E+05	1.43E-02	3.39E+06	2.04E-07	1.43E-08	2.40E-09	6.56E-07	2.88E-13	9.36E-15	2.97E-13
Ru-106	7.30E+04	2.31E-03	3.21E+07	2.16E-08	2.31E-09	2.80E-08	0.00E+00	5.44E-13	0.00E+00	5.44E-13
Sb-124	4.90E+02	1.55E-05	5.20E+06	1.33E-07	1.55E-11	6.40E-09	2.72E-06	8.35E-16	4.23E-17	8.77E-16
Sr-89	8.00E+04	2.54E-03	4.37E+06	1.59E-07	2.54E-09	6.10E-09	1.38E-08	1.30E-13	3.50E-17	1.30E-13
Sr-90	3.60E+03	1.14E-04	9.09E+08	7.63E-10	1.14E-10	3.60E-08	3.10E-09	3.45E-14	3.54E-19	3.45E-14
Sr-91*	1.70E+06	5.39E-02	3.42E+04	2.03E-05	5.20E-08	3.70E-10	-	1.62E-13	-	1.62E-13
Sr-92*	1.00E+06	3.17E-02	9.76E+03	7.10E-05	2.79E-08	2.10E-10	-	4.92E-14	-	4.92E-14
Tc-99m*	2.20E+05	6.98E-03	2.16E+04	3.20E-05	6.59E-09	4.00E-09	1.66E-07	2.21E-13	1.09E-15	2.22E-13
Te-129m*	8.40E+05	2.66E-02	2.90E+06	2.39E-07	2.66E-08	6.60E-09	-	1.48E-12	-	1.48E-12
Te-131m*	1.50E+05	4.76E-03	1.08E+05	6.42E-06	4.70E-09	9.40E-10	-	3.71E-14	-	3.71E-14
Te-132	6.80E+04	2.16E-03	2.77E+05	2.50E-06	2.15E-09	2.00E-09	2.94E-07	3.61E-14	6.31E-16	3.67E-14
W-187*	5.30E+05	1.68E-02	8.60E+04	8.06E-06	1.66E-08	1.90E-10	-	2.64E-14	-	2.64E-14
Xe-131m	3.80E+10	1.20E+03	1.02E+06	6.78E-07	1.20E-03	NG	1.17E-08	-	1.41E-11	1.41E-11
Xe-133	1.60E+12	5.07E+04	4.53E+05	1.53E-06	5.06E-02	NG	4.39E-08	-	2.22E-09	2.22E-09
Xe-133m	1.10E+09	3.49E+01	1.89E+05	3.66E-06	3.47E-05	NG	4.01E-08	-	1.39E-12	1.39E-12
Xe-135	1.30E+12	4.12E+04	3.29E+04	2.11E-05	3.97E-02	NG	3.50E-07	-	1.39E-08	1.39E-08
Xe-135m	1.20E+12	3.81E+04	9.17E+02	7.56E-04	9.76E-03	NG	5.84E-07	-	5.70E-09	5.70E-09
Xe-137	1.70E+12	5.39E+04	2.29E+02(b)	3.03E-03	2.32E-04	NG	-	-	-	0.00E+00
Xe-138	2.40E+12	7.61E+04	8.45E+02	8.20E-04	1.74E-02	NG	1.73E-06	-	3.01E-08	3.01E-08
Y-90*	8.80E+02	2.79E-05	2.30E+05	3.01E-06	2.78E-11	1.50E-09	2.50E-08	3.50E-16	6.94E-19	3.50E-16
Y-91	8.90E+05	2.82E-02	5.06E+06	1.37E-07	2.82E-08	8.90E-09	1.96E-08	2.11E-12	5.53E-16	2.11E-12
Y-92*	4.10E+05	1.30E-02	1.27E+04	5.44E-05	1.18E-08	1.80E-10	-	1.78E-14	-	1.78E-14
Y-93*	1.30E+05	4.12E-03	3.64E+04	1.91E-05	3.98E-09	4.20E-10	-	1.41E-14	-	1.41E-14
Zn-65	4.90E+06	1.55E-01	2.11E+07	3.29E-08	1.55E-07	1.60E-09	8.58E-07	2.09E-12	1.33E-13	2.22E-12
Zr-95	1.90E+06	6.02E-02	5.53E+06	1.25E-07	6.02E-08	4.80E-09	1.06E-06	2.43E-12	6.38E-14	2.49E-12

(a) The airborne source terms used in the screening dose calculation assume one SMR unit.
(b) Half-life is less than 6 minutes (360 seconds); therefore, assumed to disappear quickly.

Radionuclides shown with an asterisk (*) indicate those that are not addressed under CSA N288.1:20, DCFs for these were obtained from ICRP 72; NG = Noble Gas (no DCF available).
Green shading indicates dose greater than the cutoff of 1E-10 Sv/a for inclusion as a COPC in the PERA.

Table 2-3: Summary of Radionuclides and Airborne Release Rates for PERA Modelling

Isotope	Airborne Source Term – One SMR (Bq/s)	Airborne Source Term – Four SMRs (Bq/s)
C-14	1.27E+04	5.07E+04
Co-60	3.49E-01	1.40E+00
Cs-134	2.09E-02	8.37E-02
Cs-137	3.17E-02	1.27E-01
H-3	3.08E+04	1.23E+05
I-131	1.65E+01	6.60E+01
I-132	9.83E+01	3.93E+02
I-133	7.61E+01	3.04E+02
I-134	2.76E+02	1.10E+03
I-135	1.46E+02	5.83E+02
Kr-85	6.98E+04	2.79E+05
Kr-85m	1.08E+03	4.31E+03
Kr-87	3.81E+03	1.52E+04
Kr-88	3.81E+03	1.52E+04
Xe-133	5.07E+04	2.03E+05
Xe-135	4.12E+04	1.65E+05
Xe-135m	3.81E+04	1.52E+05
Xe-138	7.61E+04	3.04E+05

2.2.2.1.2 IMPACT Model

An environmental transport and pathways model, IMPACT™ Version 5.5.2, is used to evaluate the transport and effects of contaminants on the local environment including human and ecological receptors. IMPACT™ is a modelling tool, created, maintained and supported by Ecometrix Incorporated (Ecometrix). The IMPACT™ model is a customizable tool that allows the user to assess the transport and fate of COPCs through a user-specified environment. The model is used to estimate concentrations of COPCs in a range of media.

IMPACT™ Version 5.5.2 is consistent with the equations outlined in CSA N288.1:20 (CSA, 2020) for pathways analysis and for calculation of radiological dose to humans. IMPACT™ uses specific activity models for tritium and C-14 as per CSA N288.1:20 (CSA, 2020) and as recommended by CSA N288.6:22 (CSA, 2022a). The formation of organically bound tritium (OBT) in plants and animals from HT (elemental tritium) and HTO (tritium oxide) is accounted for in the specific activity model for tritium and the dose from OBT is included in the dose results in IMPACT™.

The model was originally developed in 1993 as part of research projects funded by the Atomic Energy Control Board (now the CNSC). Since the initial development, the IMPACT™ software package has been continuously revised to improve the interface, and the integration with various operating systems, and most importantly to embody an up-to-date understanding of the fate, transport and dose impacts of radionuclides released to the environment. There are several built in libraries for parameters relevant to atmospheric dispersion, groundwater transport, soil processes, and water-sediment interaction. IMPACT™ can be used in various applications such as: human and ecological risk assessment; environmental impact assessments; pathways analysis; food-chain modeling; cumulative impacts; and derived release limits. IMPACT™ is able to model doses from emissions that can otherwise not be calculated from environmental measurements, including doses for future timeframes.

IMPACT™ was verified and validated in accordance with CSA N286.7-99. It has also been audited against CSA N286.7-16 and meets these requirements. The IMPACT™ code is verified in the IMPACT™ 5.5.2 – Tool Qualification Report (Ecometrix, 2023b) .

IMPACT™ is designed to model routine, continuous and low-level emissions, and models transport of radionuclides through equilibrium partitioning. Time-dependent equations are used to model the soil compartment. Initial concentrations in environmental media (background concentrations) are not accounted for in the analysis. Thus, doses calculated from facility emissions are incremental doses.

The IMPACT™ code models radionuclide cycling through the biosphere from both airborne and waterborne effluent releases. For the DNNP, the atmospheric dispersion model was used, as discussed in **Section 2.2.2.1.2.1**, Dispersion Models.

2.2.2.1.2.1 Dispersion Models

The concentration of COPCs in air is determined by the atmospheric release rate from the point of emission and a transfer parameter from the source to the air at a given receptor location (P_{01}). The long-term average value of the transfer parameter P_{01} is calculated based on a continuous release using a sector-averaged version of the Gaussian plume model. The model assumes that a laterally uniform concentration of radionuclides is distributed in each wind sector since wind meanders over prolonged periods of time (CSA, 2020). The atmospheric model is governed by the following mathematical equation:

$$P_{01}=\frac{\sqrt{2}}{\sqrt{\pi}x\Delta\theta}\sum_{i,k}\left[\frac{F_{ijk}D_k}{u_k\Sigma_{zi}}\exp\left(\frac{-H_{ik}^2}{2\Sigma_{zi}^2}\right)\right]$$

where:

P_{01} = ground level transfer factor for receptor j (s/m^3)
x = distance between the source and receptor j (m)
$\Delta\theta$ = width of the sector over which the plume spreads (radians)
F_{ijk} = triple joint frequency of occurrence of stability class i and wind speed class k when the wind blows into the sector containing receptor j
D_k = factor that takes account of decay and ingrowth for wind speed class k
H_{ik} = effective release height for stability class i and wind speed class k (m)
Σ_{zi} = vertical dispersion parameter for stability class i, including spreading due to building wake effects (m), where z refers to the vertical axis
u_k = mean wind speed for speed class k (m/s)

COPCs in dust are dispersed and deposited to the soil. The soil model in CSA N288.1:20 (CSA, 2020) is a dynamic model that incorporates the input of activity due to wet and dry deposition from air and loss due to decay, erosion, leaching, volatilization, and cropping. The transfer of COPCs from the air and soil to terrestrial plants is calculated using air-to-plant and soil-to-plant transfer factors. The COPCs are then transferred to terrestrial animals via inhalation (air), ingestion of water and food, and incidental ingestion of soil and sediment.

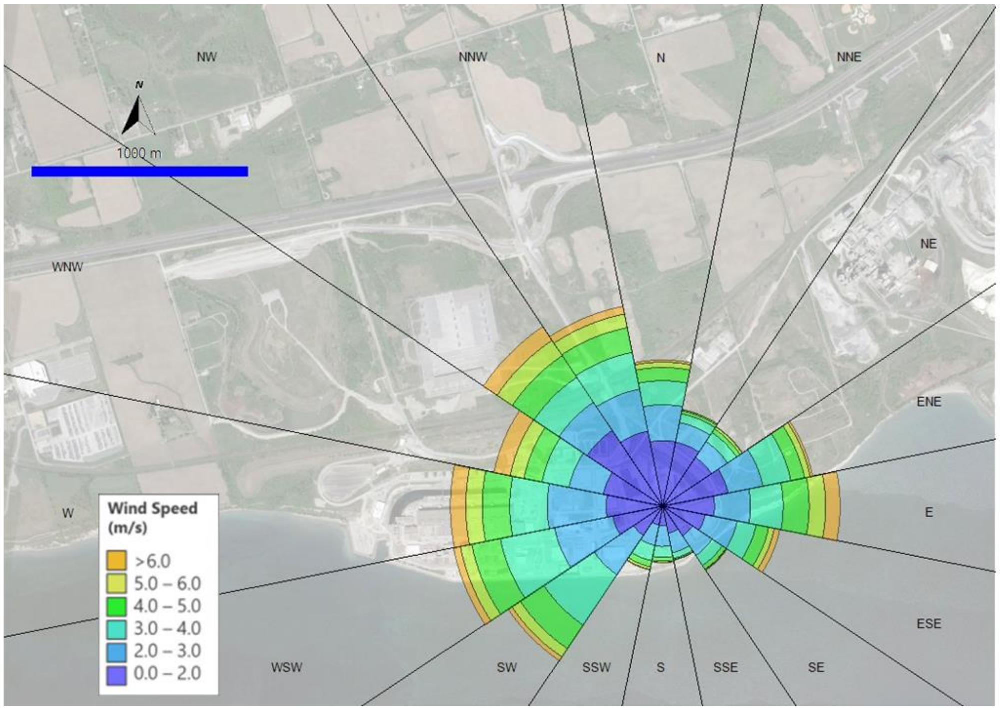
The input parameters needed to model atmospheric releases, including the characteristics of the ventilation stack are shown in **Table 2-4**. Note that one combined virtual source was assumed for the airborne releases from the four SMRs. This simplification has been shown to have little effect on modelled concentrations at receptor locations 1 km or more off-site (COG, 2019).

Table 2-4: Air Plume Characteristics

Parameter	Value	Source
Release Height	39 m	Vendor assumption
Stack Exit Velocity	44.39 m/s	Calculated based on 523 m^3/min discharged diesel generator exhaust by vendor assumption
Stack Inside Diameter	0.5 m	Vendor assumption
Nearby Building Height	33.5 m	The highest nearby building (Turbine Building) by vendor assumption
Gas Temperature	21°C	DRL Report (OPG, 2022b)
Ambient Air Temperature	20°C	DRL Report (OPG, 2022b)
Stability Parameter for Class E	5E-04 s^{-2}	default values specified in CSA N288.1:20 clause 6.1.2.10 (CSA, 2020)
Stability Parameter for Class F	0.0012 s^{-2}	default values specified in CSA N288.1:20 clause 6.1.2.10 (CSA, 2020)
Cross Sectional Area of Buildings	4290 m^2	The highest nearby building (Turbine Building) by vendor assumption

2.2.2.1.2.2 Meteorological Data

Meteorological data (wind speed, direction and frequency; precipitation) averaged over the 2019-2023 period were used in both the human and non-human biota scenarios. Wind data were provided by OPG and are consistent with the data used for the annual Environmental Monitoring Program (EMP) reports. Wind data from the DN site exceeded the 10% annual unavailability limit as defined for the program for the year 2019; therefore, data from the 10 m meteorological tower on the Pickering Nuclear site was used for 2019. Wind data from the 10 m meteorological tower on the DN site was used for year 2020-2023. The wind data are summarized in windrose diagram showing “Wind Comes From” **Figure 2-3**.



Note: Direction is where wind comes from.

Figure 2-3: 2019-2023 Annual Average Windrose at 10m Tower at Darlington Site

2.2.2.1.2.3 Soil

Deposition on soil from air was calculated using the methodology described in the CSA N288.1:20 (CSA, 2020), and implemented in IMPACT™ version 5.5.2. The deposition model used default parameter values as recommended in CSA N288.1:20, Section 6.3.2 (CSA, 2020). Transfer from air to soil was calculated through the transfer parameter as described in Equation 6-29b of CSA N288.1:20 (CSA, 2020) with nuclide specific constants (Table 14 in CSA N288.1:20). The transfer parameter (P_{13mass}) providing concentration in terms of activity per kilogram of dry soil is defined as:

$$P_{13} = \left(v_g \;/\; \lambda_T\right)(\rho Z_{soil})^{-1}[1 - \exp(\lambda_T t)]$$

v_g = deposition velocity (m/s)
λ_T = sum of the rate constants for all significant radionuclide loss processes (s^{-1})
ρ = soil dry bulk density (kg dw/m^3), which is dependent on soil type
Z_{soil} = depth of top mixed soil layer (m)

Deposition velocity is modelled as a combination of dry and wet deposition velocity. Dry deposition velocity is defined based on the nuclide category (noble gas, iodine, all other); wet deposition velocity depends on site-specific meteorological conditions. Airborne emissions from the DNNP can deposit on inland ponds in the vicinity of the Project as well as ponds used for farm irrigation. Deposition on ponds and soil is modelled as:

$$v_w = f_{p_j} W_r{}^{r+s} P$$

f_{pj} = fraction of the time precipitation falls when the wind blows from sector j (unitless)
$W_r{}^{r+s}$ = washout ratio for rain for deposition to soil and ponds (unitless) (Table 14 in CSA N288.1:20)
P = long-term average precipitation rate (m/s)

The transfer of HTO employs a specific activity approach rather than a deposition velocity approach, since tritium atoms freely exchange with hydrogen atoms in the environment (CSA, 2020). Tritium in air will exchange with hydrogen in soil water rather than with the soil itself. Therefore, tritium in air bypasses the soil and is transferred directly from air to soil water and plant.

The soil type was assumed to be loam. This is consistent with the recommendation in CSA N288.1:20 (CSA, 2020) to use a clay or loam soil type for Southern Ontario, and is consistent with other assessments for the DN site. A value of 0.04 m for the ground surface roughness length was used for all directions relative to the release point, except for the E, ESE, SE, SSE, S, SSW, SW, WSW directions where 0.01 was used. The value of 0.04 m roughness length is for "ploughed land" as described in CSA N288.1:20 and 0.01 is used for "lawns, water bodies" (CSA, 2020).

2.2.2.2 Non-Radiological Emissions

During the site preparation and construction phases of the DNNP, air pollutants are expected to be released into the local atmosphere. Examples include fugitive dusts generated as part of typical construction activities (e.g., excavation, land clearing) and engine exhaust emissions from heavy construction vehicles, on-site personnel vehicles, and other motorized pieces of equipment. DNNP air emissions generated during the operation phase will also include emissions from the standby generators. The emissions were modelled using AERMOD to predict concentrations in air around the site. Predicted air concentrations for all Project phases are screened against applicable air quality screening criteria to identify airborne COPCs. Prior to operation, emissions will be modelled again as part of the Emissions Summary and Dispersion Modelling (ESDM) requirements for the facility.

2.2.2.2.1 Constituents of Potential Concern

Ambient air quality predictions resulting from site preparation, construction and operation of the DNNP were estimated using the AERMOD modelling tool. Details of the assumptions, modelling parameters and the level of conservatism used in the modelling are available in the appended technical memorandum (IEC, 2024). A total of three (3) site preparation modelling scenarios (Scenario 1, Scenario 2 and Scenario 3) and six (6) construction modelling scenarios (Scenario 1A/2A, Scenario 1B/2B and Scenario 1C/2C) were developed to account for variations in the types and locations of different project activities and their associated emissions over the course of the site preparation and construction phases. One operation scenario was modelled, accounting for the simultaneous operation of four (4) standby generators (with the remaining four (4) in a non-operational standby condition) and worker traffic accessing the DNNP site from the existing Holt Road entrance. The full lists of project activities considered in each scenario are described in the appended technical memorandum (IEC, 2024), and are based on the information available as of September 2024. While there may be additional backup or emergency equipment introduced for the operation phase as the design progresses, the conservative assumptions incorporated into the modelling of the operation scenario could potentially encompass this uncertainty.

Modelled parameters include nitrogen dioxide (NO_2), sulphur dioxide (SO_2), carbon monoxide (CO), particulate matter <10 µm (PM_{10}), particulate matter <2.5 µm ($PM_{2.5}$), total suspended particulate (TSP), benzo(a)pyrene (BaP) as a surrogate for polycyclic aromatic hydrocarbons (PAHs), and acrolein as a surrogate for volatile organic compounds (VOCs). These parameters were identified in OPG's Commitments Report, the EMEAF Plan, and are consistent with air quality monitoring data being collected at DNNP. The modelled concentration of COPCs in air, with the addition of existing air concentrations at the DN site, were compared against the most restrictive of the provincial and federal air quality standards including Ontario Ministry of Environment, Conservation, and Parks (MECP) Ambient Air Quality Criteria (AAQCs) (MECP, 2023) and Canadian Ambient Air Quality Standards (CAAQS) from the Canadian Council of Ministers of the Environment (CCME) (CCME, 2019) to determine whether modelled concentrations of non-radiological atmospheric COPCs could pose a risk to human and ecological receptors over the lifetime of the DNNP. Concentrations were directly compared to guidelines with the same averaging periods. The AAQCs with averaging times of 24 hours or longer are considered protective of chronic health effects. The AAQCs with averaging times of 1-hr are considered protective of short-term health effects. The air quality guidelines used as part of this risk assessment are shown in **Table 2-5**.

A summary of the predicted exceedances of applicable ambient air quality criteria are shown in **Table 2-6**. Detailed results of the air modelling and comparison with applicable ambient air quality criteria are presented from **Table 2-7** to **Table 2-16**. For site preparation three scenarios were evaluated; however, the maximum of all scenarios is presented in the summary tables. Site preparation activities were conservatively assumed to occur on a 24-hour day schedule. OPG and their contractors provided information regarding the equipment required for site preparation and construction activities, which was used to develop source inventories for the current air quality (and noise) assessment. Additionally, truck traffic is included as a source of both noise and dust emissions for each site preparation and construction scenario. As previously noted, additional details relating to the air quality modelling and the assessed scenarios are available in the appended technical memorandum (IEC, 2024).

Further discussion of ambient air quality criteria exceedances, and a summary of the non-radiological emission screening, are provided in **Section 3.1.2.1.1** and **Section 4.1.3.1.1** for human and ecological receptors, respectively.

Table 2-5: Ambient Air Quality Screening Criteria

Constituent	Units	Averaging Period	Value	Basis	Reference	Notes
Total suspended particulates (TSP)	μg/m³	24-hr	120	Visibility	(MECP, 2023)	--
Total suspended particulates (TSP)	μg/m³	Annual	60	Visibility	(MECP, 2023)	--
Particulate matter <10 μm (PM_{10})	μg/m³	24-hr	50	Health	(MECP, 2023)	--
Particulate matter <2.5 μm ($PM_{2.5}$)	μg/m³	24-hr	27	Health / Environment	(CCME, 2019; MECP, 2023)	--
Particulate matter <2.5 μm ($PM_{2.5}$)	μg/m³	Annual	8.8	Health / Environment	(CCME, 2019; MECP, 2023)	--
Sulphur dioxide (SO_2)	μg/m³	1-hr	100	Health	(MECP, 2023)	AAQC presented in ppb in source document; for consistency, value taken from O. Reg. 419/05 (Schedule 3) which are presented in μg/m³.
Sulphur dioxide (SO_2)	μg/m³	Annual	10	Vegetation	(CCME, 2019; MECP, 2023)	AAQC presented in ppb in source document; for consistency, value taken from O. Reg. 419/05 (Schedule 3) which are presented in μg/m³.
Nitrogen dioxides (as NO_2)	μg/m³	1-hr	79	Health / Environment	(CCME, 2019)	Converted from 42 ppb, where 1 ppb of NO_2 is equal to 1.88 μg/m³ at 20°C and 1 atm.
Nitrogen dioxides (as NO_2)	μg/m³	1-hr	400	Health	(MECP, 2023)	--
Nitrogen dioxides (as NO_2)	μg/m³	24-hr	200	Health	(MECP, 2023)	--

Constituent	Units	Averaging Period	Value	Basis	Reference	Notes
	µg/m³	Annual	23	Health / Environment	(CCME, 2019)	Converted from 12 ppb, where 1 ppb of NO_2 is equal to 1.88 µg/m³ at 20°C and 1 atm.
Carbon monoxide (CO)	µg/m³	1-hr	36,200	Health	(MECP, 2023)	--
	µg/m³	8-hr	15,700	Health	(MECP, 2023)	--
Acrolein	µg/m³	1-hr	4.5	Health	(MECP, 2023)	Surrogate for Volatile Organic Compounds (VOCs) without separate AAQC.
	µg/m³	24-hr	0.4	Health	(MECP, 2023)	
Benzo[a]pyrene (BaP)	µg/m³	24-hr	0.00005	Health	(MECP, 2023)	Surrogate for total Polycyclic Aromatic Hydrocarbons (PAHs) without separate AAQC
	µg/m³	Annual	0.00001	Health	(MECP, 2023)	

Notes:
µg/m³ – micrograms per cubic meter
ppb – parts per billion
atm – standard atmosphere of pressure
MECP, 2023 – Ontario's Ambient Air Quality Criteria (AAQC)
CCME, 2019 – CCME's Canadian Ambient Air Quality Standards (CAAQS)

Table 2-6: Summary of Exceedances of Ambient Air Quality Guidelines during Site Preparation, Construction and Operation

Constituent	Averaging Period	Existing Conditions	Site Preparation	Construction	Operation
Total suspended particulates (TSP)	24-hr	-	✓	✓	-
	Annual	-	✓ (on-site)	✓ (on-site)	-
Particulate matter <10 µm (PM_{10})	24-hr	-	✓	✓	✓ (on-site)
Particulate matter <2.5 µm ($PM_{2.5}$)	24-hr	-	✓ (on-site)	✓	-
	Annual	-	✓ (on-site)	✓ (on-site)	-
Sulphur dioxide (SO_2)	1-hr	-	-	✓ (on-site)	-
	Annual	-	-	✓ (on-site)	-
Nitrogen dioxides (as NO_2)	1-hr (CAAQS)	-	✓	✓	✓
	1-hr (AAQC)	-	✓	✓	✓ (on-site)
	24-hr	-	✓	✓ (on-site)	✓ (on-site)
	Annual	-	✓ (on-site)	✓ (on-site)	-
Carbon monoxide (CO)	1-hr	-	-	✓ (on-site)	-
	8-hr	-	-	✓ (on-site)	-
Acrolein	1-hr	-	✓ (on-site)	✓ (on-site)	-
	24-hr	-	✓ (on-site)	✓ (on-site)	-
Benzo[a]pyrene (BaP)	24-hr	-	✓	✓ (on-site)	✓
	Annual	✓	✓	✓	✓

Notes:
✓ = exceedance of ambient air quality criteria at both human and ecological receptor locations.
✓ (on-site) = exceedance of ambient air quality criteria at on-site ecological receptor locations only.
- = no exceedance of ambient air quality criteria.

Table 2-7: Total Suspended Particulate Matter (TSP) Air Modelling Results (All Project Phases)

Receptor ID	Receptor Name	Existing Conditions		Site Preparation (Maximum of Scenarios 1, 2 and 3)								Construction (Maximum of Scenarios 1A, 2A, 1B, 2B , 1C and 2C)								Operation							
		24-Hour	Annual	24-hr				Annual				24-hr				Annual				24-hr				Annual			
		Existing Conditions (24-hr)	Existing Conditions (Annual)	Max 24-hr TSP (Increment)	Max 24-hr TSP (Total)	% of Criteria	# of Exceedances	Max Annual TSP (Increment)	Max Annual TSP (Total)	% of Criteria	# of Exceedances	Max 24-hr TSP (Increment)	Max 24-hr TSP (Total)	% of Criteria	# of Exceedances	Max Annual TSP (Increment)	Max Annual TSP (Total)	% of Criteria	# of Exceedances	Max 24-hr TSP (Increment)	Max 24-hr TSP (Total)	% of Criteria	# of Exceedances	Max Annual TSP (Increment)	Max Annual TSP (Total)	% of Criteria	# of Exceedances
		(μg/m³)	(μg/m³)	(μg/m³)	(μg/m³)	(%)	DAYS/YR	(μg/m³)	(μg/m³)	(%)	DAYS/YR	(μg/m³)	(μg/m³)	(%)	DAYS/YR	(μg/m³)	(μg/m³)	(%)	DAYS/YR	(μg/m³)	(μg/m³)	(%)	DAYS/YR	(μg/m³)	(μg/m³)	(%)	DAYS/YR
Criteria (μg/m³)		**120**	**60**		**120**				**60**				**120**				**60**				**120**				**60**		
Ecological Receptors																											
T2022_D	Location D	49.6	22.4	523.0	**572.6**	**477%**	NA	91.2	**113.6**	**189%**	NA	2,066.3	**2,115.9**	**1763%**	NA	213.9	**236.3**	**394%**	NA	17.1	66.7	56%	NA	2.7	25.1	42%	NA
T2023_D	Location F	49.6	22.4	444.4	**494.0**	**412%**	NA	53.0	**75.4**	**126%**	NA	613.4	**663.0**	**552%**	NA	88.7	**111.1**	**185%**	NA	6.0	55.6	46%	NA	1.3	23.7	40%	NA
T2	Lake Ontario Shore	49.6	22.4	150.3	**199.9**	**167%**	NA	10.0	32.4	54%	NA	232.1	**281.7**	**235%**	NA	10.7	33.1	55%	NA	6.4	56.0	47%	NA	0.5	22.9	38%	NA
T4	Location AB	49.6	22.4	152.6	**202.2**	**168%**	NA	14.7	37.1	62%	NA	313.3	**362.9**	**302%**	NA	22.6	45.0	75%	NA	7.1	56.7	47%	NA	0.8	23.2	39%	NA
T7	Location C	49.6	22.4	92.6	**142.2**	**119%**	NA	10.4	32.8	55%	NA	338.8	**388.4**	**324%**	NA	13.5	35.9	60%	NA	7.4	57.0	47%	NA	0.7	23.1	39%	NA
T10	Location E	49.6	22.4	322.3	**371.9**	**310%**	NA	38.3	**60.7**	**101%**	NA	1,437.3	**1,486.9**	**1239%**	NA	115.9	**138.3**	**230%**	NA	20.7	70.3	59%	NA	4.2	26.6	44%	NA
FL_NEW	North/East/West Fenceline	49.6	22.4	488.2	**218.4**	**182%**	17	14.1	36.5	61%	0	1,437.4	**1,487.0**	**1239%**	291	8.9	31.3	52%	NA	56.1	105.7	88%	0	0.3	22.7	38%	0
FL_S	South Fenceline	49.6	22.4	624.8	**674.4**	**562%**	282	31.7	54.1	90%	0	1,569.6	**1,619.2**	**1349%**	9	56.2	**78.6**	**131%**	NA	13.1	62.7	52%	0	2.5	24.9	41%	0
Human Receptors																											
R15_REMP_1	Farm & Harvester	49.6	22.4	93.5	**143.1**	**119%**	2	8.2	30.6	51%	0	216.4	**266.0**	**222%**	31	11.3	33.7	56%	NA	3.3	52.9	44%	0	0.4	22.8	38%	0
R17_REMP_2	Rural Resident	49.6	22.4	246.0	**295.6**	**246%**	10	12.2	34.6	58%	0	376.7	**426.3**	**355%**	26	16.4	38.8	65%	NA	3.5	53.1	44%	0	0.3	22.7	38%	0
R21_REMP_3	Bowmanville Resident	49.6	22.4	74.8	**124.4**	**104%**	1	2.5	24.9	42%	0	90.7	**140.3**	**117%**	1	2.8	25.2	42%	NA	1.3	50.9	42%	0	0.1	22.5	37%	0
R22_REMP_4	West/East Beach Resident	49.6	22.4	80.5	**130.1**	**108%**	1	6.5	28.9	48%	0	115.6	**165.2**	**138%**	5	8.2	30.6	51%	NA	1.9	51.5	43%	0	0.2	22.6	38%	0
REMP_5	Sport Fisher	49.6	22.4	67.5	117.1	98%	0	6.1	28.5	48%	0	123.9	**173.5**	**145%**	2	6.7	29.1	49%	NA	1.9	51.5	43%	0	0.3	22.7	38%	0
REMP_6	Industrial/Commercial	49.6	22.4	77.3	**126.9**	**106%**	1	5.6	28.0	47%	0	184.1	**233.7**	**195%**	13	7.3	29.7	50%	NA	2.9	52.5	44%	0	0.3	22.7	38%	0
REMP_7	Camper	49.6	22.4	56.6	106.2	88%	0	3.3	25.7	43%	0	94.6	**144.2**	**120%**	2	3.7	26.1	44%	NA	1.6	51.2	43%	0	0.1	22.5	38%	0
REMP_9	Dairy Farm	49.6	22.4	17.0	66.6	55%	0	0.6	23.0	38%	0	32.2	81.8	68%	0	0.6	23.0	38%	NA	0.7	50.3	42%	0	0.02	22.4	37%	0
Oshawa_res	Oshawa Resident	49.6	22.4	19.8	69.4	58%	0	0.8	23.2	39%	0	53.1	102.7	86%	0	0.9	23.3	39%	NA	1.0	50.6	42%	0	0.03	22.4	37%	0

Notes:
μg/m³ – micrograms per cubic meter
Bolding/highlighting indicates an exceedance of the applicable ambient air quality criteria.

Table 2-8: PM_{10} Air Modelling Results (All Project Phases)

Receptor ID	Receptor Name	Existing Conditions		Site Preparation (Maximum of Scenarios 1, 2 and 3)								Construction (Maximum of Scenarios 1A, 2A, 1B, 2B , 1C and 2C)								Operation							
		24-Hour	Annual	24-hr				Annual				24-hr				Annual				24-hr				Annual			
		90th-% PM10	Annual PM10	Max 24-hr PM10 (Increment)	Max 24-hr PM10 (Total)	% of Criteria	# of Exceedances	Max Annual PM10 (Increment)	Max Annual PM10 (Total)	% of Criteria	# of Exceedances	Max 24-hr PM10 (Increment)	Max 24-hr PM10 (Total)	% of Criteria	# of Exceedances	Max Annual PM10 (Increment)	Max Annual PM10 (Total)	% of Criteria	# of Exceedances	Max 24-hr PM10 (Increment)	Max 24-hr PM10 (Total)	% of Criteria	# of Exceedances	Max Annual PM10 (Increment)	Max Annual PM10 (Total)	% of Criteria	# of Exceedances
		(µg/m³)	(µg/m³)	(µg/m³)	(µg/m³)	(%)	DAYS/YR	(µg/m³)	(µg/m³)	(%)	DAYS/YR	(µg/m³)	(µg/m³)	(%)	DAYS/YR	(µg/m³)	(µg/m³)	(%)	DAYS/YR	(µg/m³)	(µg/m³)	(%)	DAYS/YR	(µg/m³)	(µg/m³)	(%)	DAYS/YR
Criteria (µg/m³)		**50**	**NV**	**50**				**NV**				**50**				**NV**				**50**				**NV**			
Ecological Receptors																											
T2022_D	Location D	40.3	26.0	152.8	**193.1**	**386%**	NA	28.2	54.2	NA	NA	621.1	**661.4**	**1323%**	NA	87.6	113.6	NA	NA	3.3	43.6	87%	NA	0.5	26.5	NA	NA
T2023_D	Location F	40.3	26.0	150.0	**190.3**	**381%**	NA	18.6	44.6	NA	NA	192.9	**233.2**	**466%**	NA	32.4	58.4	NA	NA	2.0	42.3	85%	NA	0.3	26.3	NA	NA
T2	Lake Ontario Shore	40.3	26.0	48.0	**88.3**	**177%**	NA	3.4	29.4	NA	NA	70.2	**110.5**	**221%**	NA	5.3	31.3	NA	NA	1.7	42.0	84%	NA	0.1	26.1	NA	NA
T4	Location AB	40.3	26.0	49.2	**89.5**	**179%**	NA	4.8	30.8	NA	NA	94.0	**134.3**	**269%**	NA	9.8	35.8	NA	NA	1.8	42.1	84%	NA	0.2	26.2	NA	NA
T7	Location C	40.3	26.0	31.4	**71.7**	**143%**	NA	3.6	29.6	NA	NA	98.7	**139.0**	**278%**	NA	5.8	31.8	NA	NA	1.7	42.0	84%	NA	0.1	26.1	NA	NA
T10	Location E	40.3	26.0	101.6	**141.9**	**284%**	NA	12.3	38.3	NA	NA	432.2	**472.5**	**945%**	NA	47.9	73.9	NA	NA	4.4	44.7	89%	NA	0.8	26.8	NA	NA
FL_NEW	North/East/West Fenceline	40.3	26.0	145.4	**185.7**	**371%**	133	2.8	28.8	NA	NA	416.7	**457.0**	**914%**	330	4.0	30.0	NA	NA	11.4	**51.7**	**103%**	1	0.1	26.1	NA	NA
FL_S	South Fenceline	40.3	26.0	245.1	**285.4**	**571%**	321	11.1	37.1	NA	NA	1,368.7	**1,409.0**	**2818%**	250	19.9	45.9	NA	NA	2.9	43.2	86%	0	0.5	26.5	NA	NA
Human Receptors																											
R15_REMP_1	Farm & Harvester	40.3	26.0	29.4	**69.7**	**139%**	35	2.7	28.7	NA	NA	64.8	**105.1**	**210%**	91	5.1	31.1	NA	NA	1.1	41.4	83%	0	0.1	26.1	NA	NA
R17_REMP_2	Rural Resident	40.3	26.0	74.2	**114.5**	**229%**	42	3.9	29.9	NA	NA	110.0	**150.3**	**301%**	55	5.0	31.0	NA	NA	0.8	41.1	82%	0	0.1	26.1	NA	NA
R21_REMP_3	Bowmanville Resident	40.3	26.0	23.2	**63.5**	**127%**	3	0.8	26.8	NA	NA	27.8	**68.1**	**136%**	6	1.1	27.1	NA	NA	0.4	40.7	81%	0	0.0	26.0	NA	NA
R22_REMP_4	West/East Beach Resident	40.3	26.0	24.7	**65.0**	**130%**	18	2.1	28.1	NA	NA	35.1	**75.4**	**151%**	31	2.5	28.5	NA	NA	0.5	40.8	82%	0	0.0	26.0	NA	NA
REMP_5	Sport Fisher	40.3	26.0	20.8	**61.1**	**122%**	5	2.0	28.0	NA	NA	38.1	**78.4**	**157%**	39	3.3	29.3	NA	NA	0.8	41.1	82%	0	0.1	26.1	NA	NA
REMP_6	Industrial/Commercial	40.3	26.0	24.1	**64.4**	**129%**	14	1.8	27.8	NA	NA	55.3	**95.6**	**191%**	61	3.4	29.4	NA	NA	0.8	41.1	82%	0	0.1	26.1	NA	NA
REMP_7	Camper	40.3	26.0	17.8	**58.1**	**116%**	3	1.1	27.1	NA	NA	28.9	**69.2**	**138%**	20	1.7	27.7	NA	NA	0.4	40.7	81%	0	0.0	26.0	NA	NA
REMP_9	Dairy Farm	40.3	26.0	5.4	45.7	91%	0	0.2	26.2	NA	NA	9.7	50.0	100%	0	0.3	26.3	NA	NA	0.2	40.5	81%	0	0.004	26.0	NA	NA
Oshawa_res	Oshawa Resident	40.3	26.0	6.4	46.7	93%	0	0.3	26.3	NA	NA	16.0	**56.3**	**113%**	1	0.4	26.4	NA	NA	0.2	40.5	81%	0	0.01	26.0	NA	NA

Notes:
µg/m³ – micrograms per cubic meter
Bolding/highlighting indicates an exceedance of the applicable ambient air quality criteria.

Table 2-9: $PM_{2.5}$ Air Modelling Results (All Project Phases)

Receptor ID	Receptor Name	Existing Conditions		Site Preparation (Maximum of Scenarios 1, 2 and 3)								Construction (Maximum of Scenarios 1A, 2A, 1B, 2B , 1C and 2C)								Operation							
		24-Hour	Annual	24-hr				Annual				24-hr				Annual				24-hr				Annual			
		98th-% PM2.5	Annual PM2.5	Max 24-hr PM2.5 (Increment)	Max 24-hr PM2.5 (Total)	% of Criteria	# of Exceedances	Max Annual PM2.5 (Increment)	Max Annual PM2.5 (Total)	% of Criteria	# of Exceedances	Max 24-hr PM2.5 (Increment)	Max 24-hr PM2.5 (Total)	% of Criteria	# of Exceedances	Max Annual PM2.5 (Increment)	Max Annual PM2.5 (Total)	% of Criteria	# of Exceedances	Max 24-hr PM2.5 (Increment)	Max 24-hr PM2.5 (Total)	% of Criteria	# of Exceedances	Max Annual PM2.5 (Increment)	Max Annual PM2.5 (Total)	% of Criteria	# of Exceedances
		(μg/m³)	(μg/m³)	(μg/m³)	(μg/m³)	(%)	DAYS/YR	(μg/m³)	(μg/m³)	(%)	DAYS/YR	(μg/m³)	(μg/m³)	(%)	DAYS/YR	(μg/m³)	(μg/m³)	(%)	DAYS/YR	(μg/m³)	(μg/m³)	(%)	DAYS/YR	(μg/m³)	(μg/m³)	(%)	DAYS/YR
Criteria (μg/m³)		**27**	**8.8**		**27**				**8.8**				**27**				**8.8**				**27**				**8.8**		
Ecological Receptors																											
T2022_D	Location D	19.3	6.0	22.5	**41.8**	**155%**	72	5.2	**11.2**	**127%**	NA	124.2	**143.5**	**531%**	NA	16.9	**22.9**	**261%**	NA	0.6	19.9	74%	NA	0.1	6.1	70%	NA
T2023_D	Location F	19.3	6.0	27.4	**46.7**	**173%**	112	6.7	**12.7**	**145%**	NA	68.9	**88.2**	**327%**	NA	8.9	**14.9**	**169%**	NA	1.0	20.3	75%	NA	0.1	6.1	69%	NA
T2	Lake Ontario Shore	19.3	6.0	5.8	25.1	93%	1	0.9	6.9	78%	NA	14.5	**33.8**	**125%**	NA	1.2	7.2	82%	NA	0.5	19.8	73%	NA	0.02	6.0	68%	NA
T4	Location AB	19.3	6.0	6.7	26.0	96%	2	1.1	7.1	80%	NA	20.2	**39.5**	**146%**	NA	1.9	7.9	89%	NA	0.4	19.7	73%	NA	0.04	6.0	69%	NA
T7	Location C	19.3	6.0	3.8	23.1	85%	1	0.7	6.7	76%	NA	13.2	**32.5**	**120%**	NA	0.9	6.9	79%	NA	0.3	19.6	72%	NA	0.03	6.0	69%	NA
T10	Location E	19.3	6.0	19.9	**39.2**	**145%**	78	3.3	**9.3**	**106%**	NA	85.6	**104.9**	**388%**	NA	8.1	**14.1**	**160%**	NA	1.0	20.3	75%	NA	0.2	6.2	70%	NA
FL_NEW	North/East/West Fenceline	19.3	6.0	22.8	**42.1**	**156%**	3643	0.6	6.6	75%	NA	108.1	**127.4**	**472%**	271	0.8	6.8	77%	NA	1.7	21.0	78%	0	0.02	6.0	68%	0
FL_S	South Fenceline	19.3	6.0	95.0	**114.3**	**423%**	12877	3.3	**9.3**	**106%**	NA	1,994.5	**2,013.8**	**7459%**	307	4.6	**10.6**	**120%**	NA	1.2	20.5	76%	0	0.1	6.1	70%	0
Human Receptors																											
R15_REMP_1	Farm & Harvester	19.3	6.0	4.2	23.5	87%	0	0.6	6.6	75%	0	13.1	**32.4**	**120%**	10	1.0	7.0	80%	NA	0.3	19.6	73%	0	0.02	6.0	68%	0
R17_REMP_2	Rural Resident	19.3	6.0	5.7	25.0	93%	0	0.8	6.8	77%	0	16.8	**36.1**	**134%**	9	1.0	7.0	79%	NA	0.2	19.5	72%	0	0.01	6.0	68%	0
R21_REMP_3	Bowmanville Resident	19.3	6.0	1.9	21.2	78%	0	0.2	6.2	70%	0	6.1	25.4	94%	0	0.2	6.2	71%	NA	0.1	19.4	72%	0	0.004	6.0	68%	0
R22_REMP_4	West/East Beach Resident	19.3	6.0	2.7	22.0	82%	0	0.4	6.4	73%	0	8.4	**27.7**	**103%**	1	0.6	6.6	75%	NA	0.1	19.4	72%	0	0.01	6.0	68%	0
REMP_5	Sport Fisher	19.3	6.0	2.4	21.7	80%	0	0.5	6.5	74%	0	9.2	**28.5**	**106%**	2	0.7	6.7	77%	NA	0.3	19.6	73%	0	0.01	6.0	68%	0
REMP_6	Industrial/Commercial	19.3	6.0	3.2	22.5	83%	0	0.5	6.5	73%	0	11.2	**30.5**	**113%**	2	0.7	6.7	77%	NA	0.3	19.6	72%	0	0.01	6.0	68%	0
REMP_7	Camper	19.3	6.0	1.9	21.2	79%	0	0.3	6.3	71%	0	6.4	25.7	95%	0	0.4	6.4	72%	NA	0.1	19.4	72%	0	0.01	6.0	68%	0
REMP_9	Dairy Farm	19.3	6.0	0.5	19.8	73%	0	0.04	6.0	69%	0	1.8	21.1	78%	0	0.1	6.1	69%	NA	0.04	19.3	72%	0	0.001	6.0	68%	0
Oshawa_res	Oshawa Resident	19.3	6.0	0.6	19.9	74%	0	0.1	6.1	69%	0	3.2	22.5	83%	0	0.1	6.1	69%	NA	0.1	19.4	72%	0	0.002	6.0	68%	0

Notes:

$\mu g/m^3$ – micrograms per cubic meter

Bolding/highlighting indicates an exceedance of the applicable ambient air quality criteria.

Table 2-10: SO_2 Air Modelling Results (All Project Phases)

Receptor ID	Receptor Name	Existing Conditions		Site Preparation (Maximum of Scenarios 1, 2 and 3)								Construction (Maximum of Scenarios 1A, 2A, 1B, 2B , 1C and 2C)								Operation							
		1-Hour	Annual	1-hr				Annual				1-hr				Annual				1-hr				Annual			
		90th-% 1-Hr SO2	Annual SO2	Max 1-hr SO2 (Increment)	Max 1-hr SO2 (Total)	% of Criteria	# of Exceedances	Max Annual SO2 (Increment)	Max Annual SO2 (Total)	% of Criteria	# of Exceedances	Max 1-hr SO2 (Increment)	Max 1-hr SO2 (Total)	% of Criteria	# of Exceedances	Max Annual SO2 (Increment)	Max Annual SO2 (Total)	% of Criteria	# of Exceedances	Max 1-hr SO2 (Increment)	Max 1-hr SO2 (Total)	% of Criteria	# of Exceedances	Max Annual SO2 (Increment)	Max Annual SO2 (Total)	% of Criteria	# of Exceedances
		(µg/m³)	(µg/m³)	(µg/m³)	(µg/m³)	(%)	DAYS/YR	(µg/m³)	(µg/m³)	(%)	DAYS/YR	(µg/m³)	(µg/m³)	(%)	DAYS/YR	(µg/m³)	(µg/m³)	(%)	DAYS/YR	(µg/m³)	(µg/m³)	(%)	DAYS/YR	(µg/m³)	(µg/m³)	(%)	DAYS/YR
Criteria (µg/m³)		**100**	**10**	**100**				**10**				**100**				**10**				**100**				**10**			
Ecological Receptors																											
T2022_D	Location D	3.7	2.6	12.6	16.2	16%	0	0.1	2.73	27%	0	33.5	37.2	37%	NA	45.3	**47.9**	**479%**	NA	0.1	3.8	4%	NA	0.0001	2.62	26%	0
T2023_D	Location F	3.7	2.6	13.4	17.0	17%	0	0.2	2.84	28%	0	49.5	53.1	53%	NA	26.7	**29.3**	**293%**	NA	0.2	3.9	4%	NA	0.0003	2.62	26%	0
T2	Lake Ontario Shore	3.7	2.6	1.5	5.2	5%	0	0.02	2.64	26%	0	4.6	8.3	8%	NA	5.7	8.3	83%	NA	0.1	3.8	4%	NA	0.0001	2.62	26%	0
T4	Location AB	3.7	2.6	2.9	6.6	7%	0	0.03	2.65	26%	0	4.6	8.3	8%	NA	5.6	8.2	82%	NA	0.1	3.8	4%	NA	0.0001	2.62	26%	0
T7	Location C	3.7	2.6	1.4	5.0	5%	0	0.01	2.63	26%	0	2.6	6.3	6%	NA	1.9	4.5	45%	NA	0.1	3.8	4%	NA	0.0001	2.62	26%	0
T10	Location E	3.7	2.6	9.0	12.7	13%	0	0.1	2.71	27%	0	12.3	16.0	16%	NA	23.7	**26.4**	**264%**	NA	0.1	3.8	4%	NA	0.0002	2.62	26%	0
FL_NEW	North/East/West Fenceline	3.7	2.6	9.4	13.1	13%	0	0.01	2.63	26%	0	46.2	49.9	50%	NA	2.4	5.0	50%	NA	0.2	3.8	4%	0	0.00004	2.62	26%	0
FL_S	South Fenceline	3.7	2.6	34.1	37.8	38%	0	0.1	2.72	27%	0	331.3	**335.0**	**335%**	493	12.4	**15.0**	**150%**	NA	0.2	3.9	4%	0	0.0003	2.62	26%	0
Human Receptors																											
R15_REMP_1	Farm & Harvester	3.7	2.6	1.1	4.8	5%	0	0.02	2.64	26%	0	3.5	7.1	7%	NA	3.6	6.2	62%	NA	0.1	3.8	4%	0	0.0001	2.62	26%	0
R17_REMP_2	Rural Resident	3.7	2.6	4.8	8.5	8%	0	0.02	2.64	26%	0	9.2	12.9	13%	NA	2.6	5.2	52%	NA	0.1	3.8	4%	0	0.00003	2.62	26%	0
R21_REMP_3	Bowmanville Resident	3.7	2.6	1.8	5.5	6%	0	0.004	2.62	26%	0	3.0	6.7	7%	NA	0.7	3.3	33%	NA	0.1	3.8	4%	0	0.00002	2.62	26%	0
R22_REMP_4	West/East Beach Resident	3.7	2.6	1.3	5.0	5%	0	0.01	2.63	26%	0	4.7	8.4	8%	NA	1.7	4.3	43%	NA	0.1	3.8	4%	0	0.00004	2.62	26%	0
REMP_5	Sport Fisher	3.7	2.6	0.9	4.6	5%	0	0.01	2.63	26%	0	3.0	6.7	7%	NA	4.3	6.9	69%	NA	0.05	3.7	4%	0	0.0001	2.62	26%	0
REMP_6	Industrial/Commercial	3.7	2.6	0.9	4.6	5%	0	0.01	2.63	26%	0	3.0	6.7	7%	NA	2.7	5.3	53%	NA	0.1	3.8	4%	0	0.0001	2.62	26%	0
REMP_7	Camper	3.7	2.6	0.6	4.3	4%	0	0.01	2.63	26%	0	2.2	5.9	6%	NA	1.5	4.1	41%	NA	0.1	3.7	4%	0	0.00004	2.62	26%	0
REMP_9	Dairy Farm	3.7	2.6	0.5	4.2	4%	0	0.001	2.62	26%	0	1.0	4.7	5%	NA	0.2	2.8	28%	NA	0.11	3.8	4%	0	0.00001	2.62	26%	0
Oshawa_res	Oshawa Resident	3.7	2.6	0.6	4.3	4%	0	0.001	2.62	26%	0	1.4	5.1	5%	NA	0.3	2.9	29%	NA	0.1	3.8	4%	0	0.00002	2.62	26%	0

Notes:
µg/m³ – micrograms per cubic meter
Bolding/highlighting indicates an exceedance of the applicable ambient air quality criteria.

Table 2-11: NO_2 Air Modelling Results (Site Preparation)

Receptor ID	Receptor Name	Existing Conditions				Site Preparation (Maximum of Scenarios 1, 2 and 3)															
		1-Hour		24-Hour	Annual	1-hr (a)				1-hr (b)				24-hr				Annual			
		90th-% 1-Hr NO2	98th-% 1-Hr NO2	90th-% 24-hr NO2	50th-% Annual NO2	98th-% 1-hr NO2 (Increment)	98th-% 1-hr NO2 (Total)	% of Criteria	# of Exceedances	Max 1-hr NO2 (Increment)	Max 1-hr NO2 (Total)	% of Criteria	# of Exceedances	Max 24-hr NO2 (Increment)	Max 24-hr NO2 (Total)	% of Criteria	# of Exceedances	Max Annual NO2 (Increment)	Max Annual NO2 (Total)	% of Criteria	# of Exceedances
		(μg/m³)	(μg/m³)	(μg/m³)	(μg/m³)	(μg/m³)	(μg/m³)	(%)	DAYS/YR	(μg/m³)	(μg/m³)	(%)	HRS/YR	(μg/m³)	(μg/m³)	(%)	DAYS/YR	(μg/m³)	(μg/m³)	(%)	DAYS/YR
Criteria (μg/m³)		**79**	**79**	**200**	**23**	**79**				**400**				**200**				**23**			
Ecological Receptors																					
T2022_D	Location D	22.4	38.5	19.0	7.1	550.7	**589.1**	**746%**	NA	5,294.8	**5,317.2**	**1329%**	NA	706.4	**725.4**	**363%**	NA	96.1	**103.28**	**449%**	NA
T2023_D	Location F	22.4	38.5	19.0	7.1	1,207.3	**1,245.7**	**1577%**	NA	5,612.7	**5,635.1**	**1409%**	NA	873.3	**892.3**	**446%**	NA	117.8	**124.92**	**543%**	NA
T2	Lake Ontario Shore	22.4	38.5	19.0	7.1	292.4	**330.9**	**419%**	NA	712.1	**734.5**	**184%**	NA	230.9	**249.9**	**125%**	NA	19.68	**26.82**	**117%**	NA
T4	Location AB	22.4	38.5	19.0	7.1	260.0	**298.5**	**378%**	NA	1,276.9	**1,299.3**	**325%**	NA	250.1	**269.1**	**135%**	NA	19.85	**26.99**	**117%**	NA
T7	Location C	22.4	38.5	19.0	7.1	212.8	**251.2**	**318%**	NA	642.1	**664.4**	**166%**	NA	172.3	191.3	96%	NA	15.12	22.27	97%	NA
T10	Location E	22.4	38.5	19.0	7.1	758.3	**796.8**	**1009%**	NA	3,778.4	**3,800.8**	**950%**	NA	773.2	**792.2**	**396%**	NA	90.9	**98.00**	**426%**	NA
FL_NEW	North/East/West Fenceline	22.4	38.5	19.0	7.1	769.4	**807.9**	**1023%**	NA	3,918.7	**3,941.1**	**985%**	448	694.3	**713.3**	**357%**	83	109.37	**116.52**	**507%**	NA
FL_S	South Fenceline	22.4	38.5	19.0	7.1	4,696.4	**4,734.9**	**5994%**	NA	14,256.3	**14,278.7**	**3570%**	2846	3,151.5	**3,170.5**	**1585%**	298	477.1	**484.20**	**2105%**	NA
Human Receptors																					
R15_REMP_1	Farm & Harvester	22.4	38.5	19.0	7.1	206.3	**244.7**	**310%**	NA	546.2	**568.6**	**142%**	46	156.1	175.1	88%	0	12.33	19.47	85%	NA
R17_REMP_2	Rural Resident	22.4	38.5	19.0	7.1	75.0	**113.5**	**144%**	NA	2,042.6	**2,065.0**	**516%**	42	231.9	**250.9**	**125%**	2	10.17	17.31	75%	NA
R21_REMP_3	Bowmanville Resident	22.4	38.5	19.0	7.1	23.8	62.3	79%	NA	834.3	**856.7**	**214%**	18	96.5	115.5	58%	0	2.896	10.04	44%	NA
R22_REMP_4	West/East Beach Resident	22.4	38.5	19.0	7.1	91.7	**130.1**	**165%**	NA	609.8	**632.1**	**158%**	24	114.3	133.3	67%	0	5.44	12.59	55%	NA
REMP_5	Sport Fisher	22.4	38.5	19.0	7.1	138.2	**176.7**	**224%**	NA	442.1	**464.5**	**116%**	6	122.0	141.0	71%	0	10.87	18.01	78%	NA
REMP_6	Industrial/Commercial	22.4	38.5	19.0	7.1	179.3	**217.7**	**276%**	NA	458.2	**480.6**	**120%**	10	127.4	146.4	73%	0	8.92	16.06	70%	NA
REMP_7	Camper	22.4	38.5	19.0	7.1	106.2	**144.6**	**183%**	NA	325.3	347.7	87%	0	79.2	98.2	49%	0	4.48	11.63	51%	NA
REMP_9	Dairy Farm	22.4	38.5	19.0	7.1	3.6	42.0	53%	NA	299.8	322.1	81%	0	35.9	54.9	27%	0	0.687	7.83	34%	NA
Oshawa_res	Oshawa Resident	22.4	38.5	19.0	7.1	10.3	48.8	62%	NA	330.5	352.9	88%	0	33.7	52.6	26%	0	0.951	8.09	35%	NA

Notes:

(a) Sum of 98th percentile 1-hour concentration (existing condition) and 98th percentile 1-hour concentration (Project increment).
(b) Sum of 90th percentile 1-hour concentration (existing condition) and maximum 1-hour concentration (Project increment).
μg/m³ – micrograms per cubic meter
Bolding/highlighting indicates an exceedance of the applicable ambient air quality criteria.

Table 2-12: NO_2 Air Modelling Results (Construction)

Receptor ID	Receptor Name	Existing Conditions				Construction (Maximum of Scenarios 1A, 2A, 1B, 2B , 1C and 2C)															
		1-Hour		24-Hour	Annual	1-hr (a)				1-hr (b)				24-hr				Annual			
		90th-% 1-Hr NO2	98th-% 1-Hr NO2	90th-% 24-hr NO2	50th-% Annual NO2	98th-% 1-hr NO2 (Increment)	98th-% 1-hr NO2 (Total)	% of Criteria	# of Exceedances	Max 1-hr NO2 (Increment)	Max 1-hr NO2 (Total)	% of Criteria	# of Exceedances	Max 24-hr NO2 (Increment)	Max 24-hr NO2 (Total)	% of Criteria	# of Exceedances	Max Annual NO2 (Increment)	Max Annual NO2 (Total)	% of Criteria	# of Exceedances
		(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/m^3)	(%)	DAYS/YR	(µg/m^3)	(µg/m^3)	(%)	HRS/YR	(µg/m^3)	(µg/m^3)	(%)	DAYS/YR	(µg/m^3)	(µg/m^3)	(%)	DAYS/YR
Criteria (µg/m^3)		**79**	**79**	**200**	**23**		**79**				**400**				**200**				**23**		
Ecological Receptors																					
T2022_D	Location D	22.4	38.5	19.0	7.1	1,353.1	**1,391.6**	**1761%**	NA	6,826.1	**6,848.5**	**1712%**	NA	1,071.0	**1,090.0**	**545%**	NA	166.7	**173.9**	**756%**	NA
T2023_D	Location F	22.4	38.5	19.0	7.1	1,003.3	**1,041.8**	**1319%**	NA	3,814.1	**3,836.4**	**959%**	NA	684.9	**703.8**	**352%**	NA	152.3	**159.4**	**693%**	NA
T2	Lake Ontario Shore	22.4	38.5	19.0	7.1	254.3	**292.8**	**371%**	NA	902.5	**924.8**	**231%**	NA	207.3	**226.3**	**113%**	NA	19.5	**26.6**	**116%**	NA
T4	Location AB	22.4	38.5	19.0	7.1	279.7	**318.2**	**403%**	NA	945.0	**967.3**	**242%**	NA	238.2	**257.2**	**129%**	NA	22.2	**29.3**	**128%**	NA
T7	Location C	22.4	38.5	19.0	7.1	124.6	**163.0**	**206%**	NA	549.5	**571.8**	**143%**	NA	114.1	133.1	67%	NA	7.9	15.0	65%	NA
T10	Location E	22.4	38.5	19.0	7.1	835.4	**873.8**	**1106%**	NA	2,419.2	**2,441.6**	**610%**	NA	684.7	**703.7**	**352%**	NA	92.4	**99.5**	**433%**	NA
FL_NEW	North/East/West Fenceline	22.4	38.5	19.0	7.1	632.8	**671.3**	**850%**	NA	5,498.7	**5,521.1**	**1380%**	437	624.8	**643.7**	**322%**	85	117.5	**124.6**	**542%**	NA
FL_S	South Fenceline	22.4	38.5	19.0	7.1	44,994.0	**45,032.5**	**57003%**	NA	67,695.5	**67,717.9**	**16929%**	7168	28,117.7	**28,136.6**	**14068%**	362	5,759.0	**5,766.1**	**25070%**	NA
Human Receptors																					
R15_REMP_1	Farm & Harvester	22.4	38.5	19.0	7.1	228.5	**267.0**	**338%**	NA	642.9	**665.3**	**166%**	71	158.6	177.6	89%	0	14.5	21.7	94%	NA
R17_REMP_2	Rural Resident	22.4	38.5	19.0	7.1	66.0	**104.5**	**132%**	NA	1,549.7	**1,572.1**	**393%**	34	165.6	184.6	92%	0	11.3	18.4	80%	NA
R21_REMP_3	Bowmanville Resident	22.4	38.5	19.0	7.1	16.9	55.4	70%	NA	667.8	**690.1**	**173%**	12	97.3	116.3	58%	0	2.8	10.0	43%	NA
R22_REMP_4	West/East Beach Resident	22.4	38.5	19.0	7.1	62.6	**101.1**	**128%**	NA	820.1	**842.4**	**211%**	29	111.6	130.6	65%	0	7.2	14.4	63%	NA
REMP_5	Sport Fisher	22.4	38.5	19.0	7.1	160.9	**199.4**	**252%**	NA	498.0	**520.3**	**130%**	10	151.2	170.2	85%	0	12.0	19.1	83%	NA
REMP_6	Industrial/Commercial	22.4	38.5	19.0	7.1	203.1	**241.5**	**306%**	NA	582.0	**604.4**	**151%**	49	156.8	175.7	88%	0	11.0	18.2	79%	NA
REMP_7	Camper	22.4	38.5	19.0	7.1	106.6	**145.1**	**184%**	NA	426.8	**449.1**	**112%**	1	96.4	115.4	58%	0	5.5	12.7	55%	NA
REMP_9	Dairy Farm	22.4	38.5	19.0	7.1	1.7	40.2	51%	NA	245.2	267.6	67%	0	27.3	46.3	23%	NA	0.8	7.9	34%	NA
Oshawa_res	Oshawa Resident	22.4	38.5	19.0	7.1	5.6	44.1	56%	NA	301.7	324.0	81%	0	42.9	61.8	31%	0	1.0	8.2	35%	NA

Notes:
(a) Sum of 98th percentile 1-hour concentration (existing condition) and 98th percentile 1-hour concentration (Project increment).
(b) Sum of 90th percentile 1-hour concentration (existing condition) and maximum 1-hour concentration (Project increment).
µg/m^3 – micrograms per cubic meter
Bolding/highlighting indicates an exceedance of the applicable ambient air quality criteria.

Table 2-13: NO_2 Air Modelling Results (Operation)

Receptor ID	Receptor Name	Existing Conditions				Operation															
		1-Hour		24-Hour	Annual	1-hr (a)				1-hr (b)				24-hr				Annual			
		90th-% 1-Hr NO2	98th-% 1-Hr NO2	90th-% 24-hr NO2	50th-% Annual NO2	98th-% 1-hr NO2 (Increment)	98th-% 1-hr NO2 (Total)	% of Criteria	# of Exceedances	Max 1-hr NO2 (Increment)	Max 1-hr NO2 (Total)	% of Criteria	# of Exceedances	Max 24-hr NO2 (Increment)	Max 24-hr NO2 (Total)	% of Criteria	# of Exceedances	Max Annual NO2 (Increment)	Max Annual NO2 (Total)	% of Criteria	# of Exceedances
		(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/m^3)	(%)	DAYS/YR	(µg/m^3)	(µg/m^3)	(%)	HRS/YR	(µg/m^3)	(µg/m^3)	(%)	DAYS/YR	(µg/m^3)	(µg/m^3)	(%)	DAYS/YR
Criteria (µg/m^3)		**79**	**79**	**200**	**23**		**79**				**400**				**200**				**23**		
Ecological Receptors																					
T2022_D	Location D	22.4	38.5	19.0	7.1	48.4	**86.9**	**110%**	NA	618.6	**641.0**	**160%**	NA	90.7	109.7	55%	NA	0.14	7.28	32%	NA
T2023_D	Location F	22.4	38.5	19.0	7.1	280.7	**319.2**	**404%**	NA	415.8	**438.2**	**110%**	NA	150.5	169.5	85%	NA	0.45	7.60	33%	NA
T2	Lake Ontario Shore	22.4	38.5	19.0	7.1	143.8	**182.2**	**231%**	NA	266.6	289.0	72%	NA	85.0	104.0	52%	NA	0.11	7.26	32%	NA
T4	Location AB	22.4	38.5	19.0	7.1	61.2	**99.7**	**126%**	NA	286.8	309.2	77%	NA	68.5	87.5	44%	NA	0.11	7.26	32%	NA
T7	Location C	22.4	38.5	19.0	7.1	23.2	61.6	78%	NA	320.9	343.3	86%	NA	59.0	78.0	39%	NA	0.09	7.24	31%	NA
T10	Location E	22.4	38.5	19.0	7.1	111.8	**150.2**	**190%**	NA	317.6	340.0	85%	NA	107.2	126.2	63%	NA	0.20	7.35	32%	NA
FL_NEW	North/East/West Fenceline	22.4	38.5	19.0	7.1	128.8	**167.3**	**212%**	NA	493.0	**515.4**	**129%**	10	101.8	120.8	60%	0	0.45	7.59	33%	NA
FL_S	South Fenceline	22.4	38.5	19.0	7.1	286.1	**324.5**	**411%**	NA	449.6	**472.0**	**118%**	37	186.6	**205.6**	**103%**	1	0.59	7.73	34%	NA
Human Receptors																					
R15_REMP_1	Farm & Harvester	22.4	38.5	19.0	7.1	63.8	**102.3**	**129%**	NA	257.0	279.3	70%	0	65.6	84.6	42%	0	0.10	7.25	32%	NA
R17_REMP_2	Rural Resident	22.4	38.5	19.0	7.1	8.9	47.4	60%	NA	328.9	351.3	88%	0	34.2	53.1	27%	0	0.05	7.20	31%	NA
R21_REMP_3	Bowmanville Resident	22.4	38.5	19.0	7.1	4.4	42.9	54%	NA	328.8	351.2	88%	0	34.8	53.8	27%	0	0.04	7.18	31%	NA
R22_REMP_4	West/East Beach Resident	22.4	38.5	19.0	7.1	17.7	56.1	71%	NA	277.8	300.2	75%	0	25.9	44.9	22%	0	0.07	7.22	31%	NA
REMP_5	Sport Fisher	22.4	38.5	19.0	7.1	88.64	**127.1**	**161%**	NA	285.0	307.3	77%	0	74.4	93.4	47%	0	0.09	7.24	31%	NA
REMP_6	Industrial/Commercial	22.4	38.5	19.0	7.1	48.1	**86.6**	**110%**	NA	240.8	263.2	66%	0	41.9	60.9	30%	0	0.09	7.24	31%	NA
REMP_7	Camper	22.4	38.5	19.0	7.1	23.6	62.0	79%	NA	152.6	174.9	44%	0	20.6	39.6	20%	0	0.07	7.21	31%	NA
REMP_9	Dairy Farm	22.4	38.5	19.0	7.1	2.43	40.9	52%	NA	161.8	184.1	46%	0	10.9	29.9	15%	0	0.03	7.17	31%	NA
Oshawa_res	Oshawa Resident	22.4	38.5	19.0	7.1	4.0	42.4	54%	NA	168.7	191.1	48%	0	10.5	29.5	15%	0	0.04	7.18	31%	NA

Notes:
(a) Sum of 98th percentile 1-hour concentration (existing condition) and 98th percentile 1-hour concentration (Project increment).
(b) Sum of 90th percentile 1-hour concentration (existing condition) and maximum 1-hour concentration (Project increment).
µg/m^3 – micrograms per cubic meter
Bolding/highlighting indicates an exceedance of the applicable ambient air quality criteria.

Table 2-14: CO Air Modelling Results (All Project Phases)

Receptor ID	Receptor Name	Existing Conditions		Site Preparation (Maximum of Scenarios 1, 2 and 3)								Construction (Maximum of Scenarios 1A, 2A, 1B, 2B , 1C and 2C)								Operation							
		1-Hour	8-Hour	1-hr				8-hr				1-hr				8-hr				1-hr				8-hr			
		90th-% 1-Hr CO	90th-% 8-Hr CO	Max 1-hr CO (Increment)	Max 1-hr CO (Total)	% of Criteria	# of Exceedances	Max 8-hr CO (Increment)	Max 8-hr CO (Total)	% of Criteria	# of Exceedances	Max 1-hr CO (Increment)	Max 1-hr CO (Total)	% of Criteria	# of Exceedances	Max 8-hr CO (Increment)	Max 8-hr CO (Total)	% of Criteria	# of Exceedances	Max 1-hr CO (Increment)	Max 1-hr CO (Total)	% of Criteria	# of Exceedances	Max 8-hr CO (Increment)	Max 8-hr CO (Total)	% of Criteria	# of Exceedances
		(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/m^3)	(%)	HRS/YR	(µg/m^3)	(µg/m^3)	(%)	8 HRS/YR	(µg/m^3)	(µg/m^3)	(%)	HRS/YR	(µg/m^3)	(µg/m^3)	(%)	8 HRS/YR	(µg/m^3)	(µg/m^3)	(%)	HRS/YR	(µg/m^3)	(µg/m^3)	(%)	8 HRS/YR
Criteria (µg/m^3)		**36,200**	**15,700**	**36,200**				**15,700**				**36,200**				**15,700**				**36,200**				**15,700**			
Ecological Receptors																											
T2022_D	Location D	448.5	432.7	3,615.3	4,063.8	11%	NA	1,375.2	1,807.90	12%	NA	4,490.4	4,938.9	14%	NA	1,833.1	2,265.8	14%	NA	19.8	468.3	1%	NA	7.6	440.3	3%	NA
T2023_D	Location F	448.5	432.7	4,054.1	4,502.6	12%	NA	1,299.3	1,732.03	11%	NA	2,735.8	3,184.3	9%	NA	881.9	1,314.6	8%	NA	19.3	467.8	1%	NA	12.8	445.5	3%	NA
T2	Lake Ontario Shore	448.5	432.7	463.0	911.5	3%	NA	213.01	645.71	4%	NA	598.5	1,047.0	3%	NA	208.4	641.1	4%	NA	9.8	458.3	1%	NA	3.1	435.8	3%	NA
T4	Location AB	448.5	432.7	887.8	1,336.3	4%	NA	295.86	728.56	5%	NA	709.1	1,157.6	3%	NA	285.8	718.5	5%	NA	11.7	460.2	1%	NA	3.5	436.2	3%	NA
T7	Location C	448.5	432.7	408.1	856.6	2%	NA	140.08	572.78	4%	NA	341.1	789.6	2%	NA	91.4	524.1	3%	NA	13.3	461.8	1%	NA	4.5	437.2	3%	NA
T10	Location E	448.5	432.7	2,742.5	3,191.0	9%	NA	1,120.9	1,553.61	10%	NA	2,120.0	2,568.5	7%	NA	777.2	1,209.9	8%	NA	16.8	465.3	1%	NA	10.0	442.7	3%	NA
FL_NEW	North/East/West Fenceline	448.5	432.7	2,847.2	3,295.7	9%	NA	1,000.20	1,432.90	9%	NA	3,648.8	4,097.3	11%	NA	878.5	1,311.2	8%	NA	101.0	549.5	2%	NA	30.1	462.8	3%	NA
FL_S	South Fenceline	448.5	432.7	10,383.5	10,832.0	30%	NA	4,782.0	5,214.73	33%	NA	48,775.0	**49,223.5**	**136%**	NA	35,624.2	**36,056.9**	**230%**	NA	19.9	468.4	1%	NA	13.5	446.2	3%	NA
Human Receptors																											
R15_REMP_1	Farm & Harvester	448.5	432.7	346.7	795.2	2%	NA	152.1	584.8	4%	NA	419.8	868.3	2%	NA	155.9	588.6	4%	NA	8.9	457.4	1%	NA	3.0	435.7	3%	NA
R17_REMP_2	Rural Resident	448.5	432.7	1,438.6	1,887.1	5%	NA	322.3	755.0	5%	NA	1,057.8	1,506.3	4%	NA	202.8	635.5	4%	NA	10.5	459.0	1%	NA	2.8	435.5	3%	NA
R21_REMP_3	Bowmanville Resident	448.5	432.7	558.1	1,006.6	3%	NA	79.7	512.4	3%	NA	423.5	872.0	2%	NA	82.1	514.8	3%	NA	9.1	457.6	1%	NA	2.0	434.7	3%	NA
R22_REMP_4	West/East Beach Resident	448.5	432.7	384.9	833.4	2%	NA	122.6	555.3	4%	NA	549.7	998.2	3%	NA	118.9	551.6	4%	NA	10.8	459.3	1%	NA	2.8	435.5	3%	NA
REMP_5	Sport Fisher	448.5	432.7	262.6	711.1	2%	NA	100.5	533.2	3%	NA	297.1	745.6	2%	NA	127.9	560.6	4%	NA	4.10	452.6	1%	NA	2.8	435.5	3%	NA
REMP_6	Industrial/Commercial	448.5	432.7	280.3	728.8	2%	NA	101.7	534.4	3%	NA	353.9	802.4	2%	NA	116.7	549.4	3%	NA	8.4	456.9	1%	NA	2.3	435.0	3%	NA
REMP_7	Camper	448.5	432.7	180.5	629.0	2%	NA	63.5	496.2	3%	NA	249.5	698.0	2%	NA	74.2	506.9	3%	NA	6.1	454.6	1%	NA	1.8	434.5	3%	NA
REMP_9	Dairy Farm	448.5	432.7	163.7	612.2	2%	NA	40.0	472.7	3%	NA	117.8	566.3	2%	NA	28.6	461.3	3%	NA	10.97	459.5	1%	NA	2.5	435.2	3%	NA
Oshawa_res	Oshawa Resident	448.5	432.7	185.4	633.9	2%	NA	32.8	465.5	3%	NA	162.9	611.4	2%	NA	32.3	465.0	3%	NA	9.7	458.2	1%	NA	2.0	434.7	3%	NA

Notes:

µg/m^3 – micrograms per cubic meter

Bolding/highlighting indicates an exceedance of the applicable ambient air quality criteria.

Table 2-15: Acrolein Air Modelling Results (All Project Phases)

Receptor ID	Receptor Name	Existing Conditions		Site Preparation (Maximum of Scenarios 1, 2 and 3)								Construction (Maximum of Scenarios 1A, 2A, 1B, 2B , 1C and 2C)								Operation							
		1-Hour	24-Hour	1-hr				24-hr				1-hr				24-hr				1-hr				24-hr			
		90th-% 1-Hr Acrolein	Mean 24-hr Acrolein	Max 1-hr Acrolein (Increment)	Max 1-hr Acrolein (Total)	% of Criteria	# of Exceedances	Max 24-hr Acrolein (Increment)	Max 24-hr Acrolein (Total)	% of Criteria	# of Exceedances	Max 1-hr Acrolein (Increment)	Max 1-hr Acrolein (Total)	% of Criteria	# of Exceedances	Max 24-hr Acrolein (Increment)	Max 24-hr Acrolein (Total)	% of Criteria	# of Exceedances	Max 1-hr Acrolein (Increment)	Max 1-hr Acrolein (Total)	% of Criteria	# of Exceedances	Max 24-hr Acrolein (Increment)	Max 24-hr Acrolein (Total)	% of Criteria	# of Exceedances
		(μg/m³)	(μg/m³)	(μg/m³)	(μg/m³)	(%)	HRS/YR	(μg/m³)	(μg/m³)	(%)	DAYS/YR	(μg/m³)	(μg/m³)	(%)	HRS/YR	(μg/m³)	(μg/m³)	(%)	DAYS/YR	(μg/m³)	(μg/m³)	(%)	HRS/YR	(μg/m³)	(μg/m³)	(%)	DAYS/YR
Criteria (μg/m³)		**4.5**	**0.4**	**4.5**				**0.4**				**4.5**				**0.4**				**4.5**				**0.4**			
Ecological Receptors																											
T2022_D	Location D	0.0	0.0	11.0	**11.0**	**243%**	NA	1.4	**1.35**	**338%**	NA	16.7	**16.7**	**371%**	NA	2.50	**2.50**	**626%**	NA	0.0008	0.0008	0.02%	NA	0.00017	0.00017	0.04%	NA
T2023_D	Location F	0.0	0.0	11.0	**11.0**	**261%**	NA	1.5	**1.46**	**364%**	NA	10.2	**11.7**	**261%**	NA	1.40	**1.40**	**350%**	NA	0.0013	0.0013	0.03%	NA	0.00040	0.00040	0.10%	NA
T2	Lake Ontario Shore	0.0	0.0	1.5	1.5	32%	NA	0.36	0.36	90%	NA	2.2	2.2	50%	NA	0.31	0.31	77%	NA	0.0006	0.0006	0.01%	NA	0.00010	0.00010	0.03%	NA
T4	Location AB	0.0	0.0	2.8	2.8	62%	NA	0.37	0.37	92%	NA	2.1	2.1	47%	NA	0.41	**0.41**	**102%**	NA	0.0007	0.0007	0.02%	NA	0.00011	0.00011	0.03%	NA
T7	Location C	0.0	0.0	1.1	1.1	24%	NA	0.24	0.24	59%	NA	1.1	1.1	25%	NA	0.14	0.14	34%	NA	0.0008	0.0008	0.02%	NA	0.00009	0.00009	0.02%	NA
T10	Location E	0.0	0.0	8.6	**8.6**	**191%**	NA	1.6	**1.61**	**403%**	NA	5.8	**5.8**	**128%**	NA	1.52	**1.52**	**379%**	NA	0.0007	0.0007	0.02%	NA	0.00020	0.00020	0.05%	NA
FL_NEW	North/East/West Fenceline	0.0	0.0	9.1	**9.1**	**203%**	NA	1.48	**1.48**	**370%**	NA	13.9	**13.9**	**308%**	19	1.34	**1.34**	**335%**	27	0.0038	0.0038	0.09%	0	0.00050	0.00050	0.13%	0
FL_S	South Fenceline	0.0	0.0	28.3	**28.3**	**628%**	NA	6.2	**6.15**	**1538%**	NA	183.4	**183.4**	**4076%**	5624	76.1	**76.1**	**19016%**	351	0.0013	0.0013	0.03%	0	0.00069	0.00069	0.17%	0
Human Receptors																											
R15_REMP_1	Farm & Harvester	0.0	0.0	1.1	1.1	24%	NA	0.16	0.16	39%	NA	1.4	1.4	31%	NA	0.21	0.21	53%	NA	0.0005	0.0005	0.01%	NA	0.00010	0.00010	0.03%	NA
R17_REMP_2	Rural Resident	0.0	0.0	3.8	3.8	83%	NA	0.31	0.31	76%	NA	3.5	3.5	78%	NA	0.23	0.23	58%	NA	0.0006	0.0006	0.01%	NA	0.00006	0.00006	0.02%	NA
R21_REMP_3	Bowmanville Resident	0.0	0.0	1.4	1.4	31%	NA	0.089	0.09	22%	NA	1.5	1.5	32%	NA	0.12	0.12	29%	NA	0.0005	0.0005	0.01%	NA	0.00006	0.00006	0.02%	NA
R22_REMP_4	West/East Beach Resident	0.0	0.0	1.1	1.1	25%	NA	0.11	0.11	27%	NA	1.9	1.9	41%	NA	0.14	0.14	34%	NA	0.0006	0.0006	0.01%	NA	0.00007	0.00007	0.02%	NA
REMP_5	Sport Fisher	0.0	0.0	0.8	0.8	18%	NA	0.14	0.14	34%	NA	1.1	1.1	24%	NA	0.21	0.21	52%	NA	0.0003	0.0003	0.01%	NA	0.00012	0.00012	0.03%	NA
REMP_6	Industrial/Commercial	0.0	0.0	0.9	0.9	19%	NA	0.13	0.13	32%	NA	1.3	1.3	28%	NA	0.20	0.20	49%	NA	0.0005	0.0005	0.01%	NA	0.00011	0.00011	0.03%	NA
REMP_7	Camper	0.0	0.0	0.6	0.6	12%	NA	0.08	0.08	19%	NA	0.9	0.9	19%	NA	0.11	0.11	29%	NA	0.0004	0.0004	0.01%	NA	0.00006	0.00006	0.02%	NA
REMP_9	Dairy Farm	0.0	0.0	0.4	0.4	9%	NA	0.032	0.03	8%	NA	0.4	0.4	9%	NA	0.03	0.03	8%	NA	0.0006	0.0006	0.01%	NA	0.00004	0.00004	0.01%	NA
Oshawa_res	Oshawa Resident	0.0	0.0	0.5	0.5	10%	NA	0.031	0.03	8%	NA	0.6	0.6	12%	NA	0.05	0.05	13%	NA	0.0005	0.0005	0.01%	NA	0.00004	0.00004	0.01%	NA

Notes:

μg/m³ – micrograms per cubic meter

Bolding/highlighting indicates an exceedance of the applicable ambient air quality criteria.

Table 2-16: Benzo(a)pyrene (BaP) Air Modelling Results (All Project Phases)

Receptor ID	Receptor Name	Existing Conditions		Site Preparation (Maximum of Scenarios 1, 2 and 3)								Construction (Maximum of Scenarios 1A, 2A, 1B, 2B , 1C and 2C)								Operation							
		24-Hour	Annual	24-hr				Annual				24-hr				Annual				24-hr				Annual			
		24-hr BaP	Annual BaP	Max 24-hr BaP (Increment)	Max 24-hr BaP (Total)	% of Criteria	# of Exceedances	Max Annual BaP (Increment)	Max Annual BaP (Total)	% of Criteria	# of Exceedances	Max 24-hr BaP (Increment)	Max 24-hr BaP (Total)	% of Criteria	# of Exceedances	Max Annual BaP (Increment)	Max Annual BaP (Total)	% of Criteria	# of Exceedances	Max 24-hr BaP (Increment)	Max 24-hr BaP (Total)	% of Criteria	# of Exceedances	Max Annual BaP (Increment)	Max Annual BaP (Total)	% of Criteria	# of Exceedances
		(μg/m^3)	(μg/m^3)	(μg/m^3)	(μg/m^3)	(%)	DAYS/YR	(μg/m^3)	(μg/m^3)	(%)	DAYS/YR	(μg/m^3)	(μg/m^3)	(%)	DAYS/YR	(μg/m^3)	(μg/m^3)	(%)	DAYS/YR	(μg/m^3)	(μg/m^3)	(%)	DAYS/YR	(μg/m^3)	(μg/m^3)	(%)	DAYS/YR
Criteria (μg/m^3)		**5.00E-05**	**1.00E-05**	**5.00E-05**				**1.00E-05**				**5.00E-05**				**1.00E-05**				**5.00E-05**				**1.00E-05**			
Ecological Receptors																											
T2022_D	Location D	3.58E-05	**3.01E-05**	2.03E-03	**2.07E-03**	**4138%**	NA	1.54E-04	**1.84E-04**	**1839%**	NA	4.83E-06	4.06E-05	81%	NA	6.43E-07	**3.07E-05**	**307%**	NA	2.51E-05	**6.09E-05**	**122%**	NA	3.73E-06	**3.38E-05**	**338%**	NA
T2023_D	Location F	3.58E-05	**3.01E-05**	2.63E-03	**2.67E-03**	**5339%**	NA	2.89E-04	**3.19E-04**	**3191%**	NA	3.10E-06	3.89E-05	78%	NA	5.19E-07	**3.06E-05**	**306%**	NA	2.98E-05	**6.56E-05**	**131%**	NA	2.03E-06	**3.21E-05**	**321%**	NA
T2	Lake Ontario Shore	3.58E-05	**3.01E-05**	5.24E-04	**5.59E-04**	**1119%**	NA	3.28E-05	**6.29E-05**	**629%**	NA	6.92E-07	3.65E-05	73%	NA	5.45E-08	**3.02E-05**	**302%**	NA	1.87E-05	**5.45E-05**	**109%**	NA	7.24E-07	**3.08E-05**	**308%**	NA
T4	Location AB	3.58E-05	**3.01E-05**	5.88E-04	**6.24E-04**	**1247%**	NA	3.64E-05	**6.65E-05**	**665%**	NA	8.04E-07	3.66E-05	73%	NA	7.16E-08	**3.02E-05**	**302%**	NA	1.82E-05	**5.40E-05**	**108%**	NA	1.12E-06	**3.12E-05**	**312%**	NA
T7	Location C	3.58E-05	**3.01E-05**	3.27E-04	**3.63E-04**	**726%**	NA	2.44E-05	**5.45E-05**	**545%**	NA	6.36E-07	3.64E-05	73%	NA	4.31E-08	**3.01E-05**	**301%**	NA	1.64E-05	**5.22E-05**	**104%**	NA	9.81E-07	**3.11E-05**	**311%**	NA
T10	Location E	3.58E-05	**3.01E-05**	2.24E-03	**2.27E-03**	**4549%**	NA	1.45E-04	**1.75E-04**	**1751%**	NA	3.16E-06	3.90E-05	78%	NA	3.34E-07	**3.04E-05**	**304%**	NA	4.05E-05	**7.63E-05**	**153%**	NA	5.67E-06	**3.58E-05**	**358%**	NA
FL_NEW	North/East/West Fenceline	3.58E-05	**3.01E-05**	2.01E-03	**2.05E-03**	**4098%**	348	1.90E-05	**4.91E-05**	**491%**	NA	2.54E-06	3.83E-05	77%	NA	3.00E-08	**3.01E-05**	**301%**	NA	8.93E-05	**1.25E-04**	**250%**	109	4.81E-07	**3.06E-05**	**306%**	NA
FL_S	South Fenceline	3.58E-05	**3.01E-05**	9.77E-03	**9.81E-03**	**19616%**	355	1.39E-04	**1.69E-04**	**1689%**	NA	8.67E-05	**1.23E-04**	**245%**	NA	1.44E-07	**3.02E-05**	**302%**	NA	3.94E-05	**7.52E-05**	**150%**	64	3.44E-06	**3.35E-05**	**335%**	NA
Human Receptors																											
R15_REMP_1	Farm & Harvester	3.58E-05	**3.01E-05**	2.80E-04	**3.16E-04**	**631%**	153	2.14E-05	**5.15E-05**	**515%**	NA	4.85E-07	3.63E-05	73%	NA	4.14E-08	**3.01E-05**	**301%**	NA	1.43E-05	**5.01E-05**	**100%**	1	5.58E-07	**3.07E-05**	**307%**	NA
R17_REMP_2	Rural Resident	3.58E-05	**3.01E-05**	5.28E-04	**5.64E-04**	**1127%**	168	2.24E-05	**5.25E-05**	**525%**	NA	5.43E-07	3.63E-05	73%	NA	3.17E-08	**3.01E-05**	**301%**	NA	7.56E-06	4.34E-05	87%	0	4.18E-07	**3.05E-05**	**305%**	NA
R21_REMP_3	Bowmanville Resident	3.58E-05	**3.01E-05**	1.59E-04	**1.94E-04**	**389%**	39	5.92E-06	**3.60E-05**	**360%**	NA	2.35E-07	3.60E-05	72%	NA	8.53E-09	**3.01E-05**	**301%**	NA	6.37E-06	4.22E-05	84%	0	1.24E-07	**3.02E-05**	**302%**	NA
R22_REMP_4	West/East Beach Resident	3.58E-05	**3.01E-05**	1.88E-04	**2.23E-04**	**447%**	140	1.39E-05	**4.40E-05**	**440%**	NA	3.35E-07	3.61E-05	72%	NA	1.95E-08	**3.01E-05**	**301%**	NA	6.48E-06	4.23E-05	85%	0	2.46E-07	**3.03E-05**	**303%**	NA
REMP_5	Sport Fisher	3.58E-05	**3.01E-05**	1.95E-04	**2.30E-04**	**461%**	190	1.74E-05	**4.75E-05**	**475%**	NA	4.98E-07	3.63E-05	73%	NA	4.13E-08	**3.01E-05**	**301%**	NA	1.29E-05	4.87E-05	97%	0	3.90E-07	**3.05E-05**	**305%**	NA
REMP_6	Industrial/Commercial	3.58E-05	**3.01E-05**	2.09E-04	**2.45E-04**	**489%**	129	1.60E-05	**4.61E-05**	**461%**	NA	4.31E-07	3.62E-05	72%	NA	2.95E-08	**3.01E-05**	**301%**	NA	9.58E-06	4.54E-05	91%	0	3.78E-07	**3.05E-05**	**305%**	NA
REMP_7	Camper	3.58E-05	**3.01E-05**	1.31E-04	**1.66E-04**	**333%**	94	8.46E-06	**3.86E-05**	**386%**	NA	2.56E-07	3.61E-05	72%	NA	1.59E-08	**3.01E-05**	**301%**	NA	4.54E-06	4.03E-05	81%	0	1.91E-07	**3.03E-05**	**303%**	NA
REMP_9	Dairy Farm	3.58E-05	**3.01E-05**	5.91E-05	**9.49E-05**	**190%**	11	1.42E-06	**3.15E-05**	**315%**	NA	9.55E-08	3.59E-05	72%	NA	2.24E-09	**3.01E-05**	**301%**	NA	2.48E-06	3.83E-05	77%	0	3.14E-08	**3.01E-05**	**301%**	NA
Oshawa_res	Oshawa Resident	3.58E-05	**3.01E-05**	5.55E-05	**9.13E-05**	**183%**	18	1.92E-06	**3.20E-05**	**320%**	NA	1.15E-07	3.59E-05	72%	NA	3.10E-09	**3.01E-05**	**301%**	NA	2.50E-06	3.83E-05	77%	0	4.66E-08	**3.01E-05**	**301%**	NA

Notes:

μg/m^3 – micrograms per cubic meter

Bolding/highlighting indicates an exceedance of the applicable ambient air quality criteria.

2.3 Management of Hazardous Substances

This section addresses JRP Recommendation 26 from OPG's Commitments Report (OPG, 2023a), "OPG to develop a comprehensive assessment of hazardous substance releases and the required management practices for hazardous chemicals on site. [GOC Response to JRP Rec. 26]".

This section addresses the management practices for hazardous chemicals on site. Hazardous substances that are expected to be released from effluent and emission sources are discussed in **Section 2.2.1.2** and **Section 2.2.2.2**.

OPG is responsible for defining the management practices for hazardous substances throughout the lifecycle of the facility. During site preparation and construction, hazardous substances will be managed through the Contractor's Site-Specific Environmental Management Plan (SSEMP). Overall, the philosophy is to apply best management practices to minimize and avoid potential adverse impacts. SSEMPs are developed as appropriate for dust management, noise management, erosion and sediment management, smog alert action plan, spill prevention and response, soil and hazardous waste management, terrestrial environment management, in-land aquatic environment management, and discovery of physical and cultural heritage resources.

A number of chemicals such as acetone, paint aerosol cans, hydraulic oil, motor oil, cleaning chemicals, etc. will be stored in various buildings such as the Steel Fabrication Building and Warehouse. Chemicals will be stored following appropriate safety protocols and recommendations in safety data sheets. Additionally, any spills will be management according to OPG's or the Contractor's Spill Management Plan to prevent any impact on human health and the environment.

During operation, stored inventories of hazardous chemicals that will be present at the DNNP site will generally include water treatment chemicals, and small quantities of chemicals used in laboratory, cleaning, and maintenance activities. The types and quantities of hazardous chemicals to be stored and used on the site are in the process of being determined by GEH, the SMR vendor, and OPG; however, a preliminary list of these chemicals and their management practices are provided in **Table 2-17** below. Hazardous chemicals will be managed using the Workplace Hazardous Materials Information System principles. The hazardous substances inventory is expected to be refined as the DNNP progresses through the detailed design phase. The DNNP will continue to apply the principles of optimization and BATEA when designing systems to avoid/minimize the use of hazardous substances, and when selecting hazardous substances to minimize their potential impacts on members of the public and the environment.

OPG will develop the required procedures to manage (store, process dispose, transport) the hazardous substances, according to federal and provincial requirements, industry standards and best management practices.

Table 2-17: Chemicals Anticipated to be Used for the BWRX-300

Source – System from which the discharge arises	Hazardous Substance/ Chemicals (added/present)	Details of Use	Estimated Quantity / Concentration	Release Pathway / Location
Combustion Plant – Standby Power Generation and Fire Protection System	Diesel Fuel	For emergency power back-up generators, fire pumps etc.	Approximately 114,000 L. tank	Atmosphere via stand-by generator stacks and fire pump building enclosure (roof vent) – to be confirmed during the detailed design phase)
Vehicle Maintenance Garage	Gasoline	For fueling vehicles on-site.	Approximately 20 L containers (exact number will be confirmed during the detailed design phase)[4]	Atmosphere via vehicle exhausts
Balance of Plant - Cooling Water System: Chlorination and de-chlorination of Service Water System (only) *Note: final decisions on chlorination and de-chlorination agents and concentrations will be confirmed during the detailed design phase*	Sodium Hypochlorite (7-15% Solution)	To chlorinate service water and control biofouling within the system.	Approximately 4,000 L tank[4] Max 1,820 L/day (based on 4-unit DNNP)	Lake Ontario – via Cooling Water Outfall
	Captor Thiosulphate	To de-chlorinate the service water prior to combination with circulating water in the main condenser and subsequent release to the environment.	Managed to ensure that Total Residual Chlorine (TRC) does not exceed 0.01 mg/L. With a DNNP Station Target to achieve compliance with the Ontario PWQO of 2 µg/L (2 ppb) after mechanical mixing at the diffuser (dilution factor = 7)	Lake Ontario – via Cooling Water Outfall
Balance of Plant	Turbine Oil	Lubricating Oil	Approx. 20,000 L tank[4].	Atmosphere - via off-site incinerator (approx. every 5 years) – optimized disposal route to be confirmed during the detailed design phase.
Various Sources / Systems (Nuclear	Lubricants/Oils/Grease	For maintaining plant/equipment performance	To be confirmed during the detailed design phase. Leaks will	Solid Waste Disposal Route – optimized disposal route to be

[4] GE Hitachi, "BWRX-300 Preliminary Safety Analaysis Report, NEDO-33950," 2022.

Source – System from which the discharge arises	Hazardous Substance/ Chemicals (added/present)	Details of Use	Estimated Quantity / Concentration	Release Pathway / Location
Island & Balance of Plant): Collected - Equipment Floor Drain System)			be collected and contained by the Equipment Floor Drain System. If leaks were to occur, the facility is being designed with dedicated drains to separate leaks from clean, oily and contaminated systems. Leaks from areas of the plant not suitable for treatment and reuse will be directed to collection barrels that can be shipped to an off-site hazardous waste management facility. This includes any leaks from systems such as the Boron Injection System, Hydraulic Actuator System, and Turbine Bypass System.	confirmed during the detailed design phase.
Nuclear Island – Primary Circuit Water Chemistry Systems	Hydrogen	Injected into the primary circuit via the reactor feedwater pumps to remove free oxygen.	5010 kg/yr	No Release Pathway –Off-gas System Hydrogen Recombiner removes hydrogen from the off-gas. Recombined with oxygen to form water.
	Depleted zinc	Injected into the primary circuit via the reactor feedwater pumps to minimize activation of cobalt within the reactor components. Inhibits cobalt-60 adsorption into the oxide layers of metal components within the primary circuit.	90 kg dissolution vessel[4]	No Release Pathway – residual concentration removed by the Condensate Filters and Demineralizers system

Source – System from which the discharge arises	Hazardous Substance/ Chemicals (added/present)	Details of Use	Estimated Quantity / Concentration	Release Pathway / Location
	Noble Chemistry (Noble Metal Solution)	Deposits on the surface of primary circuit components and acts as a catalyst to improve the recombination of hydrogen, oxygen and other oxidising free radicals.	Approx. 38 L of 1% noble metal solution is utilized over a 2-week time frame per year[4]	No Release Pathway – residual concentration removed by the Condensate Filters and Demineralizers system
Containment Inerting System	Nitrogen	Used to inert the primary containment and avoid conditions that could result in a flammable atmosphere.	15,000 gallons / 68191 L	Atmosphere – via Main Stack
Chilled Water Equipment	Refrigerant - will be confirmed during the detailed design phase	Chillers on Radioactive Waste Building Roof	Each Chiller contains a refrigerant charge of 250 kg[4] Number of chillers and total inventory to be confirmed during the detailed design phase	Refrigerant used in a closed loop system – no normal release pathway to the environment.
	Propylene Glycol (Antifreeze)	Chillers on Radioactive Waste Building Roof	39,000 L[4]	Refrigerant used in a closed loop system – no normal release pathway to the environment
Offgas System	Refrigerant - will be confirmed during the detailed design phase	Used within Refrigeration Driers to condition offgas (remove moisture) to protect charcoal delay bed performance.	Approximately, 0.4 kg per dryer (2 dryers = 0.8 kg overall for the system). Quantity will be confirmed during the detailed design phase	Refrigerant used in a closed loop system – no normal release pathway to the environment.
Nuclear Island – Onsite Laundry	Detergents	Cleaning and decontamination of equipment, Personal Protective Equipment (laundry) or humans	Expect small/negligible concentrations may present in Liquid Waste Management System.	Cooling Water Outfall (via Liquid Waste Management System if a release is required)
Nuclear Island – Onsite Chem Labs	Various chemistry lab chemicals	Chemicals used in the analysis and quantification of liquid and gaseous radioactive wastes.	Expect small/negligible concentrations may present in Liquid Waste Management System.	Cooling Water Outfall (via Liquid Waste Management System if a release is required)

Source – System from which the discharge arises	Hazardous Substance/ Chemicals (added/present)	Details of Use	Estimated Quantity / Concentration	Release Pathway / Location
Nuclear Island – Boron Addition System	Boric Acid	Not used under normal operations – only used under emergency shutdown scenarios.	Approx. 1000 gallons / 3785 L	End of Reactor Life Decommissioning – optimal disposal route will be decided as part of Preliminary Decommissioning Plan development.

2.4 Radioactive Waste Management

2.4.1 Low and Intermediate Level Waste

Low and intermediate level waste (L&ILW) will not be generated until the start of commercial operations. L&ILW will be processed and stored on-site. Any on-site storage would be in engineered above ground building(s) or structure(s) designed to provide environmental protection, monitoring, interim storage capacity and retrievability of low level solid and liquid radioactive waste produced at the DNNP. The structural design typically utilizes prefabricated pre-stressed concrete panels joined in an overlapping configuration to prevent radiation streaming between the panels. L&ILW storage buildings and/or structures would be provided with services including fire protection, ventilation, lighting and drainage services.

A safety analysis for the storage of L&ILW is expected to be completed in 2025 to aid in the design of the planned waste storage areas/facilities to ensure radioactivity remains below applicable regulatory dose limits. OPG is expected to store intermediate level waste on-site and ship some (or potentially all) low level waste to a licensed off-site vendor. The low level waste shipped off-site is expected to be returned to the DNNP after 2035 for continued on-site storage. Once the safety analysis is complete, the PERA will be updated to reflect the assessment of potential risk to human and ecological health.

2.4.2 Used Fuel

Used fuel (or HLW) will be stored in a used fuel pool to allow for radioactive decay and cooling, and can be moved from the used fuel pool to dry storage between three and five years after removal from the reactor, followed by transfer to the ISFSI. The ISFSI will not be needed until approximately 2036. The facility will be designed to provide monitoring, interim storage capacity and retrievability of spent nuclear fuel and/or irradiated non-fuel core components. Dry storage in an ISFSI is the preferred solution for this material until a permanent disposal repository is established

A safety analysis of the planned ISFSI will be undertaken in 2025. The safety analysis is being undertaken to support the design of the facility, and will ensure that the design of the facility meets the required dose limits at the boundary of the facility.

OPG will engage with Indigenous Nations and communities on the location of the ISFSI on the DN Site.

Once the safety analysis is complete, the PERA will be updated to reflect the assessment of potential risk to human and ecological health. Based on existing OPG dry storage facilities, the main pathway of exposure is through external dose and the contribution to human and ecological dose is minimal.

2.5 Noise

Activities during site preparation, construction and operation phases of DNNP are expected to contribute to the level of noise in the local atmospheric environment. Vibrations from bedrock removal activities may occur during construction. Noise generation is expected to be greater during the site preparation and construction phases, during which heavy machinery/equipment and vehicles will be actively participating in those activities (e.g., excavation, land clearing, construction of buildings/structures) likely to produce noise consistent with a typical large-scale construction site. For this reason, noise levels were not modelled for the operations phase, as it is conservatively assumed that noise levels generated during site preparation and construction represent a bounding scenario. During the ECA application process, noise impacts associated with the operations phase would be assessed independently in accordance with the applicable regulatory guidelines.

The assumptions, modelling parameters and level of conservatism used for the noise modelling are consistent with those used for the air quality modelling and are further characterized in the appended technical memorandum (IEC, 2024).

Noise modelling results were compared against available Health Canada guidelines for the assessment of noise in environmental assessments (HC, 2017) and the Environment and Climate Change Canada (ECCC) guidance for the protection of migratory birds (ECCC, 2023). The noise guidelines provided are considered applicable to all phases of the Project.

Health Canada (2017) is premised on the notion that negative community reactions to noise are a potential indicator for adverse health effects. One such indicator is annoyance; Health Canada guidance relies on the results of socio-acoustic research studies that illustrate an increase in the percentage of a community reported to be "highly annoyed" as noise levels in the community increase. These studies have resulted in a dose-response curve that relates sound levels to "percentage highly annoyed" (%HA), which forms the basis for noise impact assessments in the Health Canada guidance.

The measurement used to assess sound levels is the day-night sound level (Ldn). This value represents a 24-hour energy equivalent sound level that includes a 10 dB penalty for sounds that occur during night-time hours (22:00-07:00). The intention is to account for the heightened sensitivity of noise during night-time hours and capture a higher potential for annoyance during common sleeping hours. Health Canada advises that a project should not cause the %HA in the community to increase by more than 6.5%. Health Canada also stipulates that sound levels in the community should not exceed an Ldn of 75 dBA, even if the increase in %HA is below 6.5%. Both noise criteria should be met to demonstrate compliance with Health Canada guidance. Exceeding one or both criteria suggests that a project may result in adverse noise impacts to the local community and mitigation measures should be investigated.

There are minimal noise screening criteria and regulatory requirements for the protection of ecological receptors. N288.6:22 (CSA, 2022a) points to ECCC (2023) which provides general guidance for avoiding causing harm to migratory birds. ECCC recommend extending setback distances from the location of known bird nests if project activities are likely to result in significant disturbances to migratory birds. Examples of significant disturbances with respect to noise include performing activities likely to result in loud noises (e.g., drilling, seismic blasting), producing noise that exceeds ambient noise levels in the natural environment by more than 10 dB, or producing noises in excess of 50 dB. Though ECCC do not provide guidance as to how these criteria are to be applied and which noise measurement statistic they should be compared against, these criteria are conservatively compared with existing noise levels (as L90[5] measurements) and maximum predicted noise level increases (as Leq[6] values) associated with DNNP activities.

Further discussion of the noise screening and the interpretation of results with respect to impacts on human and ecological receptors is provided in **Section 3.1.2.3.1** and **Section 4.1.3.3.1**, respectively.

Since the 2009 DNNP EIS, additional noise monitoring was conducted at the DN site between 2018 to 2019, as described in more detail in Section 3.1.2.10.1 of the 2020 DN ERA (Ecometrix, 2022). Noise monitoring to update existing noise level measurements for the DNNP was initiated in Spring of 2022 (OPG, 2022c). The equivalent noise level, including Ldn, LAeq[7] and LAs90[8], were monitored per the methodology described from the noise assessment methodology report (OPG, 2021a). Acoustic monitoring continued in the Fall of 2022 following the same methodology as the Spring 2022 program (OPG, 2023d). The locations of relevant Points of Reception (POR) for the background noise assessment are provided in **Figure 2-4**. These POR locations correspond to the background locations used in the noise modelling for this PERA. Results of the recent noise monitoring studies concluded that the current noise environment in the vicinity of the DNNP is typical of an urban setting and is influenced by several sources including the DNGS and other existing DN site infrastructure, traffic on the nearby Highway 401 and local roads, on the nearby CN rail line, and at the neighbouring St. Marys Cement (SMC) plant and Durham York Energy Centre (DYEC) (OPG, 2022c, 2023d).

Detailed results of the noise modelling and comparison with applicable noise guidelines for the site preparation and construction phases are presented in **Figure 2-4** and **Table 2-18** to **Table 2-21**, respectively.

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[5] L90: the 90th-percentile of the statistical noise level distribution, or the noise level that is exceeded for 90% of the measurement time, in decibels (dB)
[6] Leq: the equivalent continuous sound level, in decibels (dB); predicted values consist of existing noise levels plus any incremental sound increases associated with DNNP activities.
[7] LAeq: A-weighted equivalent continuous sound level, in A-weighted decibels (dBA).
[8] LAs90: the 90th-percentile of the statistical noise level distribution, or the noise level that is exceeded for 90% of the measurement time, in A-weighted decibels (dBA).

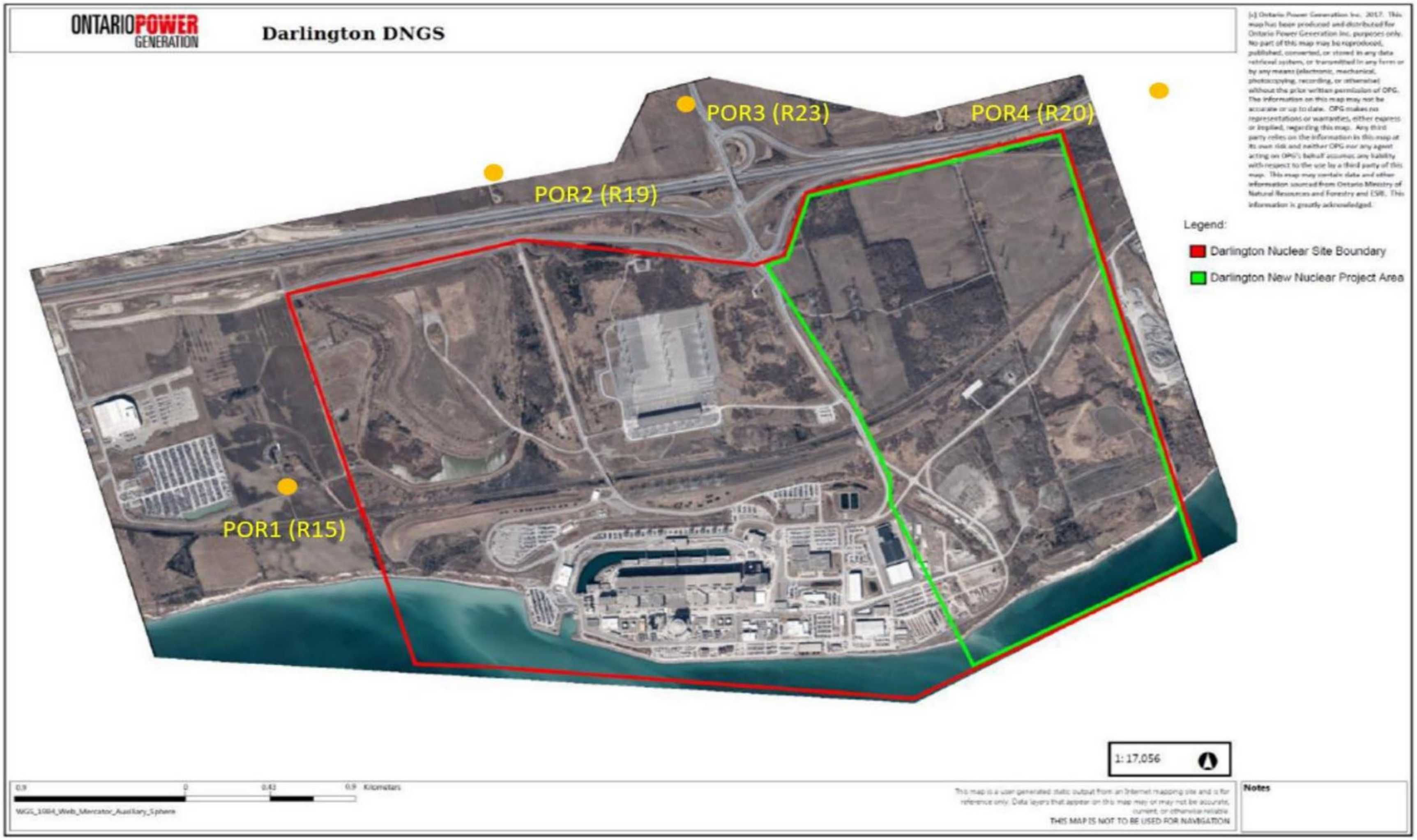


Figure 2-4: Location of Points of Reception (POR1-4)

Table 2-18: Human Health Noise Modelling Results (Site Preparation)

Receptor ID	Receptor Name	Nearest Background Station (POR)	Background		DNNP + Background						Maximums		
					SP1		SP2		SP3				
			Ldn	%HA	Ldn	%HA	Ldn	%HA	Ldn	%HA	Ldn	ΔLdn	Δ%HA
Noise Guideline (HC, 2017)			**75**		**75**	**+6.5**	**75**	**+6.5**	**75**	**+6.5**	**75**		**+6.5**
R15_REMP_1	Farm & Harvester	POR1 (R15)	56.9	5.3	57.3	5.5	57.1	5.4	57.1	5.4	57.3	+0.4	+0.2
					+0.4	*+0.2*	*+0.1*	*+0.1*	*+0.2*	*+0.1*			
R17_REMP_2	Rural Resident	POR3 (R23)	59.5	7.3	61.5	9.3	60.0	7.7	61.8	9.6	61.8	+2.3	+2.3
					+2.1	*+2.0*	*+0.5*	*+0.4*	*+2.3*	*+2.3*			
R21_REMP_3	Bowmanville Resident	POR3 (R23)	59.5	7.3	59.9	7.6	59.6	7.4	59.9	7.6	59.9	+0.4	+0.4
					+0.4	*+0.4*	*+0.1*	*+0.1*	*+0.4*	*+0.4*			
R22_REMP_4	West/East Beach Resident	POR4 (R20)	70.2	24.4	70.2	24.5	70.2	24.4	70.2	24.5	70.2	0.0	+0.0
					+0.0	*+0.0*	*+0.0*	*+0.0*	*+0.0*	*+0.0*			
REMP_5	Sport Fisher	POR1 (R15)	56.9	5.3	57.6	5.8	57.1	5.4	57.2	5.4	57.6	+0.7	+0.5
					+0.7	*+0.5*	*+0.1*	*+0.1*	*+0.2*	*+0.2*			
REMP_6	Industrial/Commercial	POR1 (R15)	56.9	5.3	57.1	5.4	57.0	5.3	57.0	5.3	57.1	+0.2	+0.1
					+0.2	*+0.1*	*+0.0*	*+0.0*	*+0.1*	*+0.1*			
REMP_7	Camper	POR1 (R15)	56.9	5.3	57.0	5.3	56.9	5.3	57.0	5.3	57.0	0.0	+0.0
					+0.0	*+0.0*	*+0.0*	*+0.0*	*+0.0*	*+0.0*			
REMP_9	Dairy Farmer	POR2 (R19)	64.9	13.8	64.9	13.8	64.9	13.8	64.9	13.8	64.9	0.0	+0.0
					+0.0	*+0.0*	*+0.0*	*+0.0*	*+0.0*	*+0.0*			
Oshawa_res	Oshawa Resident	POR2 (R19)	64.9	13.8	64.9	13.8	64.9	13.8	64.9	13.8	64.9	0.0	+0.0
					+0.0	*+0.0*	*+0.0*	*+0.0*	*+0.0*	*+0.0*			

Notes:
Shaded cells indicate the Project-associated incremental change from background.
Bolded values indicate exceedance of the noted Health Canada (2017) noise guideline.

Table 2-19: Ecological Noise Modelling Results (Site Preparation)

Receptor ID	Receptor Name	Nearest Background Station (POR)	Background			DNNP + Background									Maximum Increments		
						SP1			SP2			SP3					
			Day (15-hr)	Night (9-hr)	24-hr	Day (15-hr)	Night (9-hr)	24-hr	Day (15-hr)	Night (9-hr)	24-hr	Day (15-hr)	Night (9-hr)	24-hr	Day (15-hr)	Night (9-hr)	24-hr
Noise Guideline (ECCC, 2023)					**50**			**50**			**50**			**50**			**10**
T2022_D	Location D	POR4 (R20)	68.2	62.3	**66.8**	69.6	66.2	**68.6**	69.3	65.5	**68.2**	68.9	64.6	**67.7**	+1.4	+3.9	+1.8
						+1.4	*+3.9*	*+1.8*	*+1.1*	*+3.2*	*+1.4*	*+0.7*	*+2.3*	*+1.0*			
T2023_D	Location F	POR4 (R20)	68.2	62.3	**66.8**	68.5	63.4	**67.2**	68.2	62.3	**66.8**	68.2	62.4	**66.8**	+0.3	+1.1	+0.4
						+0.3	*+1.1*	*+0.4*	*+0.0*	*+0.0*	*+0.0*	*+0.0*	*+0.1*	*+0.0*			
T2	Lake Ontario Shore	POR1 (R15)	50.3	50.6	**50.4**	51.2	51.4	**51.2**	50.6	50.9	**50.7**	50.7	51.0	**50.8**	+0.8	+0.8	+0.8
						+0.8	*+0.8*	*+0.8*	*+0.3*	*+0.3*	*+0.3*	*+0.4*	*+0.4*	*+0.4*			
T4	Location AB	POR2 (R19)	61.8	57.6	**60.7**	61.9	57.9	**60.8**	61.8	57.7	**60.7**	61.9	57.7	**60.7**	+0.1	+0.3	+0.1
						+0.1	*+0.3*	*+0.1*	*+0.0*	*+0.1*	*+0.0*	*+0.1*	*+0.1*	*+0.1*			
T7	Location C	POR2 (R19)	61.8	57.6	**60.7**	62.0	58.1	**60.9**	61.9	57.7	**60.7**	61.9	57.9	**60.8**	+0.2	+0.5	+0.3
						+0.2	*+0.5*	*+0.3*	*+0.1*	*+0.1*	*+0.1*	*+0.1*	*+0.3*	*+0.1*			
T10	Location E	POR2 (R19)	61.8	57.6	**60.7**	63.1	60.5	**62.3**	62.3	58.9	**61.3**	62.1	58.4	**61.0**	+1.3	+2.9	+1.7
						+1.3	*+2.9*	*+1.7*	*+0.5*	*+1.3*	*+0.7*	*+0.3*	*+0.8*	*+0.4*			

Notes:

Shaded cells indicate the Project-associated incremental change from background.

Bolded values indicate exceedance of the noted ECCC (2023) noise guideline.

Background noise levels are L90 measurements (dBA)

DNNP + Background noise levels are Leq measurements (dBA)

Table 2-20: Human Health Noise Modelling Results (Construction)

Receptor ID	Receptor Name	Nearest Background Station (POR)	Background		DNNP + Background												Maximums		
					CON1A		CON1B		CON2A		CON2B		CON3A		CON3B				
			Ldn	%HA	Ldn	%HA	Ldn	%HA	Ldn	%HA	Ldn	%HA	Ldn	%HA	Ldn	%HA	Ldn	ΔLdn	Δ%HA
Noise Guideline (HC, 2017)			**75**		**75**	**+6.5**	**75**	**+6.5**	**75**	**+6.5**	**75**	**+6.5**	**75**	**+6.5**	**75**	**+6.5**	**75**		**+6.5**
R15_REMP_1	Farm & Harvester	POR1 (R15)	56.9	5.3	57.3	5.5	57.3	5.5	57.1	5.4	57.1	5.4	57.1	5.4	57.1	5.4	57.3	+0.4	+0.2
					+0.4	*+0.2*	*+0.3*	*+0.2*	*+0.2*	*+0.1*	*+0.2*	*+0.1*	*+0.2*	*+0.1*	*+0.2*	*+0.1*			
R17_REMP_2	Rural Resident	POR3 (R23)	59.5	7.3	62.0	9.9	62.1	10.0	61.5	9.3	61.6	9.4	61.4	9.1	61.4	9.2	62.1	+2.6	+2.7
					+2.5	*+2.6*	*+2.6*	*+2.7*	*+2.0*	*+2.0*	*+2.1*	*+2.1*	*+1.9*	*+1.8*	*+1.9*	*+1.9*			
R21_REMP_3	Bowmanville Resident	POR3 (R23)	59.5	7.3	60.1	7.9	60.1	7.9	59.9	7.6	59.9	7.6	59.8	7.5	59.8	7.5	60.1	+0.7	+0.6
					+0.6	*+0.6*	*+0.7*	*+0.6*	*+0.4*	*+0.3*	*+0.4*	*+0.3*	*+0.3*	*+0.3*	*+0.3*	*+0.3*			
R22_REMP_4	West/East Beach Resident	POR4 (R20)	70.2	24.4	70.3	24.5	70.3	24.5	70.2	24.5	70.2	24.5	70.2	24.4	70.2	24.4	70.3	0.0	+0.1
					+0.0	*+0.1*	*+0.0*	*+0.1*	*+0.0*	*+0.0*	*+0.0*	*+0.0*	*+0.0*	*+0.0*	*+0.0*	*+0.0*			
REMP_5	Sport Fisher	POR1 (R15)	56.9	5.3	57.7	5.8	57.7	5.8	57.2	5.5	57.2	5.5	57.8	5.9	57.8	5.9	57.8	+0.9	+0.6
					+0.8	*+0.5*	*+0.8*	*+0.5*	*+0.2*	*+0.2*	*+0.2*	*+0.2*	*+0.9*	*+0.6*	*+0.9*	*+0.6*			
REMP_6	Industrial/Commercial	POR1 (R15)	56.9	5.3	57.1	5.4	57.1	5.4	57.0	5.3	57.0	5.3	57.0	5.3	57.0	5.3	57.1	+0.2	+0.1
					+0.2	*+0.1*	*+0.2*	*+0.1*	*+0.1*	*+0.1*	*+0.1*	*+0.1*	*+0.1*	*+0.1*	*+0.1*	*+0.0*			
REMP_7	Camper	POR1 (R15)	56.9	5.3	57.0	5.3	57.0	5.3	57.0	5.3	57.0	5.3	57.0	5.3	57.0	5.3	57.0	0.0	0.0
					+0.0	*+0.0*	*+0.0*	*+0.0*	*+0.0*	*+0.0*	*+0.0*	*+0.0*	*+0.0*	*+0.0*	*+0.0*	*+0.0*			
REMP_9	Dairy Farmer	POR2 (R19)	64.9	13.8	64.9	13.8	64.9	13.8	64.9	13.8	64.9	13.8	64.9	13.8	64.9	13.8	64.9	0.0	0.0
					+0.0	*+0.0*	*+0.0*	*+0.0*	*+0.0*	*+0.0*	*+0.0*	*+0.0*	*+0.0*	*+0.0*	*+0.0*	*+0.0*			
Oshawa_res	Oshawa Resident	POR2 (R19)	64.9	13.8	64.9	13.8	64.9	13.8	64.9	13.8	64.9	13.8	64.9	13.8	64.9	13.8	64.9	0.0	0.0
					+0.0	*+0.0*	*+0.0*	*+0.0*	*+0.0*	*+0.0*	*+0.0*	*+0.0*	*+0.0*	*+0.0*	*+0.0*	*+0.0*			

Notes:
Shaded cells indicate the Project-associated incremental change from background.
Bolded values indicate exceedance of the noted Health Canada (2017) noise guideline.

Table 2-21: Ecological Noise Modelling Results (Construction)

Receptor ID	Receptor Name	Nearest Background Station (POR)	Background			DNNP + Background																		Maximum Increments		
						CON1A			CON1B			CON2A			CON2B			CON3A			CON3B					
			Day (15-hr)	Night (9-hr)	24-hr	Day (15-hr)	Night (9-hr)	24-hr	Day (15-hr)	Night (9-hr)	24-hr	Day (15-hr)	Night (9-hr)	24-hr	Day (15-hr)	Night (9-hr)	24-hr	Day (15-hr)	Night (9-hr)	24-hr	Day (15-hr)	Night (9-hr)	24-hr	Day (15-hr)	Night (9-hr)	24-hr
Noise Guideline (ECCC, 2023)					**50**			**50**			**50**			**50**			**50**			**50**			**50**			**10**
T2022_D	Location D	POR4 (R20)	68.2	62.3	**66.8**	70.8	68.6	**70.1**	71.0	68.9	**70.3**	71.4	69.4	**70.7**	71.5	69.6	**70.9**	69.8	66.6	**68.8**	69.9	66.9	**69.0**	+3.3	+7.3	+4.1
						+2.6	*+6.3*	*+3.3*	*+2.8*	*+6.6*	*+3.5*	*+3.2*	*+7.1*	*+4.0*	*+3.3*	*+7.3*	*+4.1*	*+1.6*	*+4.3*	*+2.1*	*+1.7*	*+4.6*	*+2.2*			
T2023_D	Location F	POR4 (R20)	68.2	62.3	**66.8**	68.5	63.4	**67.2**	68.5	63.4	**67.2**	68.2	62.5	**66.8**	68.2	62.5	**66.8**	69.1	65.0	**68.0**	69.1	65.0	**68.0**	+0.9	+2.7	+1.2
						+0.3	*+1.1*	*+0.4*	*+0.3*	*+1.1*	*+0.4*	*+0.0*	*+0.2*	*+0.1*	*+0.0*	*+0.2*	*+0.1*	*+0.9*	*+2.7*	*+1.2*	*+0.9*	*+2.7*	*+1.2*			
T2	Lake Ontario Shore	POR1 (R15)	50.3	50.6	**50.4**	51.1	51.3	**51.2**	51.1	51.4	**51.2**	50.7	51.0	**50.8**	50.8	51.0	**50.9**	50.8	51.0	**50.9**	50.8	51.1	**50.9**	+0.8	+0.8	+0.8
						+0.8	*+0.7*	*+0.8*	*+0.8*	*+0.8*	*+0.8*	*+0.4*	*+0.4*	*+0.4*	*+0.4*	*+0.4*	*+0.4*	*+0.5*	*+0.4*	*+0.5*	*+0.5*	*+0.5*	*+0.5*			
T4	Location AB	POR2 (R19)	61.8	57.6	**60.7**	61.9	57.9	**60.8**	61.9	57.9	**60.8**	61.9	57.7	**60.7**	61.9	57.8	**60.7**	61.9	57.7	**60.7**	61.9	57.8	**60.7**	+0.1	+0.3	+0.1
						+0.1	*+0.3*	*+0.1*	*+0.1*	*+0.3*	*+0.1*	*+0.1*	*+0.1*	*+0.1*	*+0.1*	*+0.2*	*+0.1*	*+0.1*	*+0.1*	*+0.1*	*+0.1*	*+0.2*	*+0.1*			
T7	Location C	POR2 (R19)	61.8	57.6	**60.7**	62.0	58.1	**60.9**	62.0	58.1	**60.9**	61.9	57.9	**60.8**	61.9	58.0	**60.8**	61.9	57.9	**60.8**	61.9	57.9	**60.8**	+0.2	+0.5	+0.3
						+0.2	*+0.5*	*+0.2*	*+0.2*	*+0.5*	*+0.3*	*+0.1*	*+0.3*	*+0.2*	*+0.1*	*+0.4*	*+0.2*	*+0.1*	*+0.3*	*+0.1*	*+0.1*	*+0.3*	*+0.2*			
T10	Location E	POR2 (R19)	61.8	57.6	**60.7**	62.5	59.3	**61.6**	62.7	59.6	**61.8**	62.2	58.6	**61.2**	62.3	58.9	**61.3**	62.2	58.5	**61.1**	62.2	58.7	**61.2**	+0.9	+2.0	+1.1
						+0.7	*+1.7*	*+0.9*	*+0.9*	*+2.0*	*+1.1*	*+0.4*	*+1.0*	*+0.5*	*+0.5*	*+1.3*	*+0.7*	*+0.4*	*+0.9*	*+0.5*	*+0.4*	*+1.1*	*+0.6*			

Notes:
Shaded cells indicate the Project-associated incremental change from background.
Bolded values indicate exceedance of the noted ECCC (2023) noise guideline.
Background noise levels are L90 measurements (dBA)
DNNP + Background noise levels are Leq measurements (dBA)

3.0 Predictive Human Health Risk Assessment

3.1 Problem Formulation

The problem formulation provides the objectives, goals, framework and methodology for the PERA and consists of identifying the relevant components for the predictive human health risk assessment (HHRA). These components include the identification of human receptors that may be potentially present in or around the DNNP, the identification of chemical, radiological, and other stressors, the identification of complete exposure pathways by which the COPCs may affect the human health receptors, and a conceptual site model (CSM) that illustrates all of these relationships.

During the problem formulation stage, decisions are made on which constituents of potential concern (COPC) and receptors should be focused on for further assessment in the predictive HHRA. During this planning stage, no conclusions are made regarding effects.

3.1.1 Receptor Selection and Characterization

The selection of human receptors for the predictive HHRA is generally consistent with the selection of receptors for the 2020 DN ERA (Ecometrix, 2022), the 2024 DN ERA Addendum (Ecometrix, 2024) and OPG's annual Environmental Monitoring Program (EMP) reporting (OPG, 2024a). Receptors selected for the predictive HHRA were selected to be appropriate for the assessment of both chemical and radiological stressors on human health.

3.1.1.1 Receptor Selection

3.1.1.1.1 On-Site Non-Nuclear Energy Workers

All non-nuclear energy workers (non-NEWs), contractors, and visitors at the DNNP are expected to be protected through OPG's Health and Safety Management System Program and the Radiation Protection Program, and are thus not considered in this predictive HHRA.

OPG's Health and Safety Management System Program is designed to ensure the protection of employees, contractors and visiting members of the public. The program outlines a systems approach used to manage risks associated with activities, products and services of OPG Nuclear operations. Contractors are required to maintain a level of safety equivalent to OPG staff while working at an OPG workplace (OPG, 2021b). Work at the DNNP during site preparation and construction phases is subject to safe work planning requirements under the Constructor's safety plans where safety hazards are identified, and mitigating measures are communicated through Pre-Job Briefings. Routine or planned work is expected to be in accordance with the safety plans. For DNNP operation phase, a Health and Safety management system specific to the DNNP will be implemented.

The Radiation Protection Program is designed to ensure that doses for employees, contractors and visiting members of the public are below regulatory limits, and As Low As Reasonably Achievable (ALARA), social and economic factors being taken into account(OPG, 2019b). During site preparation and construction phases of the DNNP, radiological substances will not be generated nor released. During operation phase, a Radiation Protection Program specific to DNNP will be implemented.

In summary, because human exposures on the DNNP site will be kept within safe levels through existing and future Health and Safety and Radiation Protection programs, on-Site receptors are not addressed further in the predictive HHRA.

3.1.1.1.2 Members of the Public

Off-site members of the public are categorized into "critical groups". Potential critical groups are defined through the site-specific survey and their doses are calculated in the OPG Annual Environmental Monitoring Program (EMP) Reports. Current EMP designs are based on the 2013 site specific survey information; however, site specific surveys were most recently reviewed in 2018. At the time, these reviews did not identify any significant changes with the potential to substantially alter the predictions of the ERA or the implementation of the EMP (OPG, 2021c). The next site-specific surveys are planned to start in 2024.

As a result of recent engagement activities in 2023 and 2024, representatives from the Williams Treaties First Nations (WTFNs) expressed interest in including a new human receptor in the DNNP PERA that aims to better represent the lifestyle characteristics of an Indigenous person who may work and/or live near the DN site and also harvests traditional foods (animals and plants that are fished, hunted, or gathered from the land and consumed as food (HC, 2018)) in the local area. This new receptor is assumed to hunt, fish and consume traditional foods in a greater proportion compared to the lifestyles represented by the list of receptors currently characterized in OPG's existing EMPs and ERAs. The new receptor is called a "Harvester", subject to feedback from the WTFNs. At this time, publicly available information has been used to form the basis of the Harvester receptor's diet and exposure characteristics; it is expected that this receptor will be further refined as more site-specific information is gathered through ongoing engagement activities with Indigenous Nations and communities as well as potential information from local Indigenous residents as part of the site-specific survey. The development of the Harvester receptor's diet has been described in more detail in **Section 3.2.4.2**.

The focus of this predictive HHRA is on potential risks to off-site members of the public in the potential critical groups through exposures to chemical and radiological stressors in air and water.

3.1.1.2 Receptor Characterization

As previously noted, the potential critical group receptors used for the predictive HHRA (shown in **Figure 3-2**) are generally consistent with the 2020 DN ERA (Ecometrix, 2022), the 2024 DN ERA Addendum (Ecometrix, 2024) and OPG's annual DN EMP reports, with the addition of the Harvester receptor included as part of this PERA. These receptors are considered appropriate for the assessment of potential health effects due to chemical and radiological stressors. Their characteristics are most recently described in Appendix E of the 2023 EMP report (OPG, 2024a) and are presented below. The Harvester receptor is added to this section:

- The **Oshawa Resident** potential critical group represents urban residents in Oshawa and in the community of Courtice within the Municipality of Clarington located to the west (W) and west-northwest (WNW) of the site starting at about 6 km from the site. These residents obtain drinking water from the Oshawa water supply plant (WSP) and grow a small percentage of their annual fruits and vegetables in gardens. It is assumed that 18% of the adult Oshawa residents work within 5 km of the DN site. Doses to this portion of adults are adjusted using the Industrial/Commercial worker dose to account for the increased exposure while at work due to proximity of this worker location to the station.

- The **Bowmanville Resident** potential critical group represents urban residents located to the northeast (NE) and north-northeast (NNE) of the site at distances from 4 to 7 km from DN. These residents obtain drinking water from the Bowmanville WSP and grow a small percentage of their annual fruits and vegetables in gardens. They also purchase a small percentage of their annual meat, poultry and eggs from local farms. It is assumed that 17% of the adult Bowmanville residents work within 5 km of the DN site. Doses to this portion of adults are adjusted using the Industrial/Commercial worker dose to account for the increased exposure while at work due to proximity of this worker location to the station.

- The **West/East Beach (WEB) Resident** potential critical group represents urban residents located to the east-northeast (ENE) of the site at distances from 3.5 km to 7 km. These residents obtain their drinking water from both wells and the Bowmanville WSP and grow a small percentage of their annual fruits and vegetables in gardens. They also purchase a small percentage of their annual poultry and eggs from local farms. It is assumed that 12% of the West/East Beach residents work within 5 km of the DN site. Doses to this portion of adults are adjusted using the Industrial/Commercial worker dose to account for the increased exposure while at work due to proximity of this worker location to the station.

- The **Farm** potential critical group represents agricultural farms (but not dairy farms) located in all landward wind sectors around the DN site at distances from 1.5 km to 10 km. The closest is in the WNW wind sector. Members of this group obtain their water supply mostly from wells and use it for drinking, bathing, irrigation and watering livestock. They also obtain a large fraction of their annual fruits, vegetables and animal products from locally grown sources. It is assumed that members of the Farm group do not form part of the Industrial/Commercial group.

- The **Dairy Farm** potential critical group represents dairy farms located in all landward wind sectors around the DN site at distances from 3 km to over 10 km. The closest is in the north (N) wind sector. Members of this group obtain their water supply from wells and use it for drinking, bathing, irrigation, and livestock watering. They also obtain a large fraction of their annual fruits, vegetables and animal products, including fresh cow's milk, from locally grown sources. It is assumed that members of the Dairy Farm group do not form part of the Industrial/Commercial group.

- The **Rural Resident** potential critical group represents residents in rural areas in all landward wind sectors around the site at distances of about 2 km to 5 km. Members of this group obtain about half of their water supply from wells and half from the Bowmanville WSP, and use it for drinking, bathing, and irrigation. They obtain a moderate fraction of their annual fruits, vegetables, poultry and eggs from locally grown sources. It is assumed that 9% of the Rural residents work within 5 km of the DN site. Doses to this portion of adults are adjusted using the Industrial/Commercial worker dose to account for the increased exposure while at work due to proximity of this worker location to the station.

- The **Industrial/Commercial** potential critical group represents adult workers whose work location is close to the nuclear site. The closest location for this group is the St. Marys cement plant about 1.8 km NE of the site, however, the most affected location due to updated meteorological data is the Courtice Water Pollution Control Plant (WPCP) about 2 km W of DN. The nearby Darlington Energy Complex (DEC) and Durham York Energy Centre (DYEC) are located within close proximity to the Courtice WPCP and are expected to experience exposures to airborne contaminants comparable to the Courtice WPCP. Members of this receptor group are typically at this location about 23% of the time (i.e. working hours). They consume water from the Bowmanville WSP.

- The **Sport Fisher** potential critical group represents non-commercial individuals fishing near the DN site discharge, about 0.5 km south (S) of the DN site. Members of this group were conservatively assumed to obtain all the fish they consume in a year from the vicinity of the DN site and spend 1% of their time at the discharge location where atmospheric exposure occurs.

- The **Camper** potential critical group represents campers at the Darlington Provincial Park, located from 4 to 6 km W of the site at the lakeshore, and includes McLaughlin Bay, a shallow water body where some fishing takes place. The campers are assumed to be in the park no more than six months of the year. They consume drinking water from the Oshawa WSP, and purchase a small fraction of their annual fruits, vegetables, meat, poultry, and eggs from locally grown sources.

- The **Harvester** potential critical group represents local residents in the vicinity of DN site who hunt, fish and regularly consume traditional foods harvested from the areas around the DN site. The Harvester is meant to represent Indigenous local residents, some of whom may also work near the DN site. It is conservatively assumed that 18% of the adult Harvesters work within 5 km of the DN site. Doses to this portion of adults are adjusted using the Industrial/Commercial worker dose to account for the increased exposure while at work due to proximity of this worker location to the station. The Harvester potential critical group has been conservatively placed in the WNW wind sector, approximately 1.5 km from the DN site, consistent with the Farm location.

The predictive HHRA and receptor selection does not directly address sensitive or vulnerable populations; however, sensitive or vulnerable human health groups are considered through the use of toxicity reference values (TRVs) that incorporate uncertainty factors to account for sensitive individuals.

3.1.2 Selection of Chemical, Radiological, and Other Stressors

The DNNP is expected to release certain chemicals and radionuclides to air in the normal course of operations. As described in **Section 2.2.1**, the BWRX-300 is expected to operate following a zero liquid release philosophy for radiological liquid waste; thus, no routine releases of radionuclides to surface water are expected. Though the DNNP will rely on mechanical means to protect against impingement, entrainment and biofouling, the design does include a backup chlorination system; thus, residual amounts of chlorine and/or chlorine disinfection by-products may be detectable within effluent released from the service water system, though this is expected to be mitigated by the use of dechlorination agents (Baird, 2024).

Site preparation and construction activities have the potential to generate noise and vibration levels higher than current existing conditions. As discussed in **Section 2.2.2**, no radionuclide releases to the atmosphere are expected during site preparation and construction; however, radionuclide air emissions are anticipated via the active ventilation system during normal operations.

For non-radiological air emissions, it is expected that the site preparation and construction phases will result in emissions typical of large-scale construction projects, including dust/particulates and engine and motorized equipment exhausts. The operation phase will result in emissions associated with the testing of standby generators and worker traffic accessing the DNNP from Holt Road. For the noise assessment, noises generated during operations are bounded by the site preparation and construction phases. Vibration from bedrock removal is discussed in terms of impacts on bank swallows along the Darlington bluffs in **Section 4.1.3.3.2**.

3.1.2.1 Selection of Chemical COPCs

3.1.2.1.1 Selection of Chemical COPCs in Air

As described in **Section 2.2.2.2**, atmospheric modelling was conducted for site preparation, construction and operation using AERMOD. Assumptions and specific details of the modelling are provided in IEC (2024). Air concentrations at human receptor locations were predicted for different averaging periods for TSP, PM_{10}, $PM_{2.5}$, SO_2, NO_2, CO, acrolein, and BaP. It is acknowledged that there are exceedances of the selected air quality criteria for some constituents at a number of the human receptor locations. The specific predicted exceedances are discussed below:

- TSP: There are no exceedances of the annual TSP criterion of 60 µg/m^3 during any Project phase. There are predicted exceedances of the 24-hr TSP criterion of 120 µg/m^3 during site preparation and construction at a number of receptor locations including the farm, harvester, rural resident, Bowmanville resident, west/east beach, industrial/commercial worker, sport fisher (construction only), and camper (construction only). However, exceedances are infrequent (ranging from 1 to 10 days per year during site preparation and 1 to 31 days per year during construction).

- PM_{10}: There are no exceedances of the 24-hr PM_{10} criterion of 50 µg/m^3 during the operation phase. There are predicted exceedances during site preparation and construction at all human receptor locations other than the dairy farm and Oshawa resident (during site preparation) and the dairy farm (during construction); however, exceedances are infrequent (ranging from 3 to 42 days per year during site preparation and 1 to 91 days per year during construction).

- $PM_{2.5}$: 24-hr and annual $PM_{2.5}$ are predicted to be below their air quality criteria during site preparation and operation phases at all human receptor locations. During construction, exceedance of the 24-hr criterion is predicted at the farm, harvester, rural resident, west/east beach, sport fisher, and industrial/commercial worker. Exceedances are noted to range from 1 to 10 days per year.

- SO_2 and CO: Predicted air concentrations for all averaging periods for SO_2 and CO are predicted to remain below air quality criteria during all Project phases at all human receptor locations.

- NOx (as NO_2): There are no exceedances of the annual NOx criterion of 23 µg/m^3 during all Project phases. NOx concentrations exceed 1-hr criterion of 79 µg/m^3 during site preparation, construction, and operation and the 24-hr criterion of 200 µg/m^3 during site preparation only (at the rural resident).

- Acrolein: 24-hr and annual acrolein are predicted to be below their air quality criteria during all Project phases at all human receptor locations.

- BaP: Predicted BaP concentrations exceed the 24-hr criterion of 5.00E-05 µg/m^3 during site preparation at all human receptor locations and only at the farm and harvester location during operation (predicted to occur 1 day per year). The annual criterion of 1.00E-05 µg/m^3 was exceeded during all Project phases at all human receptor locations. The existing annual concentration of BaP is already above the criterion without the addition of BaP from DNNP activities.

TSP and PM_{10}

The 24-hr TSP criterion of 120 µg/m^3 is from the Ontario MECP, which identifies visibility as the sensitive endpoint for the TSP criterion rather than human or ecological health. Elevated TSP concentrations are generally not considered to pose significant health risks because these particles are too large (<50 – 100 µm) to be inhaled deep into the lungs (US EPA, 2022); therefore, TSP was not considered for further assessment in the PERA.

Occasional exceedance of the 24-hr PM_{10} criterion during site preparation and construction was predicted at human receptor locations. Exposures to elevated concentrations of PM_{10} are associated with various adverse respiratory and cardiovascular effects in humans. When inhaled, PM_{10} can deposit onto surfaces of the upper region of the lungs. However, the finer particles can be inhaled deeply into the lungs (i.e., $PM_{2.5}$) are associated with greater risk because they are more chemically active, and have more complex characteristics, than larger particles (HC, 2016a). If individuals are present during short periods of elevated PM_{10} they may experience short-term respiratory symptoms such as coughing, difficulty breathing, asthma symptoms and/or chronic bronchitis; however, effects should be reversible and subside after exposure. Short-term exposure to $PM_{2.5}$ is typically associated with a greater number of adverse health effects than would be experienced through short-term exposure to PM_{10}. Since there were minimal predicted exceedances of $PM_{2.5,}$ (during construction only and low frequency of exceedance ranging from 1 to 10 days per year) which is generally considered to be a more reliable indicator of potential adverse health effects, and as negative health effects would be infrequent and should subside after exposure, both PM_{10} and $PM_{2.5}$ were not considered for further quantitative assessment in the PERA.

<u>NOx (as NO_2):</u>

There are no predicted exceedances of annual screening values at any human receptor location during all Project phases; therefore, no long-term effects are expected. There are predicted infrequent exceedances (2 days per year) of the 24-hr screening criterion at the rural resident location during site preparation but no exceedances during construction and operation. There are predicted exceedances of the short-term 1-hr screening criterion at human receptor locations during site preparation, construction, and operation. Additional context to these exceedances is discussed further.

Potential adverse health effects that are attributed to short-term exposures to ambient nitrogen dioxide include asthma exacerbations and possibly increased risk of cardiopulmonary effects, and to a lesser extent cardiovascular and respiratory mortality (HC, 2016b). Individuals with certain pre-existing diseases such as asthma appear to be sensitive to exposure to ambient NO_2. Although it has been suggested that there may not be a threshold for the health effects of $NO_{2,}$ even considering short-term (1-hour) exposures (CCME, 2020), at least some reviews (Hesterberg et al., 2009) do not support this assertion and rather support a 1-hour threshold. Hesterberg et al. (2009) completed a critical review of over 50 human clinical studies in which human volunteers (including sensitive sub-populations: the elderly, children, and asthmatics) were exposed to NO_2 at concentrations ranging from 0.1 to 3.5 ppm (equivalent to 188 to 6,580 µg/m^3 [1 ppm = 1,880 µg/m^3) for periods of 30 minutes to 6 hours, often combined with exercise and co-pollutants. Their findings indicated that there is evidence of no-effect at low concentrations, and that a threshold of approximately 0.2 ppm (or 376 µg/m^3) is supported. Additionally, as reported in Health Canada (2016b), both the WHO and US EPA concluded that healthy individuals do not experience any adverse effects at concentrations up to 1 ppm (or 1,880 µg/m^3). The maximum predicted concentration of 1-hour NO_2 was 2,065 µg/m^3 at the rural resident location during site preparation, which is 110% of the concentration protective for short-term exposures in asthmatics per Hesterberg et al. (2009). If sensitive individuals are present during periods when ambient NO_2 concentrations exceed the screening value, it is possible that they could experience minor irritation of the respiratory system. These effects would subside after exposure. The maximum predicted concentration of 1-hour NO_2 during the construction phase is modelled to drop back below the 1,880 µg/m^3 value from Hesterberg et al. (2009), and reach a maximum of 1,572 µg/m^3 at the rural resident location.

As noted in IEC (2024), the predicted air quality results are considered to represent the maximum predicted concentrations at each receptor location at any time during the modelling period. These results do not represent a single point in time but rather a consolidation of potential worst-case concentrations experienced by each receptor, which may occur at different times and frequencies under varying real-world conditions. Furthermore, the modelling is considered conservative as emission rates were calculated assuming maximum equipment usage and activity rates (e.g., 24-hour continuous usage) during each applicable Project phase. A further level of conservatism was added to the modelling by using 90th and 98th percentile background concentrations, the latter of which already represents nearly 50% of the CAAQS standard before considering predicted incremental Project effects. It is expected that equipment usage/activity rates, meteorological conditions and background NO_2 concentrations will vary over the lifetime of the Project; the likelihood that "worst-case conditions" (i.e., elevated background NO_2 concentrations and unfavourable meteorological conditions including calm winds) would occur at the same time and persist long enough for appreciable health effects to occur is relatively low. Thus, maximum predicted NO_2 concentrations and exceedances of applicable air quality criteria are likely to be overestimated by the modelling.

As part of OPG's Environmental Monitoring and Environmental Assessment Follow-up (EMEAF) Plan, OPG is committed to monitoring TSP, PM_{10}, $PM_{2.5}$, BaP, acrolein, NO_2, SO_2 and CO during the site preparation and construction phases of the DNNP, and a minimum of one year during operation phase. OPG will continue to evaluate the air monitoring data to determine if additional mitigation measures are needed.

Considering the above discussion, NO_2 was not considered for further assessment in the PERA.

BaP:

The 24-hr and annual BaP criteria are predicted to be exceeded at human receptor locations during all Project phases (with the exception of 24-hr during construction where there no exceedances). Exceedances are primarily associated with elevated existing concentrations of BaP in air at the DNNP. BaP releases are associated with use of heavy equipment, fuel combustion by-products, and road transportation activities.

3.1.2.1.2 Selection of Chemical COPCs in Surface Water

As described in **Section 2.2.1.2**, the BWRX-300 is being designed to avoid chemical dosing, namely chlorine, for water filtration and biofouling prevention; rather, the design will rely on both active and passive mechanical measures to achieve these operational goals. However, as an additional backup measure, it is expected that there will still be provisions in the design to allow for chlorine injection in the future, to be used only if and as required. Thus, the only chemical

COPC conservatively considered in liquid effluent released to surface water is total residual chlorine (TRC).

No human health screening guidelines are available from federal and provincial jurisdictions for chlorine or TRC in drinking water. Chlorine is a common disinfectant used to treat drinking water to inactivate and kill waterborne pathogens and prevent biofouling of water supply systems. Health Canada (2009) has not established a drinking water guideline for chlorine, noting its low toxicity at concentrations commonly found in drinking water, which ranges between 0.04 to 2.0 mg/L. No adverse health effects have been observed in humans consuming water with chlorine levels up to 50 mg/L, though it should be noted this study represented an acute exposure to chlorine and did not assess long-term consumption (HC, 2009). The U.S. EPA's Regional Screening Levels (RSLs) generic tables provide resident tap water screening criteria for chlorine set at 2 mg/L (Target Hazard Quotient [THQ] = 1) and 0.2 mg/L (THQ = 0.1) considering oral ingestion by a child (US EPA, 2024). The World Health Organization (WHO) has established an acceptability guideline for chlorine of 5 mg/L based on the aesthetic qualities of taste, odour and appearance (WHO, 2011); however, this is not a health-based guideline and is not appropriate to be used as a human health screening guideline. It is important to recognize that the risks associated with chlorine disinfectant by-products in drinking water are outweighed by the risks associated with consuming inadequately disinfected water. Thus, Health Canada stipulates that any measures taken to limit the amount of chlorination in drinking water must not compromise the effectiveness of disinfection (HC, 2009). Considering the above, the U.S. EPA RSLs are selected as human health screening criteria for TRC in surface water.

Since detailed design for DNNP is not yet complete, the existing DNGS was used as a reference for determining a conservative amount of chlorine dosing for the BWRX-300, scaled back to account for the smaller reactor size and flows. Referring to the DNGS design and operating manuals, the following amounts have been prorated for DNNP as a suggestion for a conservative assumption that the maximum concentration of total residual chlorine (TRC) at the CCW duct never exceeds 0.01 mg/L, which is the ON MECP limit for discharge.

Waterborne effluent released from the DNNP would be discharged to the CCW duct and then diluted in Lake Ontario through the diffuser. Predicted effluent TRC results were therefore converted to estimated concentrations in the mixing zone using a dilution factor of 7 (Baird, 2024) at the diffuser. A range in dilution factors of 7:1 and 8:1 was identified in Baird (2024) depending on flow scenarios. For the purposes of the ERA, a dilution factor of 7:1 was selected to be conservative.

Assuming the maximum allowable concentration of 0.01 mg/L released from the diffuser into Lake Ontario, the screening of TRC is shown below in **Table 3-1**. Using the recommended site-specific diffuser dilution factor of 7, the estimated mixing zone TRC concentration released to Lake Ontario is calculated to be 0.0014 mg/L. This estimated concentration is below both the 2 mg/L (THQ = 1) and 0.2 mg/L (THQ = 0.1) RSLs. The U.S. EPA (2024) notes that RSLs are risk-based values suitable for screening potentially contaminated sites to determine if the degree of contamination warrants further investigation. Thus, the estimated mixing zone concentration for TRC being less than the U.S. EPA's RSLs for chlorine suggests that TRC does not pose a risk to human health and does not require further assessment in the predictive HHRA. Furthermore, the use of dechlorination agents to remove residual chlorine in the CCW system is expected to reduce end of pipe TRC concentrations to well below detection limits (Baird, 2024).

Table 3-1: Human Health Screening of Total Residual Chlorine in DNNP Effluent

Maximum Concentration of TRC Discharged in CW Duct	Lake Ontario Dilution Factor	Estimated Maximum Mixing Zone Concentration in Lake Ontario	Selected TRC Screening Guideline	Retained as COPC for Surface Water?
0.01 mg/L	7	0.0014 mg/L	2 mg/L (THQ=1) 0.2 mg/L (THQ=0.1)	No

3.1.2.2 Selection of Radiological COPCs

As noted in **Section 2.2.1** and earlier in this section, the BWRX-300 is expected to operate following a zero liquid release philosophy for radiological liquid waste; thus, no routine releases of radionuclides are expected to surface water (refer to **Section 7.0** for a sensitivity analysis where radiological releases to water are considered, including selection of COPCs).

The screening of atmospheric radiological COPCs has been previously described in **Section 2.2.2.1.1**. Results of the radiological air COPC screening are presented in **Table 2-2**, and the final list of radionuclides is summarized in **Table 2-3**.

3.1.2.3 Selection of Other Stressors

Noise is the only physical stressor mentioned in N288.6:22 (CSA, 2022a) as a potential non-chemical human stressor and is the only physical stressor associated with the DNNP that is of potential concern to humans.

3.1.2.3.1 Noise

Since completion of the 2009 DNNP EIS, Health Canada has released its *Guidance for Evaluating Human Health Impacts in Environmental Assessment: Noise* (HC, 2017). This document provides a novel method for estimating the percentage of people that would be "highly annoyed" (%HA) by exposure to different noise levels and types. Health Canada suggests that a noise impact requiring further evaluation and noise control measures occurs when an activity causes a change in %HA of +6.5%.

The measurement used to assess sound levels is the day-night sound level (Ldn). This value represents a 24-hour energy equivalent sound level that includes a 10 dB penalty for sounds that occur during night-time hours (22:00-07:00). The intention is to account for the heightened sensitivity of noise during night-time hours and capture a higher potential for annoyance during common sleeping hours. A dose-response curve is used to identify the %HA by sounds at the calculated levels. Additional noise control measures are required when the Ldn[9] exceeds 75 dBA. Health Canada (2017) notes that noises above this level are likely to cause sleep disturbance or disturb vulnerable populations.

Noise modelling results presented in **Section 2.5** indicate no exceedances of either the 75 dBA or +6.5 %HA noise guidelines provided by Health Canada (2017) during both the site preparation and construction phases of the Project. It should be noted again that this result is considered bounding of the operation phase, as noise generation is expected to be greatly reduced following the completion of site preparation/construction activities and the removal of heavy earthmoving vehicles/equipment from the Project site. Thus, the DNNP is not expected to result in the generation of noise levels that pose a risk to human health. Given the area's industrial and commercial uses, local residents are likely already accustomed to the existing sound levels produced by the DNGS, SMC, DYEC and local railway and vehicle traffic.

Consistent with the 2009 EIS, vibrations are not assessed for impacts to human receptors. With respect to bedrock removal for the Condenser Cooling Water and Reactor shafts, it is expected that OPG will utilize micro-blasting, a technique that uses less charge mass compared to more traditional, open-rock face blasting methods, thus resulting in the generation of less intense ground vibrations. Any vibrations produced by bedrock removal activities at the DNNP are expected to be bounded by existing blasting activities at the neighbouring St Marys Cement facility. Additionally, given the relative close proximity of the DNGS, it can be reasonably expected that any bedrock removal activities would be rigorously controlled to prevent ground motion and vibration impacts beyond the DNNP site (SENES & MMM, 2009). Furthermore, a Noise Management Plan has been developed for the DNNP that includes provisions, as necessary, to alert area residents in advance of any bedrock removal activities.

3.1.2.4 Summary of COPC Selection and Other Stressors

Table 3-2 below summarizes the radiological and non-radiological COPCs that are carried forward to the exposure assessment in the predictive HHRA. While the DNNP will be operated as a zero liquid release facility for radiological liquid waste, **Section 7.0** of this PERA conservatively assesses the release of radiological COPCs to surface water. The selection of radiological surface water COPCs is detailed in **Section 7.1**.

[9] Ldn: the average equivalent sound level over a 24-hour period, with a penalty for noise during the nighttime hours of 22:00 to 07:00.

Table 3-2: Summary of COPCs Selected for the Predictive HHRA

Category	Radiological COPCs	Chemical COPCs
Air	C-14, Co-60, Cs-134, Cs-137, H-3, I-131, I-132, I-133, I-134, I-135, Kr-85, Kr-85m, Kr-87, Kr-88, Xe-133, Xe-135, Xe-135m, Xe-138	BaP
Surface Water	None	None

3.1.3 Selection of Exposure Pathways

For exposure of human receptors to radiological COPCs, the relevant exposure pathways include:

- Air inhalation and external exposure to air;
- Ingestion of water (WSP, wells) and external exposure to water (lakes, WSPs, wells)
- Incidental ingestion of soil and beach sand;
- External exposure to soil and beach sand; and,
- Ingestion of food (homegrown and traditional foods).

The complete exposure pathways, as defined in OPG's EMP, for exposure of relevant receptors to radiological COPCs are summarized in **Table 3-3**. The Harvester receptor has also been added to the table. The final list of exposure pathways for chemical COPCs is presented in **Table 3-4**.

Table 3-3: Complete Exposure Pathways for Receptors for Exposure to Radiological COPCs

Receptor	Exposure Pathway	Environmental Media
Oshawa Urban Resident	Inhalation	Air
	Ingestion	Water (Oshawa WSP) Soil and beach sand Aquatic animals (Lake Ontario) Terrestrial plants (homegrown)
	External	Air Water Soil and beach sand
Bowmanville Urban Resident	Inhalation	Air
	Ingestion	Water (Bowmanville WSP) Soil and beach sand Aquatic animals (Lake Ontario) Terrestrial plants (homegrown) Terrestrial animals (local)
	External	Air Water Soil and beach sand
West/East Beach Urban Resident	Inhalation	Air
	Ingestion	Water (ground water wells, Bowmanville WSP) Soil and beach sand Aquatic animals (Lake Ontario) Terrestrial plants (homegrown) Terrestrial animals (local)
	External	Air Water Soil and beach sand
Farm	Inhalation	Air
	Ingestion	Water (ground water wells) Soil and beach sand Aquatic animals (Lake Ontario) Terrestrial plants (homegrown) Terrestrial animals (home raised)
	External	Air Water Soil and beach sand

Receptor	Exposure Pathway	Environmental Media
Dairy Farm	Inhalation	Air
	Ingestion	Water (ground water wells) Soil and beach sand Aquatic animals (Lake Ontario) Terrestrial plants (homegrown) Terrestrial animals (home raised incl. milk)
	External	Air Water Soil and beach sand
Rural Resident	Inhalation	Air
	Ingestion	Water (ground water wells, Bowmanville WSP) Soil and beach sand Aquatic animals (Lake Ontario) Terrestrial plants (local) Terrestrial animals (local)
	External	Air Water Soil and beach sand
Industrial/ Commercial Worker	Inhalation	Air
	Ingestion	Water (Bowmanville WSP)
	External	Air Water Soil
Sport Fisher	Inhalation	Air
	Ingestion	Aquatic animals (Lake Ontario)
	External	Air Water
Camper	Inhalation	Air
	Ingestion	Water (Oshawa WSP) Soil and beach sand Aquatic animals (Lake Ontario) Terrestrial plants (local) Terrestrial animals (local)
	External	Air Water Soil and beach sand
Harvester	Inhalation	Air
	Ingestion	Water (ground water wells) Soil and beach sand Aquatic animals (Lake Ontario) Terrestrial plants (traditional foods) Terrestrial animals (traditional foods)
	External	Air Water Soil and beach sand

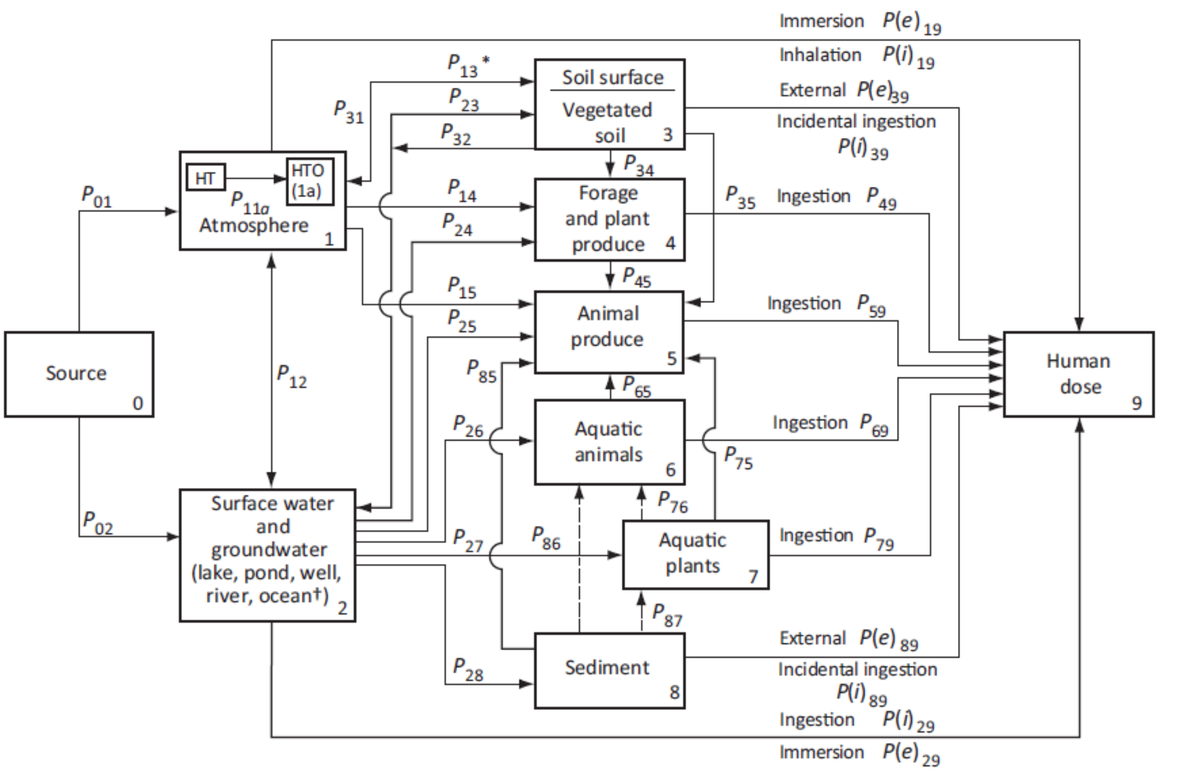
Table 3-4: Complete Exposure Pathways for Receptors for Exposure to Chemical COPCs

Receptor	Exposure Pathway	Environmental Media
Oshawa Urban Resident	Inhalation	Air
Bowmanville Urban Resident	Inhalation	Air
West/East Beach Urban Resident	Inhalation	Air
Farm	Inhalation	Air
Dairy Farm	Inhalation	Air
Rural Resident	Inhalation	Air
Industrial/ Commercial Worker	Inhalation	Air
Sport Fisher	Inhalation	Air
Camper	Inhalation	Air
Harvester	Inhalation	Air

3.1.4 Human Health Conceptual Site Model

The human health conceptual site model (CSM) illustrates how human receptors are exposed to COPCs. It represents the relationship between the source and receptors by identifying the source of contaminants, receptor locations and the exposure pathways to be considered in the assessment for each receptor. Exposure pathways represent the various routes by which radionuclides and/or chemicals may enter the body of the receptor, or (for radionuclides) how they may exert effects from outside the body.

A generic CSM, taken from CSA N288.1:20 (CSA, 2020) is shown in **Figure 3-1**, and is applied to human receptors around the DNNP. This represents the exposure pathways from source to receptor. It is appropriate for radiological and non-radiological COPCs, except that, for non-radionuclides, external and immersion pathways are represented by dermal exposure. Because none of the non-radiological COPCs are known to bioaccumulate, the ingestion of homegrown terrestrial plants (forage and plant produce) and ingestion of animal produce are not considered complete pathways.



*Includes transfer factors P_{13area}, P_{13mass}, and P_{13spw}.
†For ocean water, pathways P_{23}, P_{24}, P_{25}, and $P(i)_{29}$ are not used.
Notes:
(1) *The broken lines represent pathways that are not explicitly considered in the model or are considered only in special circumstances.*
(2) *Factors include multiple transfers where appropriate.*

Figure 3-1: Conceptual Model for Human Receptors (CSA, 2020)

3.1.5 Uncertainties in the Problem Formulation

The data used in the predictive HHRA problem formulation were concluded to be of adequate quality and quantity to support the objectives of the PERA. Maximum predicted concentrations were selected for COPC screening; this is considered conservative and is not reflective of typical human exposures.

Though the BWRX-300 will rely on mechanical means for control of impingement/entrainment and biofouling prevention, the screening of chlorinated effluent released to surface water conservatively demonstrated that there are no expected risks to human health. It should be noted that this screening assessment is based on details provided by the BWRX-300 design team and is assumed to be a maximum upper bound on potential chlorination levels of DNNP system waters. Additionally, the Ontario AAQC and federal CAAQS air quality criteria are considered adequate for screening priority air pollutants and are conservatively derived by considering human health risks.

As characterized by IEC (2024) and noted in **Section 3.1.2.1.1**, predicted air quality results are considered to represent maximum predicted concentrations at each receptor location at any time. These predictions do not represent a single point in time but rather a consolidation of potential worst-case concentrations experienced by each receptor, which may occur at different times and frequencies under varying real-world conditions. Furthermore, the air quality modelling is considered conservative as emission rates were calculated assuming maximum equipment usage and activity rates (e.g., 24-hour continuous usage) during each applicable Project phase. It is expected that equipment usage/activity rates, meteorological conditions and background COPC concentrations will vary over the Project lifespan; the likelihood that "worst-case conditions" (i.e., elevated background COPC concentrations and unfavourable meteorological conditions including calm winds) would occur at the same time and persist long enough for appreciable health effects to occur is relatively low. Thus, maximum predicted COPC concentrations and exceedances of applicable air quality criteria are likely to be overestimated by the modelling. The conservative assumptions considered for the air quality modelling similarly apply to the modelling of Project-related noise impacts as well. While inherently conservative in its design, the air quality and noise modelling relies on information provided by OPG and their contractors and is only as applicable as the inputs provided.

The development of the Harvester receptor relied on generic, non-site-specific information relating to Indigenous diet composition and traditional food consumption rates from the Ontario First Nations Food, Nutrition and Environment Study (FNFNES) published by Chan et al. (2014). The data used were for the ecozone that includes the DNNP location, but were not specific to the DNNP location. Though the data used are considered adequate for modelling exposures to local Indigenous receptors via the traditional food consumption pathway, the inclusion of site-specific consumption information would minimize uncertainties in future risk assessments relating to the Harvester receptor's exposure to COPCs in local traditional foods.

3.2 Exposure Assessment

The exposure assessment includes identification of exposure locations and exposure factors for each receptor, explanation of dispersion models, and presentation of modelled exposure concentrations and doses (radiological and non-radiological). Uncertainties are also discussed. This section will present the information used in the IMPACT model, and the model results.

3.2.1 Exposure Locations

An exposure location is the place where the receptor comes into contact with a COPC. The relevant human receptors are the potential critical groups defined in the 2023 EMP (OPG, 2024a), with the exception of the new Harvester receptor included as part of this PERA, as discussed in **Section 3.1.1.2**. The exposure locations of the human receptors have been conservatively located at the nearest/most exposed location for each potential critical group. Below, **Figure 3-2** presents the locations of these receptors which are generally consistent with the 2020 DN ERA (Ecometrix, 2022), the 2024 DN ERA Addendum (Ecometrix, 2024) and OPG's annual DN EMP reports, with the exception of the new Harvester receptor conservatively located at the same location as the farm location since it consistently has the highest radionuclide concentrations in air due to the predominant wind direction to the west-north-west (WNW) basing on the annual average meteorology data from 2017 to 2023.

Figure 3-2: Human Receptor Locations for the Predictive HHRA

3.2.2 Exposure Duration and Frequency

Human receptors are assumed to reside at their exposure location year-round (100%), except for the Industrial/Commercial worker, sport fisher and camper. The Industrial/Commercial worker is exposed about 23% of the time based on a typical 8-hour workday schedule. The Sport Fisher is assumed to spend 1% of their time at the discharge location where atmospheric exposure occurs. The Camper is assumed to be in the park no more than six months of the year (50%).

Similar to the identification in the 2023 EMP (OPG, 2024a) report and the 2022 DRL report (OPG, 2022b), it is assumed based on site specific survey information that 18% of the adult Oshawa/Courtice residents, 17% of the adult Bowmanville residents, 12% of the West/East Beach residents, and 9% of the Rural residents, also work within 5 km of the DN site. Therefore, to be conservative, it is assumed in this PERA that 18% of the Harvester residents also work within 5 km of the DN site. Doses to adults in these critical groups are adjusted using the Industrial/Commercial worker dose, to account for the increased exposure while at work due to proximity of this worker location to the station. It is assumed that members of the Farm and Dairy Farm groups live and work at the farm and do not form part of the Industrial/Commercial group.

3.2.3 Exposure and Dose Calculations

Radiological dose calculations follow the equations in CSA N288.1:20 (CSA, 2020), and are presented below.

Dose via particulate inhalation was calculated using the following equation:

$$Dose_{inh}\left(\frac{Sv}{annum}\right) = I \times DC_{inh} \times OF_i \times C_a$$

C_a = concentration in air (Bq/m^3)
DC_{inh} = dose coefficient for inhalation (Sv/Bq)
I = inhalation rate (m^3/a)
OF_i = occupancy factor (unitless)

Dose from immersion in contaminated air was calculated using the following equation:

$$Dose_{imm}\left(\frac{Sv}{annum}\right) = f_0 \times [f_u + (1 - f_u) \times S_b] \times DC_a \times C_a$$

C_a = concentration in air (Bq/m^3)
DC_a = effective dose coefficient for a semi-infinite cloud ($Sv\text{-}m^3/Bq\text{-}a$)
f_0 = fraction of time spent at exposure location (unitless)
f_u = time spent outdoors as a fraction of time spent at site (unitless)
S_b = building shielding factor (unitless)

Dose from groundshine was calculated using the following equation:

$$Dose_{groundshine}\,(\frac{Sv}{annum}) = f_0 \times f_r \times [f_u + (1 - f_u) \times S_g] \times \ DC_g \times C_g$$

C_g = activity in ground surface (Bq/m^2)
DC_g = effective dose coefficient for ground deposit ($Sv\text{-}m^2/Bq\text{-}a$)
f_i = time spent indoors as fraction of time spent on-site (unitless)
f_0 = fraction of time spent at exposure location (unitless)
f_r = dose reduction factor for non-uniformity of ground surface (unitless)
f_u = time spent outdoors as fraction of time spent on-site (unitless)
S_g = shielding factor for groundshine (unitless)

Dose via soil ingestion was calculated using the following equation:

$$Dose_{soil}\,(\frac{Sv}{annum}) = I_s \times EF_S \times DC_f \times C_s \times (D_f)_s$$

C_s = concentration in soil/sediment (Bq/kg dw)
DC_f = dose coefficient for ingestion (Sv/Bq)
$(D_f)_s$ = dilution factor for shoreline deposits that allows for non-equilibrium between suspended sediment and shoreline deposits (unitless). For soil ingestion this term is not used.
EF_s = days per year when soil/sediment ingestion could occur (days)
I_s = incidental soil/sediment intake rate (kg dw/day)

Dose via immersion in water was calculated using the following equation:

$$Dose_{immersion}\,(\frac{Sv}{annum}) = C_w \times DC_w \times (OF_w + D_c \times \rho \times OF'_w + \rho \times OF''_w)$$

C_w = concentration in water (Bq/L)
DC_w = dose coefficient for immersion in an infinite uniformly contaminated water medium (Sv-L/Bq-a)
D_C = correction factor to account for the finite size of a bathtub (unitless)
ρ = removal factor for to account for processes such as sedimentation and removal of radionuclides by water treatment plants (unitless)
OF_w = fraction of year spent swimming in a surface water body (unitless)
OF_w' = fraction of year spent bathing (unitless)
OF_w'' = fraction of year spent in a swimming pool (unitless)

Dose via water ingestion was calculated using the following equation:

$$Dose_{ingestion}\,(\frac{Sv}{annum}) = \rho_w \times k_w'' \times I_w \times DC_f \times C_w$$

C_w = concentration in groundwater (Bq/L)
DC_f = dose coefficient for intake by ingestion (Sv/Bq)

I_w = drinking water intake rate (L/a)
k''_w = fraction of drinking water intake that is contaminated (unitless)
ρ_w = removal factor for water treatment (unitless)

Dose from ingestion of diet components was calculated using the following equation:

$$Dose_{diet}(\frac{Sv}{annum}) = \rho_f \times g_f \times I_f \times DC_f \times C_f$$

C_f = concentration in food (Bq/kg fw)
DC_f = dose coefficient for intake by ingestion (Sv/Bq)
g_f = fraction of food from contaminated source (unitless)
I_f = intake of food (kg fw/a)
ρ_f = adjustment factor for food processing (unitless)

3.2.4 Exposure Factors

3.2.4.1 Radiological Exposure Factors

For the radiological dose calculations, the exposure factors (e.g., intake rates, occupancy and shielding factors, etc.) are generally those used in CSA N288.1:20 (CSA, 2020). The intake rates for ingestion and inhalation are the central or mean intake rates provided in CSA N288.1:20 (CSA, 2020). **Table 3-5** summarizes the exposure factors used in radiological dose calculations that were updated for the 2023 EMP report (OPG, 2024a).

Table 3-5: Human Exposure Factors for Radiological Dose Calculations

Exposure Factor	Units	Infant 1 year	Child 10 year	Adult
Inhalation rate	m^3/a	1830	5660	5950
Inhalation occupancy factor	unitless	1.0	1.0	1.0
Incidental soil ingestion rates	g dw/d	0.061	0.055	0.004
Incidental ingestion of sediment	g dw/d	0.061	0.055	0.004
Drinking water intake rate	L/a	98.9	151.1	379.6
Aquatic animal intake rate[(a)]	kg/a	1.68	4.82	6.86
Terrestrial animal intake rates	kg/a	262.3	286.3	255.5
Terrestrial plant intake rates	kg/a	144.5	331.1	440
Outdoor occupancy factor	unitless	0.2	0.2	0.2
Indoor plume shielding factor (skin dose and pure beta emitters)	unitless	1.0	1.0	1.0
Indoor groundshine shielding factor (gamma emitters)[(b)]	unitless	0.5	0.5	0.5
Indoor groundshine shielding factor (pure beta emitters)[(b)]	unitless	0	0	0
Groundshine shielding factor (uneven surface shielding)	unitless	0.2	0.2	0.2

Exposure Factor	Units	Infant 1 year	Child 10 year	Adult
Beach swim occupancy factor	unitless	0	0.014	0.014
Bathing occupancy factor	unitless	0.014	0.014	0.014
Pool swim occupancy factor (WSP fill)	unitless	0	0.028	0.028
Pool swim occupancy factor (Well water fill)	unitless	0	0.014	0.014
Skin area	m^2	0.72	1.46	2.19
Dilution factor for shoreline sediments (DF)s	unitless	1.0	1.0	1.0
Shore Width factor (lake)	unitless	0.3	0.3	0.3
Shoreline occupancy factor	unitless	0.02	0.02	0.02
No. days/year soil ingested	d/a	135	135	135
No. days/year sediment ingested	d/a	45	45	45

Notes:
[a] Excludes shellfish due to freshwater environment at DN. Shellfish are a marine environment food product.
[b] For effective and skin dose.

3.2.4.2 Human Diet

The site-specific survey data has been used to develop the water and food sources for the human receptors (except harvester). The human diet details are the same as described in the 2022 DRL report for Darlington Nuclear Generating Station (OPG, 2022b), which are not provided again here.

Neither a site-specific traditional foods diet study nor a WTFNs Indigenous Knowledge study is available at this time; therefore, publicly available information is used to form the initial basis of the diet for the Harvester. The diet for the Harvester is composed of traditional foods as well as store-bought foods. Traditional foods are animals and plants that are fished, hunted, or gathered from the land and consumed as food (HC, 2018). The discussion below is focused on the traditional foods component of the diet. The main source of information for ingestion rates and food components of traditional foods is the First Nations Food, Nutrition and Environment Study (FNFNES) for Ontario (Chan et al., 2014). Part of the FNFNES included household interviews to collect information on foods consumed. The FNFNES is the most recent publicly available study from Ontario on traditional food consumption rates.

The Harvester receptor for the DNNP PERA utilizes, as an initial set of characteristics and subject to further refinements in collaboration with the WTFNs, available information from the FNFNES for the Mixedwood Plains (Chan et al., 2014). Based on the data review, the following key assumptions and methodologies for traditional foods consumption were applied:

- The consumption rates for the average consumer were assumed to be representative of the Harvester receptor. Harvesting of traditional food was assumed to occur near the DNNP site.
- The consumption rates were assumed to be the average of those reported for male and female, for each traditional food category (fish, game meat, game organs, birds, and

plants) were used. The consumption rate for fish, game meat and organs is higher for males, and the consumption rate for birds and plants is higher for females; therefore the gender-averaged consumption rates were considered appropriate.

- The traditional food categories are broken down into more detailed categories which include: fish, large mammal, small mammal, mammal organs, riparian bird, terrestrial bird, and plants.
- Based on knowledge of ecological receptors that exist near the DNNP, a representative traditional food is then selected to represent all traditional foods identified in the traditional food category (**Table 3-7**).
  - Walleye was selected as the representative fish since it was more commonly observed in Lake Ontario near the DN site than yellow perch or smallmouth bass (Ecometrix, 2022).
  - Deer was selected as the representative large mammal since deer have been observed on the DN site. The closest Wildlife Management Unit in Ontario that allows sustainable harvest of moose is approximately 100 km away. While members of Indigenous peoples may harvest moose, deer is more common near the DN site.
  - Canada goose was selected as the representative terrestrial bird. While both Canada goose and wild turkey have been observed on the DN site, Canada goose was selected since it was identified as a species that has been injured/killed through vehicle collisions; indicating it is likely more common than wild turkeys near the DN site.

The consumption rates used for each food category for the Harvester receptor in the DNNP PERA are shown in **Table 3-6** in the column “proportioned consumption rate”. The specific food items that are modelled to represent each food category are shown in

Table 3-7 in the column “representative traditional food for modelling”. It is understood that this is the starting point to represent the Harvester diet for assessment purposes and these characteristics will be refined over time through ongoing engagement with the WTFN, and updated in future ERAs.

Table 3-6: Processed Consumption Rates for Harvester Modelling

Traditional Food Category	Table 10a FNFNES (g/d)[b]	Table 10e FNFNES (g/d) [b]	% of Traditional Food Category	Traditional Food Category (Detailed)	% of Traditional Food Category (Detailed)	Proportioned Consumption Rate (g/d)	% of Traditional Food Diet
Total Traditional Food[a]	**41.81**	**-**	**-**	**-**	**-**	**41.81**	**100%**
Fish	**10.35**	**-**	**100%**	**-**	**-**	**-**	**-**
Walleye/pickerel	-	4.92	34%	Fish	100%	10.35	25%
Yellow perch	-	6.69	46%				
Smallmouth bass	-	2.99	20%				
Game meat	**8.21**	**-**	**100%**	**-**	**-**	**-**	**-**
Deer	-	6.71	55%	Large mammal	83%	6.85	16%
Moose	-	3.51	29%				
Rabbit	-	2.03	17%	Small mammal	17%	1.36	3%
Game organs	**4.88**	**-**	**100%**	**-**	**-**	**-**	**-**
Moose liver	-	3.69	56%	Mammal organs	100%	4.88	12%
Deer liver	-	2.9	44%				
Birds	**2.28**	**-**	**100%**	**-**	**-**	**-**	**-**
Wild turkey	-	0.97	30%	Terrestrial bird	69%	1.58	4%
Canada Goose	-	1.27	39%				
Ducks	-	1.00	31%	Riparian bird	31%	0.7	2%
Plants	**16.09**	**-**	**100%**	**-**	**-**	**-**	**-**
Corn	-	3.79	37%	Terrestrial Plants	100%	16.09	38%
Squash	-	2.30	22%				
Beans	-	4.28	41%				

Notes:
[a] The sum of the consumption rates for the Traditional Food Categories is used rather than the total reported in Table 10e in the FNFNES (Chan et al., 2014). This is considered conservative.
[b] Represents an average consumer, average of men and women surveyed in the FNFNES (Chan et al., 2014).

Table 3-7: Traditional Foods Selected for Harvester Modelling

Traditional Food Category	Traditional Food Category (Detailed)	Traditional Foods Most Consumed (from FNFNES)	Representative Traditional Food for Modelling
Fish	Fish	Walleye/pickerel	Walleye
		Yellow perch	
		Smallmouth bass	
Game	Large mammal	Deer	Deer
		Moose	
	Small mammal	Rabbit	Rabbit
Game Organs	Mammal organs	Deer organs	Deer organs
		Moose organs	
Birds	Riparian bird	Duck	Mallard
	Terrestrial bird	Canada goose	Canada goose
		Wild turkey	
Plants	Plants	Corn	Vegetables
		Squash	
		Beans	

The adult, child, and infant age groups were assessed for the Harvester in the DNNP PERA. The Harvester was conservatively assumed to be located at the same location as the Farm potential critical group characterized in OPG's existing Environmental Monitoring Program and ERAs, since the farm location consistently has the highest radionuclide concentrations in air due to the predominant wind direction to the west-north-west (WNW), based on the annual average meteorology data from 2017 to 2023.

The water intake of the Harvester is also conservatively assumed to be the same as for the Farm. Water for drinking, bathing, and gardening is obtained from both shallow and deep wells. Consistent with existing EMP assumptions, a small fraction of adult residents living near DN also work within 5 km of the DN site. Therefore, it is assumed that 18% of the Harvester residents are also Industrial/Commercial workers, spending 23% of their time at work and 77% of the time at home.

The traditional food items consumed by the Harvester adult were assumed to be taken from the nearby farm location, except for fish which was taken from the outfall location at DNNP, which is representative of fish in Lake Ontario in the initial mixing zone. The local food intake fractions implemented in the IMPACT model for the Harvester receptor are shown in **Table 3-8**. The local food intake fraction was calculated as follows:

Local Intake Fraction (%) = (Annual Intake of a Traditional Food Type / Total Annual Food Intake in the Corresponding Food Category) * Local Harvest Fraction * 100%

where,

Annual Intake of a Traditional Food Type = annual ingestion rate of a traditional food type consumed within each relevant food category (kg/yr).

Total Annual Food Intake in the Corresponding Food Category = annual ingestion rate for traditional + store bought food in the food category (kg/yr).

Local Harvest Fraction = the fraction of the traditional food type that is harvested locally (unitless). For this assessment a local harvest fraction of 1 has been conservatively assumed for all food types.

As discussed above, the annual traditional food intake of the Harvester adult for the DNNP PERA was developed utilizing the available information from the FNFNES for the Mixedwood Plains ecozone, while the total annual food intake of a Harvester adult is taken from Table G.9b in CSA N288.1:20 (CSA, 2020), split up by food categories. The data in CSA N288.1:20 (CSA, 2020) are from a survey conducted jointly by Health Canada and Statistics Canada in 2004 (Statistics Canada, 2004). They represent the average dietary intakes for the different age groups of the general population, with diets adjusted to reference energy intakes. The FNFNES report only provides traditional food intake rates for adults. The traditional food intake rates for the Harvester 10y-child and Harvester 1y-infant were determined based on the ratio of the consumption rates by food item for the 10y-child/adult and 1y-infant/adult, as provided in CSA N288.1:20; Table G.9b (CSA, 2020).

Table 3-8: Local Food Intake Fractions for Harvester for IMPACT Model – Adult, Child, and Infant

Food Category in IMPACT Model	Traditional Food Type (Detailed)	Representative Traditional Food for Modelling	Adult			Child-10y			Infant-1y		
			Total Diet by Food Category (kg fw/a) [(a)]	Proportioned Traditional Foods Consumption Rate (kg fw/a) [(b)]	Local Intake Fraction [(c)]	Total Diet by Food Category (kg fw/a) [(a)]	Proportioned Traditional Foods Consumption Rate (kg fw/a) [(d)]	Local Intake Fraction [(c)]	Total Diet by Food Category (kg fw/a) [(a)]	Proportioned Traditional Foods Consumption Rate (kg fw/a) [(d)]	Local Intake Fraction [(c)]
Aquatic Animals	Fish	Walleye	6.86	3.78	55.07%	4.82	2.65	55.03%	1.68	0.92	55.02%
Terrestrial Animals	Large mammal	Deer	253.9	2.50	0.98%	286.25	0.70	0.24%	262.28	0.20	0.08%
	Small mammal	Rabbit		0.50	0.20%		0.14	0.05%		0.05	0.02%
	Mammal organs	Deer organs		1.78	0.70%		1.24	0.43%		0.45	0.17%
	Riparian bird	Mallard		0.26	0.10%		0.14	0.05%		0.05	0.02%
	Terrestrial bird	Canada goose		0.58	0.23%		0.32	0.11%		0.12	0.05%
Terrestrial Plants	Plants	Vegetables	441.7	5.87	1.33%	331.09	3.19	0.96%	144.54	0.12	0.08%

Notes:

[(a)] Total diet by food category is from CSA N288.1:20; Table G.9b.

[(b)] Proportioned consumption rate in Table 3 with unit conversion from g/d to kg/a.

[(c)] Local Intake Fraction = (annual food Intake of a traditional food type / total annual food intake in the corresponding food category) * local harvest fraction * 100%. Note, local harvest fraction is assumed to be 1.

[(d)] Consumption rates for 10y-child and 1y-infant were proportioned from adult based on the consumption rate ratio of 10y-child/adult and 1y-infant/adult by food item as provided in CSA N288.1:20; Table G.9b.

3.2.4.3 Bioaccumulation Factors for Human Food Items

Bioaccumulation factors (BAFs) relate the COPCs in the environmental media to the concentration in the aquatic biota and terrestrial plants. The BAFs used for assessing the concentrations in human food items are presented in **Table A-1** in **Appendix A**.

3.2.4.4 Transfer Factors for Human Food Items

Transfer factors (TFs) represent the fraction of daily COPC intake transferred to the tissue of birds and mammals. The TFs used for assessing the concentrations in human food items are presented in **Table A-2**, **Table A-3** and **Table A-4** in **Appendix A**.

3.2.4.5 Human Dose Coefficients

Dose coefficients (DCF) for all internal and external exposure routes for humans are used to estimate radiological exposure. The DCFs for ingestion and inhalation by human receptors were taken from CSA N288.1-20 (CSA, 2020), which generally follows the ICRP 72 (ICRP, 1995), as well as ICRP 72 itself for radionuclides that were not addressed in CSA N288.1-20 (CSA, 2020). The external DCFs used in the IMPACT model were derived based on the methods described in CSA N288.1-20 (CSA, 2020). DCF for all internal and external exposure routes for humans are presented in **Table A-5** in **Appendix A**.

3.2.5 Dispersion Models

Dispersion models used to estimate COPC concentrations in physical media are described in **Section 2.2.2.1.2**. The dispersion equations are consistent with CSA N288.1:20 (CSA, 2020), as implemented in the IMPACT model.

3.2.6 Exposure Point Concentrations and Doses

The radiological release rates, receptor characteristics, and the exposure factors detailed in the previous sections, were used as inputs into the IMPACT™ model to predict the radiological doses to human receptors from the DNNP.

This section presents the estimated concentrations (environmental media concentrations), as well as estimated radiation doses to human receptors due to atmospheric releases from the DNNP. The environmental media concentrations are summarized in **Table B-1** in **Appendix B**, the foodstuff concentrations are summarized in **Table B-2** in **Appendix B**, and the doses by pathways are summarized in **Table B-3** in **Appendix B** as well as the total doses in **Table 3-11** Sample calculations are provided in **Appendix F**. The results are based on releases from four SMRs.

The human receptors with the highest predicted radiological dose from 4 SMRs are:

- Dairy Farm (infant): 0.66 µSv/a
- Farm (adult): 0.65 µSv/a

- Farm (child): 0.60 µSv/a

The dose to the Dairy Farm (infant) is predominantly from C-14 (53%) in milk and terrestrial plants, and I-131 (41%) in milk. At the Farm, the dose is predominantly from C-14 (70%) in terrestrial plants, and Xe-138 (16%) from inhalation and immersion.

3.2.7 Uncertainties in the Exposure Assessment

The IMPACT™ model was used to predict dose to identified human receptors from the SMR. The IMPACT™ model used is a steady state model; however, it includes time dependent equations to account for buildup in soil from deposition, for all radionuclides released.

It includes progeny buildup through use of progeny inclusive dose coefficients. Forty years of ingrowth was used to develop the progeny inclusive external dose coefficients for soil for each radionuclide, which is the timeframe used in CSA N288.1:20 for development of progeny-inclusive dose coefficients for sediment and soil exposure (CSA, 2020). This is a reasonable assumption considering the anticipated lifespan of the SMRs. Exposure factors were based on best-available information from literature with preference for exposure factors identified in CSA N288.1:20 (CSA, 2020).

Uncertainties in predictions of media concentrations arise from inherent uncertainty in the air model in IMPACT™. The model reports an annual average concentration, and typically over-predicts this concentration by a factor of 1.5. Uncertainty in the air predictions arises from the following assumptions made in the model:

- The activity in the plume has a normal distribution in the vertical plane.
- The effects of building-induced turbulence on the effective release height and plume spread have been generalized, while data suggest that effects of building wakes vary substantially depending upon the geometry of the buildings and their orientation with respect to wind direction.
- A given set of meteorological and release conditions leads to a unique modelled air concentration, whereas in reality measured concentrations can vary by a factor of 2 under identical conditions.

The dispersion model is valid for distances up to approximately 20 km. CSA N288.1:20 indicates that at distances greater than 20 km the dispersion model should be used with caution because at distances greater than 20 km the assumption of steady state meteorological conditions implicit in the model becomes less valid (CSA, 2020).

The uncertainties from the exposure assessment also include uncertainty in the exposure factors selected. In general, exposure factors developed to characterize human receptors were selected from published sources such as CSA N288.1:20 (CSA, 2020), or site-specific values were identified based on OPG's site-specific surveys.

For the harvester, there is uncertainty related to the dietary assumptions. Publicly available information from FNFNES (Chan et al., 2014) was used; however, the intent is to refine the assumptions through site specific surveys and further engagement with Indigenous Nations and communities.

Considering the conservatism described above in the air model, and in the exposure factors, it is reasonable to conclude that doses arising from DNNP activities have not been underestimated.

3.3 Toxicity Assessment

3.3.1 Toxicological Reference Values (TRVs)

Based on the discussion and conclusions in **Sections 3.1.2.1.1 and 3.1.2.4**, the only non-radiological COPC identified for quantitative assessment is benzo(a)pyrene in air. Benzo(a)pyrene may present non-cancer and cancer hazards through inhalation. The selected inhalation TRVs are identified in **Table 3-9** below.

Table 3-9: Chronic Non-cancer and Cancer Unit Risk Inhalation TRVs

Constituent	Duration	Value	Unit	Critical Effect	Source
Benzo(a)pyrene (non-cancer)	Chronic	2.0E-03	µg/m^3	Developmental toxicity (decreased embryo/fetal survival)	(HC, 2021a)
Benzo(a)pyrene (cancer)	Chronic	6.0E-04	(µg/m^3)$^{-1}$	Cancer (tumours of the upper gastrointestinal tract and upper respiratory tract)	(HC, 2021a)

3.3.2 Radiation Dose Limits and Targets

The public dose limit for radiation protection is 1 mSv/a, as described in the Radiation Protection Regulations under the Nuclear Safety and Control Act. This limit is defined as an incremental dose. It is set at a fraction of natural background exposure to radiation. Public doses arising from licensed facilities are compared to the public dose limit and higher doses are considered unacceptable.

3.3.3 Uncertainties in the Toxicity Assessment

Uncertainty factors are inherent to the inhalation TRVs selected for benzo(a)pyrene. For the non-cancer inhalation TRV of 2.0E-03 µg/m^3, an uncertainty factor of 3000 has been applied – this accounts for a factor of 3 for toxicodynamic differences, 10 for intraspecies variability, 10 for LOAEL to NOAEL extrapolation, and 10 for database deficiencies. For the cancer inhalation unit risk of 6.0E-04 (µg/m^3)$^{-1}$ specific uncertainty factors are not applicable; however, the unit risk provides a conservative scaling from rodent to human. The BaP unit risk is based on tumours of the upper gastrointestinal tract and upper respiratory tract (HC, 2021a).

3.4 Risk Characterization

3.4.1 Risk Estimation and Discussion of Non-Radiological Effects

The risk characterization combines the results of the exposure assessment and toxicity assessment to estimate the potential for cancer and non-cancer human health effects from exposure to the COPCs.

The methods of non-radiological risk estimation used for the HHRA were:

- Hazard Quotients (HQs) for non-carcinogens; and
- Incremental Lifetime Cancer Risk (ILCR) for carcinogens.

Since BaP is considered for both non-carcinogenic and carcinogenic risk both HQs and ILCRs are calculated. The HQs were calculated as the ratio of the air concentration (adjusted based on fraction of time spent at the location) divided by the TRV, as shown below:

$$HQ = \frac{Exposure\ Estimate}{TRV}$$

The HQs were compared to a benchmark value of 0.2 per medium, to account for uncertainty in pathways beyond Project activities (i.e., exposure to background sources unrelated to the Project). This approach is consistent with the approach taken by Health Canada in its guidance on human health preliminary quantitative risk assessment (HC, 2021b).

For carcinogenic risk, the incremental risk (i.e., total risk minus background risk) of developing cancer over a lifetime was estimated by multiplying the predicted air concentration above background by the inhalation cancer unit risk, as shown below:

$$ILCR = \sum C_{ai} \times TR_i \times UR \times ADAF_i$$

where,

ILCR	=	incremental lifetime cancer risk (unitless)
C_{ai}	=	concentration in air during lifestage i (µg/m^3)
TR_i	=	fraction of time exposed for lifestage i (yr/80 yr)
UR	=	adult inhalation cancer unit risk (µg/m^3)$^{-1}$
$ADAF_i$	=	age-dependent adjustment factors for lifestage i

The intent is to estimate an ILCR for a composite receptor exposed to the constituent throughout all stages of a lifetime. For this assessment, the composite receptor was calculated assuming 0.5 years as an infant, 4.5 years as a toddler, 7 years as a child, 8 years as a teen and 60 years as an adult.

The mode of action for BaP is considered mutagenic; therefore, ADAFs are used to account for varying sensitivities of age-specific exposure periods. The ADAFs applied are 10 for infant, 5 for toddler, 3 for child, 2 for teenager, and 1 for adult (HC, 2013).

Incremental lifetime cancer risks were compared against an increase in lifetime cancer risk of 1 in 1,000,000 (10^{-6}) consistent with CSA N288.6:22.

The HQs and ILCRs for BaP were calculated for site preparation, construction and operation for all human receptor locations and are shown in **Table 3-10**. The predicted HQs for BaP at all human receptor locations are below 0.2 for all Project phases and the predicted ILCRs are below 1 in 1,000,000 for all Project phases; therefore, no adverse chronic effects from inhalation of BaP are expected.

Table 3-10: Predicted Non-Cancer and Cancer Benzo(a)pyrene Risk for Human Receptors

		Existing Conditions	Annual BAP (Increment, Site Preparation)	Annual BAP (Total, Site Preparation)	Annual BAP (Increment, Construction)	Annual BAP (Total, Construction)	Annual BAP (Increment, Operation)	Annual BAP (Total, Operation)	Hazard Quotient (Site Preparation)(a)	Hazard Quotient (Construction)(a)	Hazard Quotient (Operation)(a)	ILCR (Site Preparation)(b)	ILCR (Construction)(b)	ILCR (Operation)(b)
		(µg/m³)	(µg/m³)	(µg/m³)	(µg/m³)	(µg/m³)	(µg/m³)	(µg/m³)	Unitless	Unitless	Unitless	Unitless	Unitless	Unitless
R15_REMP_1	Farm & Harvester	3.01E-05	2.14E-05	5.15E-05	4.14E-08	3.01E-05	5.58E-07	3.07E-05	2.58E-02	1.51E-02	1.53E-02	2.00E-08	3.87E-11	5.21E-10
R17_REMP_2	Rural Resident	3.01E-05	2.24E-05	5.25E-05	3.17E-08	3.01E-05	4.18E-07	3.05E-05	2.62E-02	1.51E-02	1.53E-02	2.09E-08	2.96E-11	3.90E-10
R21_REMP_3	Bowmanville Resident	3.01E-05	5.92E-06	3.60E-05	8.53E-09	3.01E-05	1.24E-07	3.02E-05	1.80E-02	1.51E-02	1.51E-02	5.52E-09	7.96E-12	1.15E-10
R22_REMP_4	West/East Beach Resident	3.01E-05	1.39E-05	4.40E-05	1.95E-08	3.01E-05	2.46E-07	3.03E-05	2.20E-02	1.51E-02	1.52E-02	1.30E-08	1.82E-11	2.29E-10
REMP_5	Sport Fisher	3.01E-05	1.74E-05	4.75E-05	4.13E-08	3.01E-05	3.90E-07	3.05E-05	2.37E-04	1.51E-04	1.52E-04	1.62E-08	3.86E-11	3.65E-10
REMP_6	Industrial/Commercial	3.01E-05	1.60E-05	4.61E-05	2.95E-08	3.01E-05	3.78E-07	3.05E-05	5.30E-03	3.46E-03	3.50E-03	1.49E-08	2.75E-11	3.53E-10
REMP_7	Camper	3.01E-05	8.46E-06	3.86E-05	1.59E-08	3.01E-05	1.91E-07	3.03E-05	9.64E-03	7.53E-03	7.57E-03	7.90E-09	1.48E-11	1.78E-10
REMP_9	Dairy Farm	3.01E-05	1.42E-06	3.15E-05	2.24E-09	3.01E-05	3.14E-08	3.01E-05	1.58E-02	1.51E-02	1.51E-02	1.32E-09	2.09E-12	2.94E-11
Oshawa_res	Oshawa Resident	3.01E-05	1.92E-06	3.20E-05	3.10E-09	3.01E-05	4.66E-08	3.01E-05	1.60E-02	1.51E-02	1.51E-02	1.80E-09	2.89E-12	4.35E-11

Notes:
(a) The Sport Fisher, Camper, and Industrial/Commercial receptors are assumed to only spend 1%, 50%, and 23% of their time at their locations. This has been factored into the HQ calculation.
(b) The ADAFs used in the ILCR calculation are shown in addition to the fraction of time exposed per lifestage (TR_i)

Age	ADAF - Mutagenic mode	ED (yr)	LE (yr)	TR_i = ED/LE
Infant	10	0.5	80	0.00625
Toddler	5	4.5	80	0.05625
Child	3	7	80	0.0875
Teenager	2	8	80	0.1
Adult	1	60	80	0.75

3.4.2 Risk Estimation and Discussion of Radiation Effects

The total radiation doses to human receptors are compared to the regulatory public dose limit of 1 mSv/a. A summary of the total dose for each human receptor and age group and comparison against the dose limit is provided in **Table 3-11**.

The highest total dose due to atmospheric radiological release from 4 SMRs is 6.55E-04 mSv/a for the dairy farm infant. The dose estimates for the human receptors range from approximately 0.001% of the regulatory public dose limit of 1 mSv/a to a maximum of 0.07% of the regulatory public dose limit. Demonstrating that these human receptor groups are protected implies that other receptor groups near the DN site with anticipated lower exposure are also protected.

Since the dose estimates are a small fraction of the incremental public dose limit of 1 mSv/a, and of the natural background dose of 1.4 mSv/a, no discernable health effects are anticipated due to exposure of potential critical groups to radiological releases from the DNNP.

Table 3-11: Summary of Total Dose to Human Receptors and Comparison to Dose Limit

Human Receptor	Adult		Child-10y		Infant-1y	
	Total Dose (mSv/a)	% of Dose Limit	Total Dose (mSv/a)	% of Dose Limit	Total Dose (mSv/a)	% of Dose Limit
Oshawa Resident+	2.20E-04	0.02%	1.98E-04	0.02%	1.83E-04	0.02%
Bowmanville Resident+	1.79E-04	0.02%	1.66E-04	0.02%	1.63E-04	0.02%
WEB Resident+	3.26E-04	0.03%	3.21E-04	0.03%	3.50E-04	0.03%
Farm	6.54E-04	0.07%	6.01E-04	0.06%	4.85E-04	0.05%
Dairy Farm	3.06E-04	0.03%	3.81E-04	0.04%	**6.55E-04**	0.07%
Rural Resident+	2.37E-04	0.02%	2.30E-04	0.02%	2.43E-04	0.02%
Sport Fisher	5.28E-06	0.001%	5.66E-06	0.001%	7.15E-06	0.001%
Camper	1.18E-04	0.01%	1.11E-04	0.01%	1.07E-04	0.01%
Harvester+	2.45E-04	0.02%	2.34E-04	0.02%	2.65E-04	0.03%
Industrial Commercial+	7.72E-05	0.01%	NA	NA	NA	NA

Note:
"+" indicates that a portion of the adults work near DN site and for modelling purposes are attributed the Industrial Commercial receptor dose while at work.
The bold value indicates the highest total dose for human receptor due to atmospheric radiological release from 4 SMRs.
NA: not applicable.
There are no exceedances of the public dose limit of 1 mSv/a.

3.4.3 Uncertainties in the Risk Characterization

The uncertainties in the characterization of risk consist of those identified in the exposure assessment (**Section 3.2.7**) and toxicity assessment (**Section 3.3.3**), since these two assessments are the inputs to the risk characterization.

The uncertainties from the exposure assessment (**Section 3.2.7**) include model uncertainty and uncertainty in the exposure factors selected. There were no major uncertainties identified from the toxicity assessment (**Section 3.3.3**). In general, in each step of the predictive HHRA, conservative assumptions were used to address uncertainties or realistic assumptions were made. The use of this approach is far more likely to overestimate potential risk than to underestimate risk.

4.0 Predictive Ecological Risk Assessment

The predictive ecological risk assessment (EcoRA) is a process that evaluates the potential for adverse effects and risks to ecological receptors (plants, animals, etc.) that may be exposed to chemical and radiological contaminants and/or other biophysical stressors such as noise, light and collisions with structures or vehicles.

4.1 Problem Formulation

The Problem Formulation defines the problem to be addressed in the predictive EcoRA and the framework and general methodology by which the predictive EcoRA will address the defined problem (FCSAP, 2012). Generally, the problem formulation includes the identification of ecological receptors and their unique exposure characteristics, the screening and selection of COPCs (radiological and non-radiological) and other stressors, the identification of assessment and measurement endpoints and exposure pathways, and the development of an overall conceptual site model (CSM) for the predictive EcoRA.

The predictive EcoRA focuses on the DNNP site and surrounding areas, as shown in **Figure 4-1**. The assessment has been divided into five (5) distinct assessment areas in order to assess exposures to ecological receptors across different receptor locations of the DNNP and wider DN site. All five assessment areas (AB, C, D, E, and Darlington Nuclear) and their associated receptor locations have been retained from the previous 2020 DN ERA (Ecometrix, 2022) and 2024 DN ERA Addendum (Ecometrix, 2024) reports for consistency and to more easily compare results from this report with the aforementioned assessments. A sixth receptor location (location F) has been introduced within the existing assessment area E for this PERA to assess ecological receptors within closer proximity to the location of the future SMRs and represents a receptor location that may receive higher radiological doses than the receptor locations assessed in the 2020 DN ERA (Ecometrix, 2022) and 2024 DN ERA Addendum (Ecometrix, 2024) and 2009 DNNP EcoRA (SENES, 2009). The overall DNNP lands are situated within assessment areas D and E. The assessment also looks at nearshore Lake Ontario, generally in the area surrounding the outfalls from the existing DNGS diffuser and future DNNP diffuser.

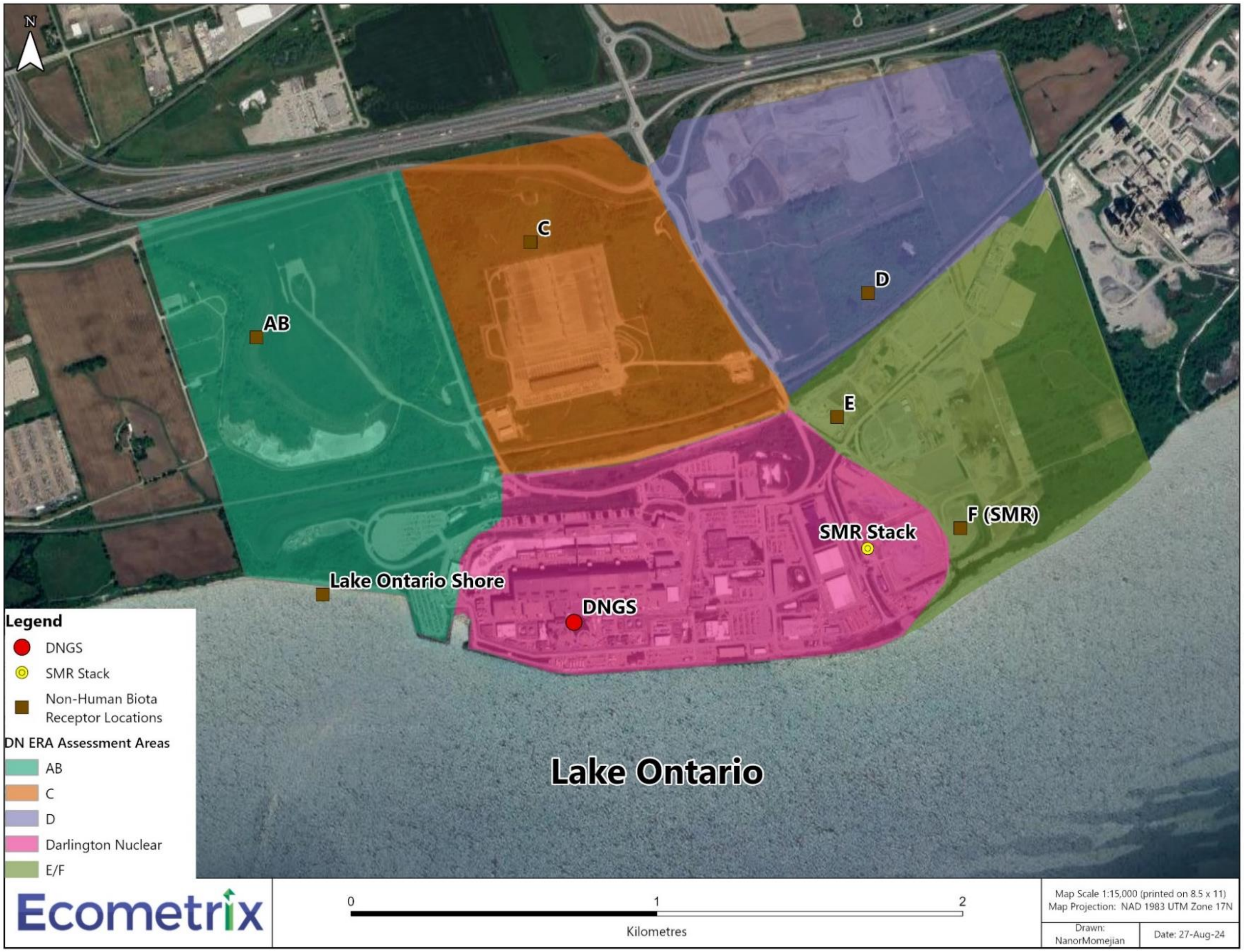


Figure 4-1: Assessment Areas and Ecological Receptor Locations for the Predictive EcoRA

4.1.1 Receptor Selection and Characterization

4.1.1.1 Receptor Selection

Species were selected to represent each major plant and animal taxonomic group, reflecting the main ecological exposure pathways, feeding habits, and habitats at or around the DNNP site. The list of ecological receptors assessed in this predictive EcoRA is consistent with the 2020 DN ERA (Ecometrix, 2022) and 2024 DN ERA Addendum (Ecometrix, 2024) reports. Ecological receptors were selected based on the criteria for receptor selection identified in N288.6:22 (CSA, 2022a).

Stakeholder input into ecological receptor selection was also considered, as documented in the Communications and Consultation TSDs from both EAs (HAUSSMANN, 2011; OPG, 2009b). The 2009 and 2011 lists of ecological receptors were reviewed, in addition to data provided in the DN Biodiversity reports for the 9-year period between 2011 to 2019 and 4-year period between 2019 to 2022. Common nesting bird species, bats, as well as amphibians and reptiles identified in the 2011-2019 and 2019-2022 biodiversity reports were added to the list. Fish species commonly observed in the Lake Ontario near-shore area were also presented based on fish and larval fish community assessments conducted during 2011 to 2019 (OPG, 2022d).

As of June 2024, an Indigenous Knowledge Study is being scoped by the WTFNs with support from OPG. It is acknowledged that the list of ecological receptors chosen for this PERA has not been informed by an Indigenous Knowledge Study; however, future risk assessments may be able to benefit from any information that is shared from the Indigenous Knowledge Study that can better inform receptor selection. It is also noted that the PERA is an iterative process and thus could be revised to incorporate Indigenous Knowledge obtained through the Indigenous Knowledge Study in a future update.

It is generally impractical to assess the effect of radiological and non-radiological emissions on all species of biota within a natural ecosystem, including within the ecosystem surrounding the DNNP site. Therefore, representative organisms are chosen for the dose and risk analysis. These organisms are selected because they are known to exist on the site, are representative of major taxonomic groups and exposure pathways, or have special ecological, socioeconomical or cultural importance or value (e.g., species at risk, traditional foods harvested by local Indigenous peoples). Some receptors are considered as a general category or species, such as benthic invertebrates. This is common practice in EcoRAs to assess the benthic community as a single receptor rather than individual benthic invertebrate species since it is not feasible or practical to assess individual species. However, conservative toxicity benchmarks are used that are protective of the majority of species.

Ecological receptors were selected in previous ecological assessments for the DN site in 2009 (SENES, 2009), 2011 (OPG, 2011a), 2017 (Ecometrix, 2017), and most recently in 2020 (Ecometrix, 2022). The 2020 DN ERA relied upon a series of environmental studies that investigated the terrestrial and aquatic communities at the DN site, focusing on a study period between 2011 to 2019 (Ecometrix, 2022). At the time, these studies described the most up to date site conditions with respect to ecological biodiversity and habitats at the DN site. The 2024 DN ERA Addendum (Ecometrix, 2024) utilized the receptor list compiled in the 2020 DN ERA and supplemented the list by examining updated studies completed in the period between 2019 and 2022, including:

- Acoustic Bat Monitoring Report – Darlington New Nuclear Project (Beacon, 2021)
- Darlington Nuclear Site Biodiversity Monitoring Program Three Year Report (2019-2021) (Beacon, 2022)
- Darlington Nuclear Site Biodiversity Monitoring Program Annual Report, 2022 (Beacon, 2023)

The above studies assessed in the 2024 DN ERA Addendum represent the best current understanding of site conditions with respect to biota and ecological habitats present at the DNNP site and the wider DN site. Additionally for this predictive EcoRA, the latest biodiversity program technical memorandum from Beacon (2024) was reviewed, further updating the current understanding of ecological receptors and their habitats at the DN site to October 2023.

The criteria for receptor selection for this PERA began with the rationale previously outlined in the 2020 DN ERA (Ecometrix, 2022) and was supplemented with a review of recent monitoring studies and relevant regulatory information (e.g., verification of current Species at Risk status). The rationale for receptor selection was previously outlined in Appendix C of SENES (2009) and has been adapted for the current predictive EcoRA:

- Preliminary selection: a list of ecological receptors for the DN site was compiled from previous DN assessment reports;
- Secondary selection: The list of ecological receptors was expanded to include other species identified in the terrestrial and aquatic environment TSDs for the 2009 NND EA (Golder and SENES, 2009; OPG, 2009c), the 2011 Refurbishment and Continued Operation EA (OPG, 2011b; SENES, 2011a), the 2019 DNNP supporting environment studies report (OPG, 2022d) and the most recent monitoring studies completed between 2019 and 2023 (Beacon, 2021, 2022, 2023, 2024);
- Final selection: The list of ecological receptors was refined. In some instances, individual species with similar exposure pathways were grouped together and analyzed as one generic type of ecological receptor. For example, all terrestrial trees and grasses were analyzed as "terrestrial plants", and various benthic invertebrate species were analyzed as "benthic invertebrates." In other cases, particular species were selected as representatives of different feeding habits. For example, American Robin, Bank Swallow, Yellow Warbler, and Song Sparrow were analyzed with species-specific feeding habits.

Relying on the criteria outlined in Table 7.1 of CSA N288.6 (CSA, 2022a), the selection of ecological receptors for the predictive EcoRA is presented below in **Table 4-1**. Receptors in bolded font are noted to have been selected as representative species retained for further assessment in the predictive EcoRA.

Table 4-1: Criteria for the Selection of Ecological Receptors

Organism Category	Species Considered	Selection Criteria				Outcome of Selection
		1	2	3	4	
		Major Plant or Animal Group	Facility, Stakeholder, or Indigenous Importance	Socio-economic/ Ecological Significance	Exposed to and/or Sensitive to Stressor	
Bottom-Feeding Fish	**Northern Redbelly Dace**	Benthopelagic forage fish	Present on Site – Coot's Pond	Food source for other receptors (fish/birds)	Exposed to aquatic release through water, sediment and consumption of food (planktonic crustaceans, benthic invertebrates, fish eggs).	Selected as an ecological receptor
	Round Whitefish	Benthic forage fish	Present near Site - ecological receptor for previous EAs	Nearshore spawning shoals in the area	Exposed to aquatic release through water, sediment and consumption of food (planktonic crustaceans, benthic invertebrates, fish eggs). Sensitive to thermal stressor.	Selected as an ecological receptor
	White Sucker	Common nearshore benthic forage fish	Present near Site - ecological receptor for previous EAs	Dominant member of sparse nearshore fish community	Exposed to aquatic release through water, sediment and consumption of food (planktonic crustaceans, benthic invertebrates, fish eggs). Exposed to thermal stressor.	Selected as an ecological receptor
	American Eel	Benthic predator fish	Present near Site - Highly valued by Indigenous peoples	Listed as Endangered in Ontario. Listed as Threatened by COSEWIC	Exposed to aquatic release through surface water and consumption of prey. Occasionally impinged species.	Selected as an ecological receptor
	Burbot	Benthic predator fish	Present near Site. Entrained species in the 2015/16 entrainment study	-	Exposed to aquatic release through water, sediment and consumption of prey (planktonic crustaceans, benthic invertebrates, other fish species and fish eggs). Commonly entrained fish.	Not selected as an ecological receptor: Assessment of other bottom-feeding fish will be protective of Burbot
	Deepwater Sculpin	Benthic forage fish	Present near Site. Entrained species in the 2015/2016 entrainment study.	Listed as special concern federally (SARA and COSEWIC)	Exposed to aquatic release through water, sediment and consumption of food (planktonic crustaceans, benthic invertebrates, fish eggs).	Not selected as an ecological receptor: Assessment of other bottom-feeding fish will be protective of Deepwater Sculpin
	Lake Sturgeon	Benthic fish	Present near Site - ecological receptor for previous EAs - found in Lake Ontario and adjacent tributary mouths	Conservation concern in Great Lakes (Threatened provincially)- Subject to recovery efforts in Lake Ontario - Historical commercial species	Exposed to aquatic release through water, sediment and consumption of food (planktonic crustaceans, benthic invertebrates, fish eggs).	Not selected as an ecological receptor: Assessment of other bottom-feeding fish will be protective of Lake Sturgeon
	Longnose Sucker	Benthic forage fish	Present near Site	-	Exposed to aquatic release through water, sediment and consumption of food (planktonic crustaceans, benthic invertebrates, fish eggs)	Not selected as an ecological receptor: Assessment of other bottom-feeding fish will be protective of Longnose Sucker
	Mottled Sculpin	Benthic forage fish	Present near Site. Entrained species in the 2015/16 entrainment study	-	Exposed to aquatic release through water, sediment and consumption of food (planktonic crustaceans, benthic invertebrates, fish eggs).	Not selected as an ecological receptor: Assessment of other bottom-feeding fish will be protective of Mottled Sculpin
	Rainbow Trout	Benthopelagic predator fish	Common fish near site	Species of fishery interest	Exposed to aquatic release through water, sediment and consumption of food (planktonic crustaceans, benthic invertebrates, other fish species and fish eggs)	Not selected as an ecological receptor: Assessment for other pelagic fish expected to be protective of Rainbow Trout.

Organism Category	Species Considered	Selection Criteria				Outcome of Selection
		1	2	3	4	
		Major Plant or Animal Group	Facility, Stakeholder, or Indigenous Importance	Socio-economic/ Ecological Significance	Exposed to and/or Sensitive to Stressor	
	Brown Trout	Benthopelagic predator fish	Present near Site	Species of fishery interest	Exposed to aquatic release through water, sediment and consumption of food (planktonic crustaceans, benthic invertebrates, other fish species and fish eggs)	Not selected as an ecological receptor: Assessment for other pelagic fish expected to be protective of Brown Trout
	Walleye	Benthopelagic predator fish	Present near Site. Entrained in the 2015/16 entrainment study	Species of fishery interest	Exposed to waterborne effluent through water, sediment and consumption of food (planktonic crustaceans, benthic invertebrates, other fish species and fish eggs). Commonly entrained fish.	Not selected as an ecological receptor: Assessment for other pelagic fish expected to be protective of Walleye
	Round Goby	Benthic forage fish	Present near Site - ecological receptor for previous EAs - found in Lake Ontario	Invasive species in Lake Ontario	Exposed to waterborne effluent through water, sediment and consumption of food. Commonly impinged/entrained species.	Not selected as an ecological receptor: Invasive species; assessment for other pelagic fish expected to be protective of Round Goby
Pelagic Fish	**Alewife**	Common schooling pelagic forage fish	Present on Site - ecological receptor for previous EAs	Dominant member of sparse nearshore fish community	Exposed to waterborne effluent through surface water and consumption of food. Exposed to thermal stressor. Commonly impinged/entrained species.	Selected as an ecological receptor
	Lake Trout	Common pelagic predator fish	Present near Site - ecological receptor for previous EAs	Potentially spawns in the area - Commercial and sport fish	Exposed to waterborne effluent through surface water and consumption of prey. Exposed to thermal stressor.	Selected as an ecological receptor
	Chinook Salmon	Pelagic predator fish	Present near Site	Species of fishery interest	Exposed to waterborne effluent through surface water and consumption of prey	Not selected as an ecological receptor: Assessment for other pelagic fish expected to be protective of Chinook Salmon
	Emerald Shiner	Nearshore schooling pelagic forage fish	Present on Site - ecological receptor for previous EAs - found in Forebay and Lake Ontario	Numerically important in nearshore fish community	Exposed to waterborne effluent through surface water and consumption of food. Exposed to thermal stressor.	Not selected as an ecological receptor: Assessment for other pelagic fish expected to be protective of Emerald Shiner
	Rainbow Smelt	Pelagic forage fish	Common fish near site	-	Exposed to waterborne effluent through surface water and consumption of prey. Commonly impinged/entrained species.	Not selected as an ecological receptor: Assessment for other pelagic fish expected to be protective of Rainbow Smelt
	Spottail Shiner	Pelagic forage fish	Present near Site - found in forebay and Lake Ontario	-	Exposed to waterborne effluent through surface water and consumption of food	Not selected as an ecological receptor: Assessment for other pelagic fish expected to be protective of Spottail Shiner
Reptiles and Amphibians	American Toad	Toad	Present on Site	On-Site breeder	Exposed to waterborne effluent through surface water, sediment, and prey.	Not selected as an ecological receptor. Assessment of other amphibians (i.e., frogs) expected to be protective.

Organism Category	Species Considered	Selection Criteria				Outcome of Selection
		1	2	3	4	
		Major Plant or Animal Group	**Facility, Stakeholder, or Indigenous Importance**	**Socio-economic/ Ecological Significance**	**Exposed to and/or Sensitive to Stressor**	
	Midland Painted Turtle	**Turtle**	Present and breed on Site - ecological receptor for previous EAs	On-Site breeder. COSEWIC Special Concern Status	Exposed to waterborne effluent through surface water, sediment, and prey.	Selected as an ecological receptor
	Snapping Turtle	**Turtle**	Present and breed on Site	On-Site breeder. Listed as species of Special Concern Federally (Both SARA and COSEWIC)	Exposed to waterborne effluent through surface water, sediment, and prey.	Selected as an ecological receptor
	Green Frog	**Frog**	Present on Site - ecological receptor for previous EAs	On-Site breeder	Exposed to waterborne effluent through surface water, sediment, and prey.	Selected as an ecological receptor
	Northern Leopard Frog	**Frog**	Present on Site	On-Site breeder	Exposed to waterborne effluent through surface water, sediment, and prey.	Selected as an ecological receptor
	Red-backed Salamander	Salamander	Present near site	Rare species in the region	Exposed to airborne emissions through soil	Not selected as an ecological receptor. Assessment of other amphibians (i.e., frogs) expected to be protective.
	Eastern Garter snake	Snake	Present on site	-	Exposed to airborne emissions through soil	Not selected as an ecological receptor. Assessment of other reptiles (i.e., turtles) expected to be protective.
Aquatic Plants	Burreed	**Aquatic plant**	Ecological receptor for previous EAs	Heavily used by wildlife - represents permanent shallow water marshland areas	Exposed to waterborne effluent through surface water and sediment	Selected as an ecological receptor
Aquatic Invertebrates	Amphipods Oligochaetes/ chironomids Molluscs Crayfish Zebra mussel	**Benthic invertebrates**	Ecological receptor for previous EAs	Food source for fish and riparian birds	Exposed to waterborne effluent through sediment	Selected as an ecological receptor
Riparian Birds	**Bufflehead**	Diving bird - omnivore	Present on Site - ecological receptor for previous EAs - Inshore and Coot's Pond	Nesting near Site	Exposed to waterborne effluent through water, food (aquatic plants and invertebrates) and sediment	Selected as an ecological receptor
	Mallard	Dabbling bird - omnivore	Present on Site - ecological receptor for previous EAs - Inshore and Coot's Pond	Nesting near Site	Exposed to waterborne effluent through water, food (aquatic plants and invertebrates) and sediment	Selected as an ecological receptor
	Green Heron	Wetland breeder - piscivore	Present on Site	Breeding on Site	Exposed to waterborne effluent through water and food (fish)	Selected as an ecological receptor
	Wood Duck	Dabbling bird - herbivore	Present on Site	Breeding on Site	Exposed to waterborne effluent through water, food (aquatic plants) and sediment	Not selected as an ecological receptor: Assessment of Mallard and Bufflehead is expected to be protective of Wood Duck
	Trumpeter Swan	Dabbling bird - herbivore	Present on Site	Nesting on Site	Exposed to waterborne effluent through water, food (aquatic plants) and sediment	Not selected as an ecological receptor: Assessment of Mallard

Organism Category	Species Considered	Selection Criteria				Outcome of Selection
		1	2	3	4	
		Major Plant or Animal Group	Facility, Stakeholder, or Indigenous Importance	Socio-economic/ Ecological Significance	Exposed to and/or Sensitive to Stressor	
						and Bufflehead is expected to be protective of Trumpeter Swan
	Pied-billed Grebe	Diving bird - invertebrates	Present on Site - ecological receptor for previous EAs - Inshore and Coot's Pond	Breeding on Site	Exposed to waterborne effluent through water, food (aquatic plants and invertebrates) and sediment	Not selected as an ecological receptor: Assessment of Mallard and Bufflehead is expected to be protective of Pied-billed Grebe
	Least Bittern	Wetland breeder - piscivore	Occasionally observed on Site	Listed as Threatened federally (SARA and COSEWIC) and provincially	Exposed to waterborne effluent through water and food (fish)	Not selected as an ecological receptor: Assessment of Green Heron is expected to be protective of Least Bittern
Riparian Mammals	**Muskrat**	Mammalian herbivore	Present on Site - ecological receptor for previous EAs	On-site breeder – year-round presence	Exposed to waterborne effluent through water, food (aquatic vegetation) and sediment	Selected as an ecological receptor
Terrestrial Invertebrates	Butterflies (Caterpillars)	Long-distant migrant	Present on Site	Conservation concern for winter habitat stress (Mexico)	Exposed to airborne emissions through soil	Not selected as an ecological receptor: Assessment for Earthworm is expected to be protective of butterflies
	Dragonflies	Aquatic early lifestage - Insectivore	Present on Site	-	Exposed to airborne emissions through soil	Not selected as an ecological receptor: Assessment for Earthworm is expected to be protective of dragonflies
	Earthworms	Soil dwelling - Detritivore	Present on Site - ecological receptor for previous EAs	Food source for other ecological receptors	Exposed to airborne emissions through soil	Selected as an ecological receptor
Terrestrial Plants	Canada Blue Joint	**Grasses**	Present on Site	Food source for terrestrial mammals	Exposed to airborne emissions through soil and atmospheric deposition	Selected as an ecological receptor
	Sugar Maple	Deciduous tree	Present on Site - ecological receptor for previous EAs	Important element in woodland community	Exposed to airborne emissions through soil and atmospheric deposition	Selected as an ecological receptor
	Butternut Tree	Deciduous tree	Present on Site	Endangered species on both federal and provincial level	Exposed to airborne emissions through soil and atmospheric deposition	Not selected as an ecological receptor: Assessment of sugar Maple is expected to be protective of Butternut Tree
Terrestrial Birds	**American Robin**	Ground feeding insectivore	Present on Site - ecological receptor for previous EAs	On-Site breeder - Common to the upland community	Exposed to airborne emissions through food (terrestrial invertebrates) and soil	Selected as an ecological receptor
	Bank Swallow	Aerial insectivore	Present on Site - ecological receptor for previous EAs	Breeds along Lake Ontario shoreline. Threatened species on both the federal and provincial level	Exposed to airborne emissions through food (terrestrial invertebrates) and soil	Selected as an ecological receptor

Organism Category	Species Considered	Selection Criteria				Outcome of Selection
		1	2	3	4	
		Major Plant or Animal Group	Facility, Stakeholder, or Indigenous Importance	Socio-economic/ Ecological Significance	Exposed to and/or Sensitive to Stressor	
	Song Sparrow	Tree/shrub feeding omnivore	Present on Site - ecological receptor for previous EAs	On-Site breeder - Common to upland successional habitat	Exposed to airborne emissions through food (terrestrial invertebrates and plants) and soil	Selected as an ecological receptor
	Yellow Warbler	Tree/shrub feeding insectivore	Present on Site - ecological receptor for previous EAs	On-Site breeder - Common to Coot's pond, upland successional habitat	Exposed to airborne emissions through food (terrestrial invertebrates) and soil	Selected as an ecological receptor
	Marsh Wren	Marsh-dwelling insectivore	Present on Site	On-site breeder	Exposed to airborne emissions through food (terrestrial invertebrates) and soil	Not selected as an ecological receptor: Assessment of other terrestrial birds is expected to be protective of Marsh Wren
	Swamp Swallow	Marsh-dwelling insectivore	Present on Site	On-site breeder	Exposed to airborne emissions through food (terrestrial invertebrates) and soil	Not selected as an ecological receptor: Assessment of other terrestrial birds is expected to be protective of Swamp Swallow
	House Wren	Tree/shrub feeding insectivore	Present on Site	On-site breeder	Exposed to airborne emissions through food (terrestrial invertebrates) and soil	Not selected as an ecological receptor: Assessment of other terrestrial birds is expected to be protective of House Wren
	Barn Swallow	Aerial insectivore	Present on Site	On-Site breeder. Threatened species on both the federal and provincial level	Exposed to airborne emissions through food (terrestrial invertebrates) and soil	Not selected as an ecological receptor: Assessment of other terrestrial birds is expected to be protective of Barn Swallow
	Tree Swallow	Aerial insectivore	Present on Site	On-Site breeder	Exposed to airborne emissions through food (terrestrial invertebrates) and soil	Not selected as an ecological receptor: Assessment of other terrestrial birds is expected to be protective of Tree Swallow
	Mourning Dove	Ground feeding herbivore	Present on Site	On-Site breeder	Exposed to airborne emissions through food (plants) and soil	Not selected as an ecological receptor: Assessment of other terrestrial birds is expected to be protective of Mourning Dove
	Downy Woodpecker	Tree feeding insectivore	Present on Site	On-Site breeder - common to woodland habitat	Exposed to airborne emissions through food (terrestrial invertebrates) and soil	Not selected as an ecological receptor: Assessment of other terrestrial birds is expected to be protective of Downy Woodpecker
	Eastern Wood-Pewee	Aerial insectivore	Present on Site	On-Site breeder - common to woodland habitat. Listed as species of special concern provincially and federally (SARA and COSEWIC)	Exposed to airborne emissions through food (terrestrial invertebrates) and soil	Not selected as an ecological receptor: Assessment of other terrestrial birds is expected to be protective of Eastern Wood-Pewee
	Willow Flycatcher	Aerial insectivore	Present on Site	On-Site breeder - Common to Coot's pond, upland successional habitat	Exposed to airborne emissions through food (terrestrial invertebrates) and soil	Not selected as an ecological receptor: Assessment of other terrestrial birds is expected to be protective of Willow Flycatcher

Organism Category	Species Considered	Selection Criteria				Outcome of Selection
		1	2	3	4	
		Major Plant or Animal Group	Facility, Stakeholder, or Indigenous Importance	Socio-economic/ Ecological Significance	Exposed to and/or Sensitive to Stressor	
	Great Crested Flycatcher	Aerial insectivore	Present on Site	On-Site breeder	Exposed to airborne emissions through food (terrestrial invertebrates) and soil	Not selected as an ecological receptor: Assessment of other terrestrial birds is expected to be protective of Great Crested Flycatcher
	Eastern Kingbird	Aerial insectivore	Present on Site	On-Site breeder - Common to Coot's pond	Exposed to airborne emissions through food (terrestrial invertebrates) and soil	Not selected as an ecological receptor: Assessment of other terrestrial birds is expected to be protective of Eastern Kingbird
	Black-capped chickadee	Tree feeding insectivore	Present on Site	On-Site breeder - common to woodland habitat	Exposed to airborne emissions through food (terrestrial invertebrates) and soil	Not selected as an ecological receptor: Assessment of other terrestrial birds is expected to be protective of Black-capped Chickadee
	Grey Catbird	Ground feeding insectivore	Present on Site	On-Site breeder - Common to upland successional habitat	Exposed to airborne emissions through food (terrestrial invertebrates) and soil	Not selected as an ecological receptor: Assessment of other terrestrial birds is expected to be protective of Grey Catbird
	Cedar Waxwing	Tree feeding herbivore (berries and fruit)	Present on Site	On-Site breeder - Common to upland successional habitat	Exposed to airborne emissions through food (plants) and soil	Not selected as an ecological receptor: Assessment of other terrestrial birds is expected to be protective of Cedar Waxwing
	American Redstart	Aerial insectivore	Present on Site	On-Site breeder - common to woodland habitat	Exposed to airborne emissions through food (terrestrial invertebrates) and soil	Not selected as an ecological receptor: Assessment of other terrestrial birds is expected to be protective of American Redstart
	Common Yellowthroat	Shrub/ ground feeding insectivore	Present on Site	On-Site breeder - Common to upland successional habitat	Exposed to airborne emissions through food (terrestrial invertebrates) and soil	Not selected as an ecological receptor: Assessment of other terrestrial birds is expected to be protective of Common Yellowthroat
	Savannah Sparrow	Ground feeding insectivore	Present on Site	On-Site breeder	Exposed to airborne emissions through food (terrestrial invertebrates) and soil	Not selected as an ecological receptor: Assessment of other terrestrial birds is expected to be protective of Savannah Sparrow
	Red-winged Blackbird	Shrub/ ground feeding omnivore	Present on Site	On-Site breeder - Common to Coot's pond, upland successional habitat	Exposed to airborne emissions through food (plants and terrestrial invertebrates) and soil	Not selected as an ecological receptor: Assessment of other terrestrial birds is expected to be protective of Red-winged Blackbird

Organism Category	Species Considered	Selection Criteria				Outcome of Selection
		1	2	3	4	
		Major Plant or Animal Group	**Facility, Stakeholder, or Indigenous Importance**	**Socio-economic/ Ecological Significance**	**Exposed to and/or Sensitive to Stressor**	
	Common Grackle	Shrub/ ground feeding omnivore	Present on Site	On-Site breeder	Exposed to airborne emissions through food (plants and terrestrial invertebrates) and soil	Not selected as an ecological receptor: Assessment of other terrestrial birds is expected to be protective of Common Grackle
	American Goldfinch	Tree/shrub feeding herbivore (seeds)	Present on Site	On-Site breeder	Exposed to airborne emissions through food (plants) and soil	Not selected as an ecological receptor: Assessment of other terrestrial birds is expected to be protective of American Goldfinch
	American Crow	Omnivore	Present on Site - ecological receptor for previous EAs	Common to the Site	Exposed to airborne emissions through food (plants and terrestrial invertebrates) and soil	Not selected as an ecological receptor: Assessment of other terrestrial birds is expected to be protective of American Crow
	Red-eyed Vireo	Tree/ shrub feeding insectivore	Present on Site - ecological receptor for previous EAs	Infrequent on-Site breeder - woodland habitat	Exposed to airborne emissions through food (terrestrial invertebrates) and soil	Not selected as an ecological receptor: Assessment of other terrestrial birds is expected to be protective of Red-eyed Vireo
	Olive-sided flycatcher	Aerial insectivore	Present on Site	Listed as Threatened federally (SARA) and Special Concern provincially	Exposed to airborne emissions through food (terrestrial invertebrates) and soil	Not selected as an ecological receptor: Assessment of other terrestrial birds is expected to be protective of Olive-sided flycatcher
	Bobolink	Ground feeding omnivore	Present on Site	Breeding on Site. Listed as Threatened federally (SARA and COSEWIC) and provincially	Exposed to airborne emissions through food (plants, terrestrial invertebrates) and soil	Not selected as an ecological receptor: Assessment of other terrestrial birds is expected to be protective of Bobolink
	Eastern Meadowlark	Ground feeding omnivore	Present on Site	Breeding on Site. Listed as Threatened federally (SARA and COSEWIC) and provincially	Exposed to airborne emissions through food (plants, terrestrial invertebrates) and soil	Not selected as an ecological receptor: Assessment of other terrestrial birds is expected to be protective of Eastern Meadowlark
	Wood Thrush	Ground feeding insectivore	Present on Site	Listed as Threatened federally (SARA and COSEWIC) and provincially	Exposed to airborne emissions through food (terrestrial invertebrates) and soil	Not selected as an ecological receptor: Assessment of other terrestrial birds is expected to be protective of Wood Thrush
	Canada Warbler	Tree/shrub feeding insectivore	Present on Site	Listed as Threatened federally (SARA and COSEWIC), and Special Concern provincially	Exposed to airborne emissions through food (terrestrial invertebrates) and soil	Not selected as an ecological receptor: Assessment of other terrestrial birds is expected to be protective of Canada Warbler
Mammals	**Eastern Cottontail**	Mammalian herbivore	Present on Site - ecological receptor for previous EAs	Common to upland habitat	Exposed to airborne emissions through food (plants) and soil	Selected as an ecological receptor

Organism Category	Species Considered	Selection Criteria				Outcome of Selection
		1	2	3	4	
		Major Plant or Animal Group	Facility, Stakeholder, or Indigenous Importance	Socio-economic/ Ecological Significance	Exposed to and/or Sensitive to Stressor	
	Meadow Vole	Mammalian herbivore	Present on Site - ecological receptor for previous EAs	On-site breeder – year-round presence - Common to upland habitat - common prey item	Exposed to airborne emissions through food and soil	Selected as an ecological receptor
	White-tailed Deer	Mammalian herbivore	Present on Site - ecological receptor for previous EAs	Common to upland habitat	Exposed to airborne emissions through food (plants) and soil	Selected as an ecological receptor
	Common Shrew	Mammalian insectivore	-	Common in similar habitats to the Site	Exposed to airborne emissions through food (insects) and soil	Selected as an ecological receptor
	Raccoon	Mammalian omnivore	Present on Site - ecological receptor for previous EAs	Common to upland habitat	Exposed to airborne emissions through food and soil	Selected as an ecological receptor
	Red Fox	Mammalian carnivore	Present on Site - ecological receptor for previous EAs	Common to upland habitat	Exposed to airborne emissions through food (small mammals) and soil	Selected as an ecological receptor
	Short Tailed Weasel	Mammalian carnivore	Present on Site - ecological receptor for previous EAs	Common to upland habitat	Exposed to airborne emissions through food (small mammals) and soil	Selected as an ecological receptor
	Deer Mouse	Mammalian omnivore	Present on Site - ecological receptor for previous EAs	Common to upland habitat	Exposed to airborne emissions through food and soil	Not selected as an ecological receptor: Assessment of other terrestrial mammals is expected to be protective of Deer Mouse
	Little Brown Myotis (Bat)	Mammalian insectivore	Present on Site	Listed as Endangered both federally and provincially	Exposed to airborne emissions through food (insects) and soil	Not selected as an ecological receptor: Assessment of other terrestrial mammals is expected to be protective of Little Brown Myotis
	Northern Myotis (Bat)	Mammalian insectivore	Foraging on Site	Listed as Endangered both federally and provincially	Exposed to airborne emissions through food (insects) and soil	Not selected as an ecological receptor: Assessment of other terrestrial mammals is expected to be protective of Northern Myotis

Note:
Species selected as ecological receptors for the predictive EcoRA are bolded in the "Species Considered" column.

Ecological receptors were selected to represent each major plant and animal group, reflecting the main ecological exposure pathways, feeding habits and habitats at and around the DNNP site. In making the selection, species that were ecologically similar to other species and could be represented by another species, were not selected, in order to reduce redundancy in the exposure calculations. For example, the Alewife and emerald shiner are similar across all criteria and could be assessed interchangeably. However, according to impingement reports, of these two species, the Alewife is the dominant species impinged at DN, so it was chosen to be a receptor. Other effects on the Alewife are considered to be representative of effects on the emerald shiner. Further descriptions regarding the selected ecological receptors, such as habitat and feeding habits, are provided in **Appendix E.**

Ecological receptors selected for further analysis and the assessment models used in estimating their COPC exposure, dose and risk are presented in **Table 4-2**. Six species of fish were chosen as receptors to represent the fish likely to be influenced by the construction and operation of the DNNP. However, due to the limited species-specific exposure factor and toxicity data available, risks to fish are estimated by assessing the fish in two categories (bottom-feeding fish and pelagic fish) for the radiological assessment and as one category (all fish) for the non-radiological assessment.

The radiological dose assessment for fish considers external exposure from sediment as a particular pathway for bottom-feeding fish, which does not occur for pelagic fish, so two types of fish (i.e. bottom-feeding & pelagic) are modelled separately. For non-radiological dose assessment, this unique pathway is not applicable, so there is no need for two categories of fish. Similarly, for terrestrial plants, all species were assessed in one category (terrestrial plants) using generic bioaccumulation factors (BAFs) and toxicity reference values (TRVs).

Small-bodied forage fish are not identified as a specific ecological receptor; however, all fish assessed in the EcoRA are assumed to spent 100% of their time in the vicinity of DN, near the diffuser. Therefore, the results for large-bodied fish as a group would be similar to those for small-bodied fish.

A fish model is used for assessment of frogs because the sensitive life stages for frogs (i.e., egg and tadpole) are aquatic and similar to the sensitive life stages for fish. For example, during the tadpole stage, tadpoles and fish have similar exposure pathways (e.g., absorption through skin and gills). In addition, exposure factor and toxicity data for amphibians are limited. Therefore, the fish assessment model is considered to be appropriate for frogs during their most sensitive life stages.

A fish model is also used for the assessment of turtles, since there is a lack of exposure factor and toxicity data for turtles. Both organisms reside in water, and they share similar exposure pathways.

Several of the proposed buildings at the DNNP and existing buildings on the wider DN site may provide a suitable habitat for birds. Geese and gulls typically nest on most of the existing building roofs in the protected area of the DNGS. The assessment of other riparian (i.e., semiaquatic) birds as ecological receptors, such as the Bufflehead and the Mallard, is expected to be protective of geese and gulls.

Table 4-2: Summary of Ecological Receptors and their Assessment Models used in the Predictive EcoRA

Receptor Category	Assessment Model	Major Plant or Animal Group	Representative Species
Fish	Bottom Feeding Fish	Benthopelagic forage fish	Northern Redbelly Dace
		Benthic forage fish	Round Whitefish
		Benthic forage fish	White Sucker
		Benthic predator fish	American Eel
	Pelagic Fish	Pelagic forage fish	Alewife
		Pelagic predator fish	Lake Trout
Reptiles and Amphibians	Bottom Feeding Fish	Reptile	Turtles
		Amphibian	Frogs
Aquatic Plants	Aquatic Plant	Aquatic Plants	Aquatic Plants
Aquatic Invertebrates	Benthic Invertebrate	Benthic Invertebrates	Benthic Invertebrates
Riparian Birds	Bufflehead	Diving bird – omnivore	Bufflehead
	Mallard	Dabbling bird – omnivore	Mallard
	Green Heron	Piscivore	Green Heron
Riparian Mammals	Muskrat	Herbivore	Muskrat
Terrestrial Invertebrates	Soil Invertebrate	Soil-dwelling detrivore	Earthworm
Terrestrial Birds	American Robin	Ground feeding insectivore	American Robin
	Bank Swallow	Aerial insectivore	Bank Swallow
	Song Sparrow	Omnivore	Song Sparrow
	Yellow Warbler	Insectivore	Yellow Warbler
Terrestrial Plants	Terrestrial Plant	Grass	Grass
	Terrestrial Plant	Deciduous tree	Sugar Maple
Terrestrial Mammals	Eastern Cottontail	Mammalian herbivore	Eastern Cottontail
	Meadow Vole	Mammalian herbivore	Meadow Vole
	White-tailed Deer	Mammalian herbivore	White-tailed Deer
	Common Shrew	Mammalian insectivore	Common Shrew
	Raccoon	Mammalian omnivore	Raccoon
	Red Fox	Mammalian carnivore	Red Fox
	Short-tailed Weasel	Mammalian carnivore	Short-tailed Weasel

4.1.1.2 Consideration of Species at Risk

A review of all flora and fauna identified in the 2020 DN ERA (Ecometrix, 2022) and 2024 DN ERA Addendum (Ecometrix, 2024) was performed against the Species at Risk in Ontario (SARO) list, Schedule 1 of the federal *Species at Risk Act* (SARA), and the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) list. A number of threatened and endangered species at risk (SAR) have been identified within the DN Site Study Area between the 2011 to 2023 time period. Species listed as "Endangered" (i.e., a species that is facing imminent extirpation or extinction) or "Threatened" (i.e., a species that is likely to become an endangered species without protective action) by either COSEWIC, SARA, or SARO are included in **Table 4-3**. As the general prohibitions under Species at Risk Act (SARA) do not apply to species of Special Concern, and CSA N288.6 does not specify species of Special Concern as ecologically significant, species with a current status of "Special Concern" are not listed in **Table 4-3**.

Exposure models for the assessment of specific SAR are lacking due to gaps in the eco-toxicological literature. SAR can be assessed by reference to ecological similar non-SAR or other SAR species for the predictive EcoRA. These surrogate species are selected to have receptor characteristics (e.g., body weight, food ingestion rates, dietary habits) that are similar to the SAR species. Detailed justifications for selections of each of the surrogate species, based on ecological considerations, are presented further in this section.

Table 4-3: Species at Risk and Surrogate Receptor Species for the Predictive EcoRA

Species at Risk (Common and Scientific Name)	SARA (Federal-official list) [a]	COSEWIC (Federal) [a]	SARO (Provincial) [a]	Ecological Category / Feeding Niche	Surrogate Species	Last Observed
Terrestrial Invertebrates						
Monarch (*Danaus plexippus*)	Endangered	Endangered	Special Concern	Terrestrial invertebrates	Earthworm (*Lumbricus* sp.)	2023
Reptiles / Amphibians						
Blanding's Turtle (*Emydoidea blandingii*)	Endangered	Endangered	Threatened	Riparian reptile	Turtles (Community)	2023 [g]
Plants						
Butternut Tree [h] (*Juglans cinerea*)	Endangered	Endangered	Endangered	Terrestrial plants	Sugar Maple (*Acer saccharum*)	2023
Birds [b]						
Bank Swallow (*Riparia riparia*)	Threatened	Threatened	Threatened	Terrestrial birds – aerial insectivore	Bank Swallow (*Riparia riparia*)	2023
Barn Swallow (*Hirundo rustica*)	Threatened	Special Concern	Special Concern	Terrestrial birds – aerial insectivore	Bank Swallow (*Riparia riparia*)	2023
Bobolink (*Dolichinyx oryzivorus*)	Threatened	Special Concern	Threatened	Terrestrial birds – ground-feeding omnivore	American Robin (*Turdus migratorius*)	2023
Canada Warbler (*Cardellina canadensis*)	Threatened	Special Concern	Special Concern	Terrestrial birds – aerial insectivore	Bank Swallow (*Riparia riparia*)	2019
Chimney Swift (*Chaetura pelagica*)	Threatened	Threatened	Threatened	Terrestrial birds – aerial insectivore	Bank Swallow (*Riparia riparia*)	2023
Eastern Meadowlark (*Strunella magna*)	Threatened	Threatened	Threatened	Terrestrial birds – ground-feeding omnivore	American Robin (*Turdus migratorius*)	2023
Least Bittern (*Ixobrychus exilis*)	Threatened	Threatened	Threatened	Riparian birds – piscivore	Green Heron (*Butorides virescens*)	2023
Wood Thrush (*Hylocichla mustelina*)	Threatened	Threatened	Special Concern	Terrestrial birds – ground-feeding omnivore	American Robin (*Turdus migratorius*)	2023

Species at Risk (Common and Scientific Name)	SARA (Federal-official list) [a]	COSEWIC (Federal) [a]	SARO (Provincial) [a]	Ecological Category / Feeding Niche	Surrogate Species	Last Observed
Mammals [c, d]						
Little Brown Myotis (*Myotis lucifugus*)	Endangered	Endangered	Endangered	Mammalian insectivore	Common Shrew (*Sorex cinereus*)	2022
Fish						
American Eel [f] (*Anguilla rostrata*)	Unlisted	Threatened	Endangered	Bottom feeding fish	American Eel (*Anguilla rostrata*)	2023 [e]

Notes:

[a] The federal and provincial status of a SAR may change over time; current SAR status was last verified on May 31, 2024.

[b] For birds, only species possibly breeding on-Site are included. Olive-Sided Flycatcher (*Contopus cooperi*) is not identified as a species that is breeding on-site (OPG, 2019c), and therefore is not included as a SAR. Loggerhead Shrike (*Lanius ludovicianus*) and Red Knot (*Calidris canutus rufa*) are also not included as only one incidental sighting of each species has occurred (Beacon, 2022, 2023). Observations of the Eastern Whip-poor-will (*Antrostomus vociferus*) and Common Nighthawk (*Chordeiles minor*) were considered to be of migrant birds not permanently remaining on-site (Beacon, 2022, 2023). The Yellow-breasted Chat (*Icteria virens*) has not been observed on the site since 2009 and there is no evidence that it is breeding on-site (Beacon, 2022, 2023); therefore, it is not included as a SAR. The Chimney Swift (*Chaetura pelagica*) and Least Bittern (*Ixobrychus exilis*) have conservatively been retained as SARs as they are considered "possible" breeders on the DN site (Beacon, 2022).

[c] For bat species, only species roosting on-site are included. During 2018 to 2022, a new SAR, the Eastern small-footed myotis (*Myotis leibii*), was identified during passive monitoring of the DNNP. However, results suggest this species is not actively roosting on the DNNP or wider DN site (Beacon, 2022, 2023), and thus has not been retained as a SAR for this predictive EcoRA.

[d] The Northern Myotis (*Myotis septentrionalis*) and Tri-colored Bat (*Pipistrellus subflavus*) were identified as SARs observed within the vicinity of the DN site in the 2020 DN ERA (Ecometrix, 2022); however, recent biodiversity studies (Beacon, 2022, 2023) have indicated these species are likely not actively roosting on the DNNP or wider DN site. Thus, these species were excluded from the SAR list presented in the 2024 DN ERA Addendum and have similarly been excluded as SARs for this predictive EcoRA.

[e] The last sighting of the American Eel occurred in 2023. Found impinged within the existing DNGS facility

[f] Though the American Eel is currently unlisted by SARA, it is under consideration for addition to the list. The American Eel is included in this list of SARs due to its "Threatened" and "Endangered" status from COSEWIC and SARO, respectively.

[g] One individual observed at Coot's Pond in August 2023. This observation is the first record of Blanding's Turtle at the DN site (Beacon, 2024).

[h] Although there are no Butternut trees present on DNNP site at the time of issuance of this report, they are included for assessment purposes to be consistent with the 2020 DN ERA and 2024 DN ERA Addendum, and in the event that they may be planted in the future.

Eight bird species, one reptile, one mammal, one plant, one terrestrial invertebrate and one fish were identified as threatened or endangered species at the DN site over the 2011-2023 period. Species designations change over time; therefore, the most recent designation guided the selection of SAR for the predictive EcoRA.

The status of some species has changed since the 2020 DN ERA. In 2021, the Barn Swallow and Canada Warbler were designated "Special Concern" by COSEWIC and SARO, both previously listed as "Threatened" (Canada Warbler was re-assessed by COSEWIC in 2020). The Bobolink was also newly designated "Special Concern" by COSEWIC (previously designated as "Threatened") in 2022. The Monarch, a milkweed butterfly, was assessed and designated as "Special Concern" under SARO in 2020 and was designated as "Endangered" under SARA in late 2023. Overall, these changes in status do not affect the inclusion of these species as Species at Risk for the predictive EcoRA.

4.1.1.2.1 Terrestrial Invertebrates

The Monarch (*Danaus plexippus*) is a milkweed butterfly. It is a migrating species that covers long distances between Ontario and Florida or central Mexico annually through four generations. In Ontario, Monarch caterpillars feed on milkweed plants and are confined to meadows and open areas with food sources. Adult butterflies are found in diverse habitats and, as a breeding species, are found in large numbers throughout the DN site. Monarch butterflies have been observed annually between 2011 to 2019 (Ecometrix, 2022) and 2019 to 2022 (Beacon, 2023). Potential risk to Monarchs is expected to be adequately assessed by the Earthworm (*Lumbricus* sp.), as they are both terrestrial invertebrates. Both Earthworms and Monarch caterpillars are exposed to airborne emissions deposited onto soil. Earthworms dwell underground and receive more soil exposure. Therefore, using Earthworms to represent Monarch caterpillars is considered conservative.

4.1.1.2.2 Reptiles and Amphibians

Blanding's Turtle (*Emydoidea blandingii*) is a medium-sized freshwater turtle with a smooth, domed, black upper shell with yellow spots and flecks. It is also identified by its characteristic bright yellow throat. They are often found in clear-water eutrophic wetlands in the Great Lakes/St. Lawrence region, generally preferring shallow water habitats and nesting within a variety of substrates including sand, organic soil, gravel, cobblestone, and soil-filled crevices of rock outcrops. It is estimated that the Great Lakes/St. Lawrence population has declined by 60% since European settlement in Ontario, and trends indicate a further 50% decline is possible over the next 120 years (COSEWIC, 2016). The Blanding's Turtle was observed for the first time at the DN site in August 2023, with one individual being observed at Coot's Pond (Beacon, 2024). Due to a lack of available exposure factors and toxicity data specific for turtles, the assessment of Blanding's Turtle relies on a generic assessment of turtles that is based on a fish model. Both organisms reside in water and share similar exposure pathways; thus, the assessment of fish is expected to be protective of turtle communities for this predictive EcoRA.

4.1.1.2.3 Terrestrial Plants

Butternut (*Juglans cinerea*) is a medium-sized tree, belonging to the walnut family, which can reach up to 30 m in height. In Ontario, Butternut usually grows alone or in small groups in deciduous forests, in sunny openings, and near forest edges. It prefers moist, well-drained soil and is often found along streams, or on well-drained gravel sites. Two Butternut trees were located in the southeast area of the DN site, on DNNP lands. In 2019, a Butternut Health Assessment was conducted and one of the Butternut trees was assessed as non-retainable (Beacon, 2023). As of March 2024, both butternut trees have been removed following the initiation of site preparation activities at the DNNP. No nuts (for re-introduction purposes) could be collected before removing the trees as neither tree produced any nuts. OPG intends to plant additional Butternut trees in the future, which may be on or off of DN site; therefore, the Butternut tree discussion has been retained. Potential risk to this species is expected to be adequately assessed by reference to other terrestrial plant species such as the Sugar Maple (*Acer saccharum*), as they receive similar exposure to airborne emissions via deposition onto soil.

4.1.1.2.4 Birds

The Bank Swallow (*Riparia riparia*) is an aerial insectivore that feeds over open areas such as fields, meadows, watercourses, and waterbodies. Bank swallows nest colonially in small to large colonies where there are natural or artificial soft soil banks, such as natural river and lake bluffs, in which they create nesting burrows. The lakeshore Bank Swallow colonies at the DN site during the 2020 to 2022 period were estimated to have between 1,118 and 1,795 burrows, the majority of which were found along the eastern-most third of the shoreline of the DN site (Beacon, 2022, 2023). Bank Swallow was retained as an ecological receptor in this predictive EcoRA.

The Barn Swallow (*Hirundo rustica*) is also an aerial insectivore that feeds over open areas and typically nests in small openings in man-made buildings, such as barns. Barn Swallows are annual breeders at the DN site, nesting in many existing buildings across the facility. Over the 2020 to 2022 period, 43 to 98 active nests were observed in and around the buildings on the site (Beacon, 2022, 2023). Barn Swallows are typically observed foraging over lawns, open field areas, wetlands and along the lakeshore at the DN site. Several of the buildings on the DN site may provide a suitable habitat for birds. The Bank Swallow is considered a suitable representative species for the Barn Swallow, and the assessment of ecological risks for the Bank Swallow in this predictive EcoRA is expected to be adequate for protection of the Barn Swallow, considering their similar diet and exposure characteristics.

Bobolink (*Dolichinyx oryzivorus*) are small omnivorous songbirds that typically forage on or near the ground for insects, seeds, and berries. They typically breed in large agricultural grasslands or fields such as hayfields and other fields with tall, lush forb vegetation. They are regular breeders at the DN site. After an absence of Bobolink in 2016, numbers have fluctuated between one and three pairs; two pairs were recorded in 2022 (Beacon, 2023). Potential risk to the Bobolink is expected to be adequately assessed by reference to another avian omnivores such as the American Robin (*Turdus migratorius*), as they are both ground-feeding birds and receive similar exposures through food and soil.

The Canada Warbler (*Cardellina canadensis*) is a small bird that primarily eats insects, often consuming them mid-flight or gleaning them off of foliage. The Canada Warbler is a regular migrant species. The last observation of this species at the DN site was 2019 (Beacon, 2023). The Bank Swallow is considered a suitable representative species for the Canada Warbler considering the similar diet and exposure characteristics.

The Chimney Swift (*Chaetura pelagica*) is a relatively small bird that feeds almost exclusive on flying insects, consuming flies, beetles, and moths while in flight. They tend to nest in caves and hollow trees, and in urbanized areas can be found nesting in buildings and man-made structures, including chimneys. The Chimney Swift was recorded in all years between 2020 and 2022. Though not seen breeding on the DN site since 2009, the species is considered a possible breeder (Beacon, 2022) and has conservatively been retained as a SAR for this predictive EcoRA. The Bank Swallow is considered a suitable representative species for the Chimney Swift, considering their similar diet and exposure characteristics.

The Eastern Meadowlark (*Strunella magna*) is a medium-sized omnivorous songbird that typically forages on or near the ground for insects, seeds, and berries. They are known to breed in grasslands and prairies, as well as pastures and hayfields. The Eastern Meadowlark builds its nest on the ground, covered with a roof woven from grasses. The species is an annual breeder at the DN site, though like the Bobolink, sightings have declined in recent years (Beacon, 2023). The American Robin is considered a suitable representative species for the Eastern Meadowlark, considering their similar diet and exposure characteristics.

The Least Bittern (*Ixobrychus exilis*) is a piscivorous bird and the smallest member of the heron family (Ardeidae) in the Americas. They nest in both freshwater and brackish wetlands and marshes abundant with cattails, reeds and rushes, and patches of woody vegetation. The Least Bittern's diet is primarily composed of small fish but will occasionally consume aquatic invertebrates and small reptiles, amphibians, or mammals. Coot's Pond, situated within assessment area AB, is considered the only suitable habitat for the Least Bittern on the DN site. Prior to 2022, the Least Bittern had been encountered five times, though attempts to establish whether breeding was occurring were unsuccessful. In 2022, Beacon Environmental confirmed breeding had occurred at Coot's Pond (Beacon, 2023). Due to their similar diets and exposure characteristics, the Green Heron (*Butorides virescens*) is expected to be a suitable surrogate for the Least Bittern for this predictive EcoRA.

Wood Thrush (*Hylocichla mustelina*) are omnivores that typically forage on invertebrates and fruits. They prefer woodlands and are not typically found at the DN site. However, in June 2021, Wood Thrush were heard from the Treefrog Swamp and the East Hedge transect, though it is not clear whether these recordings were of the same individual (Beacon, 2022). Another pair was heard from the Big Hedge transect in 2022 (Beacon, 2023). The American Robin is considered a suitable representative species for the Wood Thrush, as they are both ground-feeding insectivores and experience similar exposures through food and soil.

4.1.1.2.5 Mammals

The Little Brown Myotis (*Myotis lucifugus*) is an aerial insectivore. Like other bats, they forage during the night and roost in trees or buildings during the day. Little Brown Myotis will often select attics, abandoned buildings and barns for summer colonies to raise their young. They have bee recorded near the DN site in all years between 2020 and 2022, and likely has roosting habitat on site (Beacon, 2023). Potential risk to Little Brown Myotis is expected to be adequately assessed by reference to other mammalian insectivores such as the Common Shrew (*Sorex cinereus*) considering their similar diet. Furthermore, the Common Shrew has a higher exposure to soil compared to the Little Brown Myotis; therefore, it is a conservative representative species.

4.1.1.2.6 Fish

The American Eel (*Anguilla rostrata*) is a carnivorous fish, feeding on a variety of fishes and invertebrates. The American Eel is catadromous, utilizing a variety of marine and freshwater habitats over the course of its life history. It spawns in the Sargasso Sea (a region within the Atlantic Ocean), and during its migrations to and from spawning areas, it occurs in continental and oceanic habitats. In fresh water, its preferred habitat is in lakes and rivers including all waters to a depth of least a 10 m. Consistent with the 2020 DN ERA (Ecometrix, 2022) and 2024 DN ERA Addendum (Ecometrix, 2024), the American Eel has been retained as an ecological receptor for this predictive EcoRA. American Eel have been intermittently impinged at the DNGS, with ten individuals reportedly being impinged between 2020 and 2022 (Ecometrix, 2024) and one impinged in 2023.

4.1.1.3 Receptor Characterization

Receptor profiles in **Appendix E** describe the habitat and the feeding habits of the selected receptor species. The receptor species were assigned to assessment locations on the Site based on habitat features at each location and species habitat preferences. Receptor locations for assessment purposes are discussed in **Section 4.1.4**.

For mammals and birds, dietary assumptions were made based on the described feeding habits. Diets were simplified to represent the main food chain pathways without trying to capture their full taxonomic complexity. As an example, for some species that primarily consume insects (i.e., the Bank Swallow), the Earthworm is used as a representative for all terrestrial insects and soil invertebrates, since limited bioaccumulation data are available for insects and other invertebrates. The dietary assumptions for bird and mammal receptors are detailed in **Table 4-7**.

Species-specific exposure parameters, including bioaccumulation factors, food and water ingestion rates, transfer factors and body weights, are described in **Section 4.2.4**.

4.1.2 Assessment and Measurement Endpoints

Assessment endpoints are explicit expressions of the environmental values that are to be protected. Assessment endpoints should include the ecological receptor and the attribute of the receptor that is to be protected (e.g., abundance or viability of populations) (FCSAP, 2012). The assessment endpoints to be evaluated in this EcoRA are presented in **Table 4-4**.

Measurement endpoints are conceptually related to assessment endpoints and are defined as the tools that are used to measure exposure of or effects on each ecological receptor. Based on these measures, a potential for effect on the attribute of an assessment endpoint can be inferred. Measurement endpoints are the foundation for the lines of evidence (LOE) that are used to estimate risks to ecological receptors (FCSAP, 2012).

Measurement endpoints for COPCs are often linked to low-effect threshold concentrations or doses, also known as toxicological reference values (TRVs). The TRV represents the level of COPC exposure that is associated with a minimal and acceptable level of effect to the receptor. The TRVs typically used in an EcoRA are based on growth, survival, and reproduction measurement endpoints. They represent effects on individuals that are relevant to the viability of receptor populations.

For most ecological receptors, the assessment endpoint is the viability of the population. This implies that very localized areas of effect on individuals may be tolerated, based on minimal expected effect at the population level. For species at risk (SAR), the assessment endpoint is individual health, recognizing that each individual is important to the population; thus, any TRV exceedance is considered unacceptable for SAR.

Table 4-4: Assessment Endpoints, Measurement Endpoints, and Lines of Evidence

Organism Category	Ecological Receptors	Level of Protection	Protection Goal	Assessment Endpoint	Lines of Evidence (LOE)	
					Line of Evidence	Use of Measurement Endpoints for Specific LOEs
Bottom Feeding Fish	Northern Redbelly Dace, Round Whitefish, White Sucker, American Eel*	Population or Individual for SAR	Maintenance of bottom feeding fish populations in Lake Ontario as source of food for piscivorous fish and wildlife.	Viability of bottom-feeding fish populations.	Water Chemistry	Comparison of COPC concentrations to growth, survival and reproduction toxicological reference values (low-effect threshold concentrations).
					Radiological Dose	Comparison of estimated doses of COPCs to growth, survival and reproduction benchmark values (low-effect threshold doses) relevant to the assessment endpoint.
Pelagic Fish	Alewife, Lake Trout	Population	Maintenance of pelagic fish populations in Lake Ontario as source of food for piscivorous fish and wildlife.	Viability of pelagic fish populations.	Water Chemistry	Comparison of COPC concentrations to growth, survival and reproduction toxicological reference values (low-effect threshold concentrations).
					Radiological Dose	Comparison of estimated doses of COPCs to growth, survival and reproduction benchmark values (low-effect threshold doses) relevant to the assessment endpoint.

Organism Category	Ecological Receptors	Level of Protection	Protection Goal	Assessment Endpoint	Lines of Evidence (LOE)	
					Line of Evidence	Use of Measurement Endpoints for Specific LOEs
Reptiles and Amphibians	Turtles, Frogs	Population	Maintenance of turtle and frog populations in Coot's Pond and Treefrog Pond as sources of food for fish and wildlife.	Viability of turtle and frog populations.	Water Chemistry	Comparison of COPC concentrations to growth, survival and reproduction toxicological reference values (low-effect threshold concentrations).
					Radiological Dose	Comparison of estimated doses of COPCs to growth, survival and reproduction benchmark values (low-effect threshold doses) relevant to the assessment endpoint.
Aquatic Plants	Aquatic plants	Population	Maintenance of aquatic plant populations in Coot's Pond and Treefrog Pond as a source of food and cover for wildlife.	Viability of aquatic plant populations.	Water Chemistry	Comparison of COPC concentrations to growth, survival and reproduction toxicological reference values (low-effect threshold concentrations) for aquatic plants.
					Radiological Dose	Comparison of estimated doses of COPCs to growth, survival and reproduction benchmark values (low-effect threshold doses) relevant to the assessment endpoint.

Organism Category	Ecological Receptors	Level of Protection	Protection Goal	Assessment Endpoint	Lines of Evidence (LOE)	
					Line of Evidence	Use of Measurement Endpoints for Specific LOEs
Benthic Invertebrates	Benthic invertebrates	Community	Maintenance of a diverse aquatic and benthic invertebrate community in Lake Ontario, Coot's Pond, and Treefrog Pond as source of food for fish and wildlife.	Richness, diversity, abundance of benthic invertebrates.	Water Chemistry	Comparison of COPC concentrations to water quality guidelines.
					Sediment Chemistry	Comparison of COPC concentrations to sediment quality guidelines.
					Radiological Dose	Comparison of estimated doses of COPCs to growth, survival and reproduction benchmark values (low-effect threshold doses) relevant to the assessment endpoint.
Riparian Birds	Bufflehead, Mallard, Green Heron	Population	Maintenance of riparian bird populations along Lake Ontario shoreline and Coot's Pond as source of food for predatory wildlife.	Viability of aquatic riparian bird populations	Radiological and Toxicological Doses	Comparison of estimated doses of COPCs to growth, survival, and reproduction benchmark values (low-effect threshold doses) relevant to the assessment endpoint.
Riparian Mammals	Muskrat	Population	Maintenance of riparian mammal population along Coot's Pond as source of food for predatory wildlife.	Viability of aquatic riparian mammal populations		

Organism Category	Ecological Receptors	Level of Protection	Protection Goal	Assessment Endpoint	Lines of Evidence (LOE)	
					Line of Evidence	Use of Measurement Endpoints for Specific LOEs
Terrestrial Invertebrates	Earthworm	Population	Maintenance of terrestrial invertebrate population at the DN site as a source of food for wildlife.	Viability of terrestrial invertebrate populations	Soil Chemistry	Comparison of COPC concentrations to soil quality guidelines.
					Radiological Dose	Comparison of estimated doses to growth, survival and reproduction benchmark values (low-effect threshold doses) relevant to the assessment endpoint.
Terrestrial Plants	Grasses, Sugar Maple	Population	Maintenance of the terrestrial plant population at the DN site.	Viability of terrestrial plant populations	Soil Chemistry	Comparison of COPC concentrations to soil quality guidelines.
					Radiological Dose	Comparison of estimated doses to growth, survival and reproduction benchmark values (low-effect threshold doses) relevant to the assessment endpoint.
Terrestrial Birds	American Robin, Bank Swallow*, Song Sparrow, Yellow Warbler	Population or Individual for SAR	Maintenance of the terrestrial bird population at the DN site.	Viability of terrestrial bird populations	Radiological and Toxicological Doses	Comparison of estimated doses of COPCs to growth, survival and reproduction benchmark values (low-effect threshold doses) relevant to the assessment endpoint.
Terrestrial Mammals	Eastern Cottontail, Meadow Vole, White-	Population	Maintenance of terrestrial mammal	Viability of terrestrial		

Organism Category	Ecological Receptors	Level of Protection	Protection Goal	Assessment Endpoint	Lines of Evidence (LOE)	
					Line of Evidence	Use of Measurement Endpoints for Specific LOEs
	Tailed Deer, Common Shrew, Raccoon, Red Fox, Short-Tailed Weasel		population at the DN site.	mammal populations		

Notes:
* For Species at Risk (SAR), the goal is protection of individuals, recognizing that each individual organism's health is important to the population; thus, any toxicological reference value exceedance is considered unacceptable.

4.1.3 Selection of Chemical, Radiological, and Other Stressors

As noted in **Section 3.1.2**, the DNNP is expected to release certain chemicals and radionuclides to air during operations. The BWRX-300 is expected to operate following a zero liquid release design philosophy; thus, no routine releases of radionuclides to surface waters are expected. While the reactor design utilizes mechanical means to protect against impingement, entrainment and biofouling, the design does include a backup chlorination system; thus, residual amounts of chlorine and/or chlorine disinfection by-products may be detectable within effluent released from the service water system, though this is expected to be mitigated by the use of dichlorination agents (Baird, 2024).

Site preparation and construction activities have the potential to generate noise and vibration levels higher than current existing conditions. As discussed in **Section 2.2.2**, no radionuclide releases to the atmosphere are expected during site preparation and construction; however, radionuclide air emissions are anticipated via the active ventilation system during normal operations.

For non-radiological air emissions, it is expected that the site preparation and construction phases will result in emissions typical of large-scale construction projects, including dust/particulates and engine and motorized equipment exhausts. The operation phase will result in emissions associated with the testing of standby generators and worker traffic accessing the DNNP from Holt Road. For the noise assessment, noises generated during operations are bounded by the site preparation and construction phases.

4.1.3.1 Selection of Chemical COPCs

4.1.3.1.1 Selection of Chemical COPCs in Air

During the site preparation and construction phases of the DNNP, air pollutants are expected to be released into the local atmosphere. Examples include fugitive dusts generated as part of typical construction activities (e.g., excavation, land clearing) and engine exhaust emissions from heavy construction vehicles, on-site personnel vehicles, and other motorized pieces of equipment. DNNP air emissions generated during the operation phase will also include those from the standby generators and worker traffic entering the DNNP from the Holt Road entrance.

Predicted concentrations of air pollutants during site preparation, construction, and operation were modelled by IEC (2024) and screened against ambient air quality criteria as described in **Section 2.2.2.2** and identified in **Table 2-5**. The MECP’s AAQCs are developed to be protective of health and the environment and are therefore appropriate screening guidelines for ecological receptors. CCME’s CAAQS were developed considering human health risks and are considered overly conservative for screening ecological health risks.

PM_{10}, $PM_{2.5}$ and BaP

Specific locations relevant to ecological receptors include those located on the DN and DNNP sites and those at the fenceline where ecological receptors may reside. Consistent with

N288.6:22 (CSA, 2022a), inhalation exposures for ecological receptors are often considered minor compared to soil and food ingestion and can be ignored for most substances (except for substances that do not partition to soil); therefore, PM_{10}, $PM_{2.5}$ and BaP were not considered further for ecological receptors.

<u>TSP</u>

Dust (TSP) could be generated from Project activities including mobilization, clearing, grubbing, on-land earthmoving, grading, and excavation. Dust deposition onto vegetation could impact growth and function. Deposition rates were calculated by IEC (2024) for site preparation using the TSP concentrations divided by the settling velocity. The maximum daily incremental deposition rates of 0.3 to 0.5 g/m^2/day adjacent to Maple Grove Road are well below the value of 14 g/m^2/day cited in Farmer (1991). The dust generation assumptions are considered conservative as worst-case scenarios, which are unlikely to occur, were used in the air model. In addition, a dust management plan will be implemented that could involve mitigative measures such as the application of dust suppressants; stabilization of completed soil surfaces; and suspension of dust-generation activities during periods of inclement weather. As such, no adverse effects to vegetation, or endangerment to bat or bank swallow habitat associated with the vegetation are expected.

<u>NOx, SO_2, CO and Acrolein</u>

Substances that do not partition to soil include gases such as NOx, SO_2, CO, and acrolein. No exceedances of air quality criteria were identified for SO_2 and CO at ecological receptor locations during all Project phases.

During site preparation and construction, 1-hour NOx concentrations are predicted to exceed the 1-hour MECP AAQC at every ecological receptor location. Additionally, 24-hour NOx concentrations are modelled to exceed the 24-hour MECP AAQC at every ecological receptor location, with the exception of Location C. During operation, 1-hr NOx concentrations are predicted to exceed the MECP 1-hour AAQC at Location D, Location F and both the north/west/east fenceline and south fenceline. Predicted 24-hr NOx concentrations are modelled to exceed the MECP 24-hour AAQC only at the south fenceline, as shown in **Table 2-13**.

There is no annual MECP AAQC and the CCME CAAQS are not appropriate for ecological receptors. Adverse effect levels for NOx under short-term exposure are not expected below 5 ppm (9,000 µg/m^3) for dogs (Kleinman and Mautz, 1991), and below 3.5 ppm (6,300 µg/m^3 for plants (Heck, 1964). Predicted NOx concentrations are lower than adverse effect levels and therefore are not considered further.

During site preparation, acrolein was predicted to exceed the 1-hr and 24-hr AAQCs at ecological receptor locations, as shown in **Table 2-15**. No exceedances are predicted for acrolein during operation. When inhaled, acrolein can cause irritation of the respiratory and gastrointestinal tracts. In plants, acrolein exposure can cause surface necrosis (i.e., cell damage).

The WHO has derived an estimated no-effects value for short-term acrolein exposure of terrestrial plants of 23 µg/m^3, and for terrestrial animals of 57 µg/m^3 (WHO, 2002). Predicted acrolein concentrations are generally below these estimated no-effect values, other than potentially at the south fenceline where the predicted acrolein concentration is 28.3 µg/m^3, higher than the estimated no-effects value of 23 µg/m^3 for terrestrial plants; however, terrestrial plants are not prevalent at the south fenceline along the shoreline. As such, acrolein is not considered further in the PERA.

Considering the above discussion, no non-radiological air COPCs are considered further in the predictive EcoRA.

4.1.3.1.2 Selection of Chemical COPCs in Surface Water

As described in **Section 2.2.1.2**, the BWRX-300 is being designed to avoid chemical dosing, namely chlorine, for water filtration and biofouling prevention; rather, the design will rely on both active and passive mechanical measures to achieve these operational goals. However, as an additional backup measure, it is expected that there will still be provisions in the design for chlorine injection in the future, to be used only if and as required. Thus, the only chemical COPC considered in liquid effluent released to surface water is total residual chlorine (TRC).

Chlorine is a common disinfectant used to treat drinking water to inactivate and kill waterborne pathogens and prevent biofouling of water supply systems. It is a highly reactive chemical and strong oxidizing agent, making it toxic to biological organisms. CCME has established a water quality guideline of 0.0005 mg/L for reactive chlorine species (synonymous with TRC) for the protection of freshwater aquatic life (CCME, 1999). The Ontario Provincial Water Quality Objective (PWQO) for TRC is set at 0.002 mg/L (MOEE, 1994). As there is no current methodology to feasibly and reliably detect chlorine at the CCME guideline of 0.0005 mg/L, the PWQO of 0.002 mg/L is selected as the screening benchmark for TRC.

Consistent with the methodology presented in **Section 3.1.2.1.2**, and assuming the maximum allowable concentration of 0.01 mg/L released from the diffuser into Lake Ontario, the screening of TRC is shown below in **Table 4-5**. Using the recommended site-specific outfall dilution factor of 7 (**Section 3.1.2.1.2**), the estimated mixing zone TRC concentration released to Lake Ontario is calculated to be 0.0014 mg/L. This estimated concentration is below the selected PWQO screening guideline of 0.002 mg/L. Ontario MOEE (1979) notes that PWQOs were established at values considered protective of all forms of aquatic life at all stages of many diverse aquatic life cycles, including those considered most sensitive to chronic exposures to waterborne contaminants. Thus, the estimated mixing zone concentration for TRC being less than the PWQO screening guideline suggests that TRC does not pose a risk to aquatic life and it is not assessed further in the predictive EcoRA. Furthermore, the use of dechlorination agents to remove residual chlorine in the CCW system is expected to reduce end of pipe TRC concentrations to well below detection limits (Baird, 2024).

Table 4-5: Ecological Screening of Total Residual Chlorine in DNNP Effluent

Maximum Concentration of TRC Discharged in CW Duct	Lake Ontario Dilution Factor	Estimated Maximum Mixing Zone Concentration in Lake Ontario	Selected TRC Screening Guideline	Retained as COPC for Surface Water?
0.01 mg/L	7	0.0014 mg/L	0.002 mg/L [a]	No

Notes:
[a] Ontario PWQO for total residual chlorine (TRC), Ontario MOEE (1979)

4.1.3.2 Selection of Radiological COPCs

As noted in **Section 2.2.1** and earlier in this section, the BWRX-300 is expected to operate following a zero liquid release philosophy for radiological liquid waste; thus, no routine releases of radionuclides to surface water are expected (see **Section 7.0** for a sensitivity analysis where radiological releases to water are considered).

The screening of atmospheric radiological COPCs has been previously described in **Section 2.2.2.1.1**. Results of the radiological air COPC screening are presented in **Table 2-2**, and the final list of radionuclides is summarized in **Table 2-3**.

4.1.3.3 Selection of Other Stressors

4.1.3.3.1 Noise

As discussed in **Section 2.5**, the current noise environment in the vicinity of the DNNP is typical of an urban setting and is influenced by several sources including the DNGS and other existing DN site infrastructure, traffic on the nearby Highway 401 and local roads, the CN rail line, and the neighbouring St. Marys Cement (SMC) plant and Durham York Energy Centre (DYEC).

There are minimal regulatory noise limits for the protection of ecological receptors. N288.6:22 (CSA, 2022a) points to Environment and Climate Change Canada's (ECCC) guidelines established to avoid causing harm to migratory birds and their nests (ECCC, 2023). According to ECCC (2023), significant sources of disturbance (with respect to noise) include:

- drilling, loud noise, vibration (for example, seismic blasting);
- noise exceeding 10 decibels (dB) above ambient noise levels in the natural environment; and,
- noise greater than about 50 dB.

The 2009 DNNP EIS predicted that 24-hour Leq noise levels at Coot's Pond would increase from 56 dBA to 65 dBA during site preparation and construction but would return to existing levels following the completion of Project construction activities. Additionally, it was predicted that 24-hour Leq sound levels at St. Marys Cement's Raby Head Marsh would also increase from Project-related activities. 24-hour Leq noise levels at other potentially sensitive areas of the DN site (e.g., breeding bird habitat) were not predicted to change above existing conditions at the time and ranged between 53 to 63 dBA. Overall, the 2009 DNNP EIS concluded there would be no adverse affects to non-human biota from Project-related noise, and thus noise was not investigated as a likely effect in the Terrestrial Environment (OPG, 2009d). Similarly, Beacon Environmental noted that bird and wildlife communities would likely be adjusted to the high level of noise in the vicinity of the DN site (OPG, 2009c, 2011b), and observed that none of the planned activities, for which the two respective EAs were being conducted, were likely to increase noise to levels intolerable by local breeding birds.

In 2018/2019, noise at the DN vicinity was monitored and results were found to be similar to previous studies (OPG, 2022c). The more recent Spring and Fall 2022 noise assessments (OPG, 2022c, 2023d) found similar conclusions to the 2018/2019 and past noise studies. As indicated by the recent noise monitoring programs, noise levels at the DN site have remained consistent over time, further supporting the notion that local birds and wildlife would be accustomed to existing noise levels. Recent biodiversity studies (Beacon, 2021, 2022, 2023, 2024) indicate that numerous bird species continue to live and breed at the DN site, again indicating a tolerance for existing noise levels.

Noise modelling for this PERA (**Table 2-19** and **Table 2-21**) indicates an exceedance of the 50 dB guideline from ECCC during site preparation and construction; however, it should be noted that existing noise levels already exceed this guideline. Given the abundance of bird species currently existing at the DN site, it is likely that bird populations are already accustomed to sound levels above 50 dB from current activities and operations at the DN site. When considering the ECCC guideline for the exceedance of ambient noise levels by more than 10 dB, no incremental noise level changes were found to exceed this guideline, providing further evidence that birds at the DN site are not expected to be impacted by DNNP activities any more than what they would already be accustomed to.

With respect to bedrock removal for the Condenser Cooling Water and Reactor shafts, it is expected that OPG will utilize micro-blasting, a technique that uses less charge mass compared to more traditional, open-rock face blasting methods, thus resulting in less sound generation. Recent continuous sound monitoring completed over a week along the bluff indicated an Lpeak of 113 dBL[10] at the time of a blast at the adjacent SMC facility (Calian, 2024). Given the abundance of bank swallow colonies that continue to exist on the DN site, it is expected that

[10] dBL or dB (linear) is a parameter used for measuring air overpressure. The term "linear" refers to the fact that the measurement does not have a frequency weighting applied, such as dBA (A-weighted).

bank swallows are already accustomed to loud sounds associated with blasting methods used at SMC.

Assuming site preparation and construction equipment are adequately maintained and are compliant with regulatory noise limits, construction activities are not expected to result in long-term effects to terrestrial receptors. Site preparation and construction activities are expected to occur in phases over the course of the overall construction schedule, meaning any noises generated are unlikely to be experienced continuously over the long term. As much as its possible to do so, its expected that work will be planned to occur during daytime hours when background sound levels are higher than nighttime hours to minimize disruption of nocturnal wildlife. The development and implementation of a Noise Management Plan during the site preparation and construction phases of the Project will outline best construction practices and available mitigation measures for controlling noise generation. Furthermore, to account for the expected increase in vehicle traffic associated with the DNNP, a Traffic Management Plan will also be implemented to manage traffic-related effects, including nuisance effects such as noise, during site preparation and construction. Sound levels during the operations phase are assumed to return to levels consistent with current existing conditions.

Overall, accounting for the temporary nature of any Project-related elevated noise levels and the proposed mitigation measures, noise is not expected to result in any adverse risks to terrestrial receptors and is not assessed further in this predictive EcoRA. Additionally, given that noise generation is expected to be higher during site preparation and construction due to the occurrence of more disruptive construction activities (e.g., bedrock removal), the operation of heavy machinery and higher levels of vehicle traffic from construction personnel, the operations phase is assumed to be bounded by the site preparation and construction phases and is similarly considered to pose no risks to ecological health with respect to noise.

4.1.3.3.2 Vibration Levels

During the construction phase, bedrock removal will be required to support construction activities. Bedrock removal will result in increased vibration levels. An assessment was conducted to evaluate potential effects of increased vibration levels on bank swallows at the bluffs along the southeast of the DN site.

There is ongoing bedrock removal at St Marys Cement quarry located neighbouring the DNNP. Vibration levels along the bluffs for existing conditions were measured in June and July 2024 with all recorded vibration levels below the maximum peak ground velocity value of 0.92 mm/s. This is identified as a safe vibration level since the bank swallow colonies persist at the site year after year. Predicted vibration levels that will result from bedrock removal for the DNNP are all below 0.92 mm/s. At one of the bluff locations, a predicted marginal exceedance of 0.92 mm/s was identified; however, the bedrock removal design using a rock splitter at the starter tunnel will mitigate this exceedance (ITASCA, 2024).

Future test blasts are planned to better calibrate the model and refine the design to ensure that vibrations along the bluff are less than or equal to the prescribed level of 0.92 mm/s. Overall, considering vibration levels at the bluffs are likely to be similar to existing levels, impacts on bank swallows at the bluffs are not expected. Vibration is not considered further in the PERA.

4.1.3.3.3 Thermal Stressors, Entrainment, and Impingement

As per CSA N288.6:22, physical stressors such as thermal stress, entrainment and impingement are not subject to a formal screening process (CSA, 2022a). Thus, these stressors have been retained for further characterization in the predictive EcoRA.

The DNNP will implement a once-through cooling system. Water will be discharged through a series of diffusers which will promote rapid mixing in the lake, and the potential effects of the thermal discharge on aquatic biota are expected to be limited to the immediate area surrounding the diffuser. Thermal effects are evaluated further in **Section 4.4.2**.

The intake at DNNP is designed to limit the velocity of water near the intake to reduce the impingement and entrainment of fish. Additionally, the intake will be sited slightly deeper (i.e., > 10 m) than the DNGS structures to mitigate the potential entrainment of Round Whitefish and Deepwater Sculpin. While the intake at DNNP will result in a lower impingement and entrainment impact compared to DNGS it is still considered further in **Section 4.4.3**.

4.1.3.3.4 Bird Strikes and Wildlife Collisions

SENES (2009) completed a series of bird strike surveys between 2007-2008, ultimately concluding that the low number of bird fatalities and injuries attributable to collisions with manmade structures made further studies unnecessary. Currently, OPG tracks wildlife fatalities and injuries through an informal reporting process. For the period from 2016 to 2019, the fatalities and injuries reported through this method, not including predation deaths, are summarized in Table 4-5 of the 2020 DN ERA (Ecometrix, 2022). Similar results for the period from 2020 to 2022 are presented in Table 4-3 of the 2024 DN ERA Addendum (Ecometrix, 2024), which documents a similar low number of incidents compared to the 2016 to 2019 list.

As the BWRX-300 does not include cooling towers as part of its design, the Comprehensive EIS Review document noted that the majority of predicted bird strikes, which were attributed to cooling towers in the 2009 DNNP EIS, have effectively been eliminated (OPG, 2023b). Given that the DNNP will consist of other large structures, bird strikes with manmade objects are still a concern. However, additional mitigation measures, including the implementation of best practices when designing structures, lighting systems and fencing will help minimize the number of bird strikes caused by DNNP facilities (OPG, 2023b).

The 2009 DNNP EIS concluded that impacts to ecological receptors (particularly terrestrial mammals) may also occur in the form of vehicle collisions with DNNP-related traffic. However, it is assumed that ecological receptors present at the DNNP and wider DN site are unlikely to be affected by road mortality at any significant level (OPG, 2023b).

As part of the EMEAF Program, wildlife road mortality surveys were conducted over a one-week period in spring, summer, and fall of 2023, during the site preparation phase. Road surveys were conducted along the two main entry roads to the DN site, Park Road and Holt Road, extending approximately 300 m south of the railway line, as well as along Second Line (internal road on DNNP Lands). Overall, the first year of road mortality monitoring found very low levels of wildlife killed on roads, except for the elevated mortality of Dekay's Brownsnake during the fall monitoring period. While there is currently no clear explanation for the elevated mortality of Dekay's Brownsnake, the mortality event was noted to coincide with a known period of increased activity between late September to early October, when this species moves from its foraging areas to hibernation sites. It was also speculated that some of the deceased individuals had not been removed during the first day of sampling and were recounted as "new" individuals during the second day of sampling. Overall, road mortality results are similar to the conclusions in the 2009 DNNP EIS.

Due to the relatively small number of affected individuals, bird strikes and vehicle collisions are not expected to negatively affect populations of birds and mammals at the DNNP and DN site. Thus, these physical stressors are not discussed further in this predictive EcoRA.

4.1.3.3.5 Habitat Loss

Due to its reduced size and footprint, deployment of the four BWRX-300 reactors at the DNNP is expected to result in the retainment of some terrestrial habitat compared to the four larger-scaled reactor technologies assessed as part of the 2009 DNNP EIS. However, the loss of terrestrial habitat will nonetheless result in some adverse impacts to terrestrial wildlife.

The deployment of four BWRX-300 reactors at the DNNP was also expected to result in the loss of suitable habitat for the Bank Swallow, notably a bird species that is a SAR. OPG is making every effort to retain as much Bank Swallow nesting habitat as possible, including current plans that avoid shoreline areas with Bank Swallow nesting habitat. The development of these plans remains ongoing.

Despite these potential impacts, the BWRX-300's smaller size will result in less terrestrial habitat destruction and will require less shoreline alteration than what was assessed in the 2009 DNNP EIS (OPG, 2023b). Given that the EIS predicted no significant impacts to the terrestrial or aquatic environment with consideration of mitigation measures, it is expected that the same conclusion would be applicable to the deployment of the BWRX-300.

4.1.4 Selection of Exposure Pathways

Exposure pathways include the routes of contaminant dispersion from the source to the receptor location, and the routes of contaminant transport through the food chain or other media to the receptor organism. Both are considered, as appropriate, to each unique species and location. As this PERA is looking towards the future, the predictive EcoRA considers exposure pathways for modelled concentrations of COPCs released to the environment. As characterized in **Section 4.1.3**, no chemical or radiological COPCs are released to surface water, and no chemical COPCs are released to the atmosphere.

For fish, frog and aquatic plants bioaccumulation (including uptake from water and other media) represents the main exposure pathway. This uptake is calculated using a water-based bioaccumulation factor. For soil invertebrates and terrestrial plants, the main exposure pathway is through contact with soil and contaminant uptake from soil via bioaccumulation. The dominant exposure pathways for birds, mammals and turtles are through the uptake of contaminants via the ingestion of water, incidental ingestion of soil or sediment, and ingestion of food.

Airborne COPCs partition to soil and plants, and ingestion pathways dominate over inhalation and air immersion for most COPCs. While inhalation is minor it was included for completeness. For this assessment noble gases are important COPCs in air; therefore, external exposure of receptors to noble gases is included in this assessment. Noble gases do not enter environmental media other than air; therefore, other exposure pathways for noble gases are not applicable.

Table 4-6: Complete Exposure Pathways for All Selected Ecological Receptor Species

Category	Ecological Receptor	Location *(see Figure 4-1)*	Exposure Pathways	Environmental Media
Bottom Feeding Fish	Northern Redbelly Dace	Coot's Pond (AB)	Direct Contact*	In Water On Sediment
	Round Whitefish	Lake Ontario	Direct Contact*	In Water On Sediment
	White Sucker		Direct Contact*	In Water On Sediment
	American Eel		Direct Contact*	In Water On Sediment
Pelagic Fish	Alewife	Lake Ontario	Direct Contact*	In Water
	Lake Trout		Direct Contact*	In Water
Reptiles and Amphibians	Turtle	Coot's Pond (AB), Treefrog/Dragonfly/ Polliwog Pond (D)	Direct Contact*	In Water On Sediment
	Frog		Direct Contact*	In Water On Sediment
Aquatic Plants	Aquatic Plant	Coot's Pond (AB), Treefrog/ Dragonfly/ Polliwog Pond (D)	Direct Contact*	In Water On Sediment
Benthic Invertebrates	Benthic Invertebrate	Lake Ontario, Coot's Pond (AB)	Direct Contact*	In Water In Sediment
Riparian Birds	Bufflehead	Lake Ontario	Direct Contact	On Sediment
			Ingestion	Water Sediment Benthic Invertebrates
		Coot's Pond (AB)	Direct Contact	On Sediment
			Ingestion	Water Sediment Aquatic Plants Benthic Invertebrates
	Mallard	Lake Ontario	Direct Contact	On Sediment
			Ingestion	Water Sediment

Category	Ecological Receptor	Location *(see Figure 4-1)*	Exposure Pathways	Environmental Media
				Benthic Invertebrates
		Coot's Pond (AB)	Direct Contact	On Sediment
			Ingestion	Water Sediment Aquatic Plants Benthic Invertebrates
	Green Heron	Coot's Pond (AB)	Direct Contact	On Sediment
			Ingestion	Water Sediment Bottom-Feeding Fish (Northern Redbelly Dace)
Riparian Mammals	Muskrat	Coot's Pond (AB)	Direct Contact	On Sediment
			Ingestion	Water Sediment Aquatic Plants
Terrestrial Invertebrates	Earthworm	AB, C, D, E, F	Direct Contact*	In Soil
Terrestrial Birds	American Robin	AB, C, D, E, F	Direct Contact	On Soil
			Ingestion	Water Soil Earthworms Fruit
	Bank Swallow	AB, E, F	Direct Contact	On Soil
			Ingestion	Water Soil Caterpillars
	Song Sparrow	AB, C, D, E, F	Direct Contact	On Soil
			Ingestion	Water Soil Fruit Caterpillars
	Yellow Warbler	AB, C, D, E, F	Direct Contact	On Soil
			Ingestion	Water Soil Fruit Caterpillars
Terrestrial Plants	Grasses	AB, C, D, E, F	Direct Contact	On Soil
	Sugar Maple	D, E, F	Direct Contact	On Soil
Terrestrial Mammals	Eastern Cottontail	AB, C, D, E, F	Direct Contact	On Soil
			Ingestion	Water Soil Grasses
	Meadow Vole	AB, C, D, E, F	Direct Contact	On Soil
			Ingestion	Water Soil Grasses
	White-tailed Deer	AB, C	Direct Contact	On Soil
			Ingestion	Water

Category	Ecological Receptor	Location *(see Figure 4-1)*	Exposure Pathways	Environmental Media
				Soil Grasses
		D, E, F	Direct Contact	On Soil
			Ingestion	Water Soil Grasses Sugar Maple trees
	Common Shrew	AB, C, D, E, F	Direct Contact	On Soil
			Ingestion	Water Soil Caterpillars
	Raccoon	AB	Direct Contact	On Soil
			Ingestion	Water Soil Grasses Fruit Caterpillar Benthic Invertebrates Meadow Voles
		C	Direct Contact	On Soil
			Ingestion	Water Soil Grasses Fruit Caterpillars Meadow Voles
		D, E, F	Direct Contact	On Soil
			Ingestion	Water Soil Grasses Sugar Maple trees Fruit Caterpillars Meadow Voles
	Red Fox	AB	Direct Contact	In and on Soil
			Ingestion	Water Soil Grasses Bufflehead Mallard Eastern Cottontail Rabbits Meadow Voles
		C, D, E, F	Direct Contact	In and on Soil
			Ingestion	Water Soil Grasses Eastern Cottontail Rabbits Meadow Voles

Category	Ecological Receptor	Location *(see Figure 4-1)*	Exposure Pathways	Environmental Media
	Short-tailed Weasel	AB, C, D, E, F	Direct Contact	On Soil
			Ingestion	Water Soil Meadow Voles

Note:
* Direct contact for aquatic organisms and terrestrial invertebrates includes their indirect uptake of contaminants through the food chain, which is included in the measured bioaccumulation factors.
Inhalation, while minor, is considered for all mammals and birds. External exposure in air is considered for noble gases only.

4.1.5 Ecological Health Conceptual Site Model

The ecological health conceptual site model (CSM) illustrates how receptors are exposed to COPCs. It identifies the source of contaminants, receptor locations and the exposure pathways to be considered in the assessment for each receptor. Exposure pathways represent the various routes by which radionuclides and/or chemicals may enter the body of the receptor, or (for radionuclides) how they may exert effects from outside the body. **Table 4-6** summarizes the relevant exposure pathways for each type of ecological receptor. The CSM for the predictive EcoRA is illustrated in **Figure 4-2**.

For organism losses by entrainment/impingement, the conceptual model illustrated in CSA N288.6 is appropriate. This conceptual model (**Figure 4-3**) represents the relationship between the individual losses and possible population or community effects.

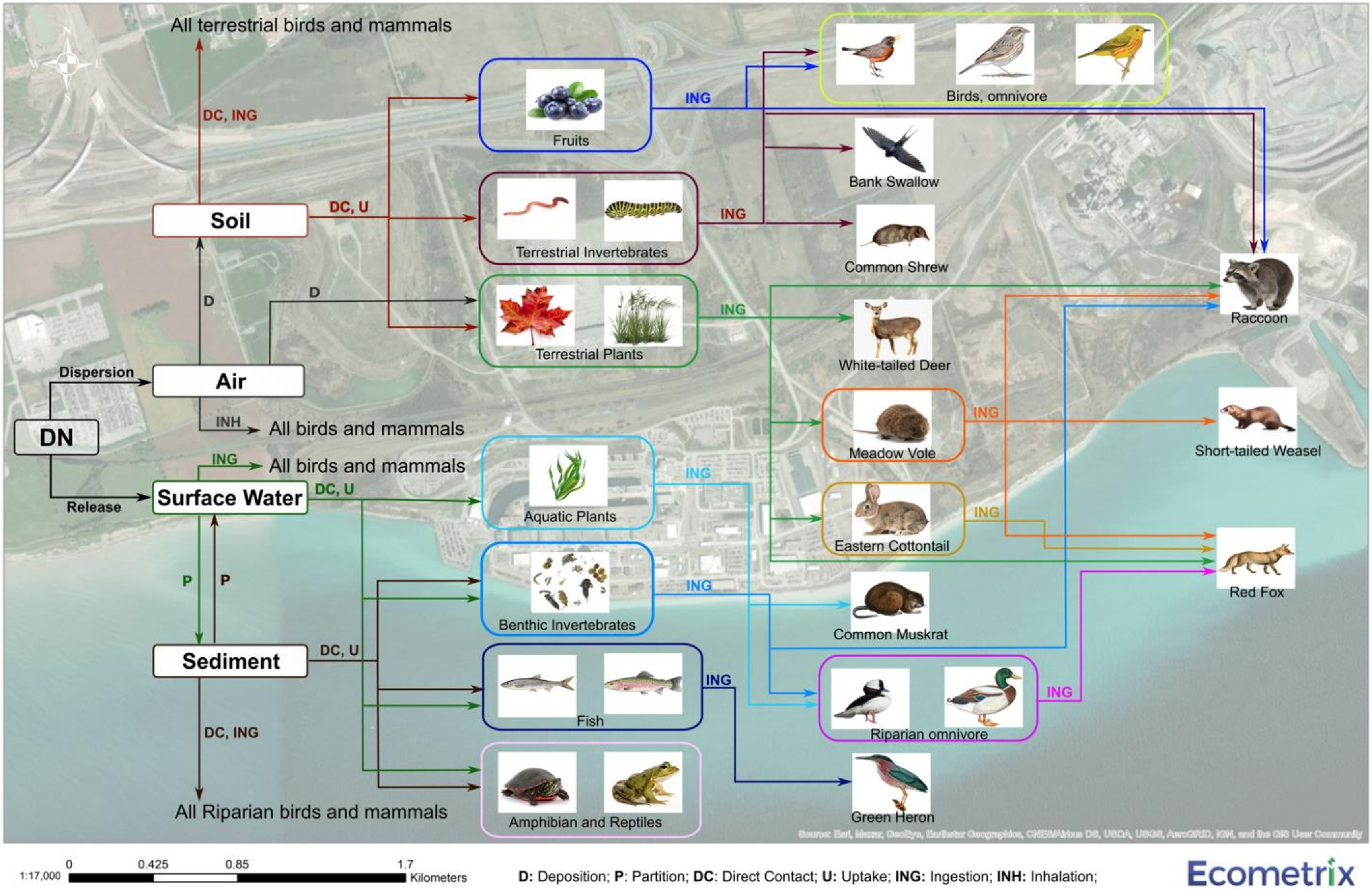


Figure 4-2: Ecological Health Conceptual Site Model for the Predictive EcoRA

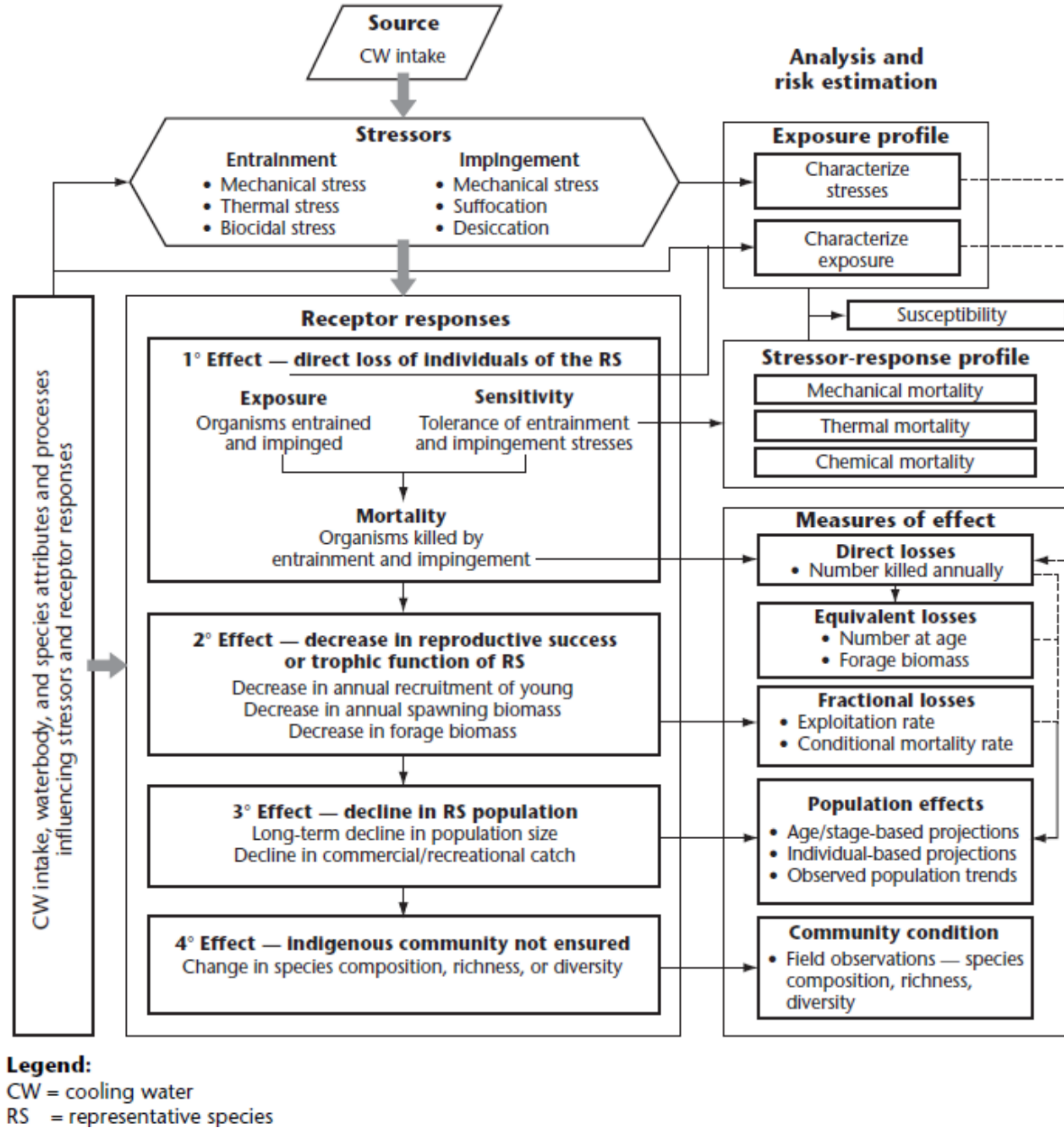


Figure 4-3: Generic Conceptual Model for Relationships between Individual Endpoints and Population/Community Endpoints (CSA, 2022a)

4.1.6 Uncertainties in the Problem Formulation

The data used in the predictive EcoRA problem formulation were concluded to be of adequate quality and quantity to support the objectives of the PERA. Maximum predicted concentrations were selected for COPC screening; this is considered conservative and is not reflective of typical ecological exposures, particularly for mobile receptors expected to move around the site or periodically leave and return to the site (i.e., migrant species).

As described in **Section 3.1.5**, though the BWRX-300 will rely on mechanical means for impingement/entrainment and biofouling prevention, the screening of chlorinated effluent released to surface water conservatively demonstrated that there are no expected risks to aquatic receptors in Lake Ontario. It should be noted that this screening assessment is based on details provided by the BWRX-300 design team and is assumed to be a maximum upper bound on potential chlorination levels of DNNP system waters.

The Ontario AAQC air quality criteria are considered adequate for screening priority air pollutants for ecological receptors. Additionally, the CCME CAAQS criteria are considered overly conservative as ecological guidelines. Thus, it is unlikely that risks to ecological receptors are being underestimated for the inhalation of airborne non-radiological COPCs.

Overall, the predictive EcoRA problem formulation is conservative in its assumptions to accommodate uncertainties and meet the objective of protecting ecological health during all phases of the DNNP. The ecological health conceptual site model is considered to be complete for the ecological exposures in the vicinity of the site.

4.2 Exposure Assessment

The exposure assessment includes identification of exposure locations and exposure factors for each receptor, explanation of dispersion models, and presentation of modelled exposure concentrations and doses (radiological and non-radiological). Uncertainties are discussed. This section also presents the information used in the IMPACT model, and the model results.

4.2.1 Exposure Points

The conceptual site model (CSM) assumes that terrestrial and aquatic receptors are present in various assessment areas as identified on **Figure 4-1**, including receptor locations AB, C, D, E, and F. Location F was added for the DNNP PERA to assess ecological receptors that may be more exposed to releases from the SMR. The location where location F was placed for the exposure assessment was determined based on a screening exercise to determine the most exposed location with available habitat.

4.2.2 Exposure Averaging

All ecological receptors were assessed assuming 100% residency at the exposure location. This was realistic for aquatic biota in a pond (i.e. Coot's Pond), and immobile terrestrial biota such as plants and soil invertebrates. This was a conservative assumption for mobile terrestrial mammals and birds that have large home ranges, and particularly for migratory ecological receptors, such as passerine birds, that spend part of the year away from the DN site.

4.2.3 Exposure and Dose Calculations

Exposure and dose calculations were performed for each radiological COPC for each ecological receptor as outlined in the ecological conceptual model.

The equations used for exposure and dose calculations are presented in the following subsections. They are commonly used in assessment of radiation exposures to ecological receptors. Assessments consider the radiation dose received from both internal and external radiation. The internal dose is calculated from internal (tissue) concentrations of radionuclides, determined from bioaccumulation or ingestion of radionuclides in water, soil/sediment, or food. The external dose is calculated from external concentrations in water and sediment or soil, and air (noble gases only).

4.2.3.1 Tissue Concentrations

The tissue concentrations (C_t) for plants, invertebrates or fish were derived using bioaccumulation factors, as per CSA N288.6:22 (CSA, 2022a) as follows:

$$C_t = C_m \cdot BAF$$

where,

C_t = whole body tissue concentration (Bq/kg fw)
C_m = media concentration (Bq/L or Bq/kg)

BAF = bioaccumulation factor (L/kg or kg/kg)

For birds and mammals, tissue concentrations were estimated using transfer factors, or biomagnification factors (BMFs) and the concentrations in their food, as follows:

$$C_t = \Sigma\, C_x \cdot I_x \cdot TF = C_f \cdot BMF$$

where,

C_x = concentration in the ingested item x (Bq/kg-fw)
I_x = ingestion rate of item x (kg-fw/d)
TF = ingestion transfer factor (d/kg)
C_f = average concentration in food (Bq/kg-fw)
BMF = biomagnification factor (unitless)

The BMF is equivalent to the total food intake rate multiplied by the transfer factor:

$$BMF = \Sigma\, I_x \cdot TF$$

The bioaccumulation factors, transfer factors and ingestion rates used for the calculation of tissue concentrations in biota are further described in **Section 4.2.4**.

4.2.3.2 Radiological Dose Calculations

Radiological doses were estimated using IMPACT 5.5.2, which is consistent with the equations outlined in CSA N288.1:20 (CSA, 2020) and the methods outlined in CSA N288.6:22 (CSA, 2022a). IMPACT™ uses the specific activity model for tritium and C-14 as per CSA N288.1:20 (CSA, 2020) and as recommended by CSA N288.6:22 (CSA, 2022a).

The radiation doses for the aquatic biota were estimated using the methods outlined in CSA N288.6:22 (CSA, 2022a). The dose for each radionuclide is comprised of an internal dose component, and an external dose component, which is driven by water and sediment. The 0.5 factor in the equation is for semi-infinite exposure to activity in water, during the time the organism spends at water surface, and for semi-infinite exposure to activity in sediment, during the time the organism spends at sediment surface. The aquatic biota dose was calculated using the following equations:

$$D_{int} = DC_{int} \cdot C_t$$

$$D_{ext} = DC_{ext} \cdot [(OF_w + 0.5 \cdot OF_{ws} + 0.5 \cdot OF_{ss}) \cdot C_w + (OF_s + 0.5 \cdot OF_{ss}) \cdot C_s]$$

where,

D_{int} = internal radiation dose (µGy/d)
D_{ext} = external radiation dose (µGy/d)

DC_{int}	=	internal dose conversion factor ((µGy/d)/(Bq/kg))
DC_{ext}	=	external dose coefficient ((µGy/d)/(Bq/kg))
C_t	=	whole body tissue concentration (Bq/kg fw)
C_w	=	water concentration (Bq/L)
C_s	=	sediment concentration (Bq/kg fw)
OF_w	=	occupancy factor in water (unitless)
OF_{ws}	=	occupancy factor at water surface (unitless)
OF_{ss}	=	occupancy factor at sediment surface (unitless)
OF_s	=	occupancy factor in sediment (unitless)

The radiation dose to terrestrial biota is estimated using a method similar to that for aquatic biota, except that the external dose component is driven by soil rather than water and sediment. The equations used to estimate radiation dose are:

$$D_{int} = DC_{int} \cdot C_t$$

$$D_{ext} = DC_{ext,s} \cdot OF_s \cdot C_s + DC_{ext,ss} \cdot OF_{ss} \cdot C_s + DC_{ext,a} \cdot C_a$$

where,

DC_{int}	=	internal dose coefficient ((µGy/d)/(Bq/kg))
$DC_{ext,s}$	=	external dose coefficient (in soil) ((µGy/d)/(Bq/kg))
$DC_{ext,ss}$	=	external dose coefficient (on soil surface) (µGy/d)/(Bq/kg))
$DC_{ext,a}$	=	external dose coefficient (immersion in air, noble gas) ((µGy/d)/(Bq/m^3))
C_a	=	air concentration (Bq/m^3)
C_t	=	whole body tissue concentration (Bq/kg fw)
C_s	=	soil concentration (Bq/kg dw)
OF_s	=	occupancy factor in soil (unitless)
OF_{ss}	=	occupancy factor at soil surface (unitless)

The total radiation dose to biota is the sum of the internal and external dose components for each radionuclide ($D_{total} = D_{int} + D_{ext}$).

The dose coefficients and occupancy factors used in the radiological dose estimation are provided in **Section 4.2.4**.

4.2.4 Exposure Factors

There are several COPC- and biota-specific exposure factors required for the dose calculations. These parameters include intake rates, body weights, occupancy factors, bioaccumulation factors (BAFs), transfer factors (TFs), and dose coefficients (DCFs).

4.2.4.1 Body Weight and Intake Rates

The body weights and total feed intake rates were consistent with those in the 2020 DN ERA (Ecometrix, 2022) and 2024 DN ERA Addendum (Ecometrix, 2024). The body weights and total feed intake rates were taken from the U.S. EPA (1993a), 2009 EcoRA (SENES, 2009) and the 2000 Pickering Nuclear (PN) EcoRA (SENES, 2000), where the assumptions and values were considered to be applicable for the DN site. For receptors, such as the Common Shrew that were not assessed in the 2009 EcoRA (SENES, 2009), body weights were obtained from the Federal Contaminated Sites Action Plan *Module 3: Standardization of Wildlife Receptor Characteristics* (FCSAP, 2012) and other sources. The feed intake rates were proportioned to body weight using allometric equations from the U.S. EPA (1993a). The water intake and inhalation rates were determined using allometric equations from the U.S. EPA for all birds and mammals (US EPA, 1993a). The incidental ingestion of soil and sediment was estimated based on the feed intake. As described by Beyer et al. incidental ingestion varied from 2% to 10.4% of dry weight food intake depending on the biota (Beyer et al., 1994). The body weights and intake rates for all birds and mammals are summarized in **Table 4-7**.

Table 4-7: Bird and Mammal Body Weights and Intake Rates

Receptor	Body Weight	Total Feed Intake		Dietary Components	Feed Type Fraction		Feed Intake		Moisture [f]	Intake of Soil / Sediment [g]	Basis of the Soil and Sediment Intake Value	Total Soil/ Sediment Intake [h]	Water Intake	Inhalation Rate
	kg	kg dw/d	kg fw/d		fw	dw	kg dw/d	kg fw/d	unitless	%		kg dw/d	L/d	m^3/d
White-tailed Deer	110[a]	3.274	16.371	Grass [a]	0.50	0.5	1.637	8.185	0.80	2.0	White-tailed Deer	0.06548	6.806	23.450
				Sugar Maple [a]	0.50	0.5	1.637	8.185	0.80					
Eastern Cottontail	1.216 [a]	0.081	0.404	Grass [a]	1.00	1.0	0.081	0.404	0.80	6.3	Black-Tailed Jackrabbit	0.00508	0.118	0.630
Common Shrew	0.004[b]	0.001	0.008	Earthworm [a,i]	1.00	1.0	0.001	0.008	0.83	2.0	assuming a default rate of 2% in soil in the diet on a dry weight basis	0.00003	0.001	0.007
Short-tailed Weasel	0.180 [a]	0.017	0.056	Meadow Vole [a]	1.00	1.0	0.017	0.056	0.70	5	average of small mammals	0.00084	0.021	0.138
Meadow Vole	0.034 [c]	0.002	0.011	Grass [a]	1.00	1.0	0.002	0.011	0.80	2.4	Meadow vole	0.00005	0.005	0.048
Raccoon - Location C, D, E, F	5.700	0.287	1.596	Grass [a]	0.13	0.14	0.040	0.200	0.80	9.4	Raccoon	0.02701	0.474	2.320
				Sugar Maple [a]	0.13	0.14	0.040	0.200	0.80					
				Fruit [a]	0.15	0.08	0.024	0.239	0.90					
				Earthworm [a,i]	0.50	0.47	0.136	0.798	0.83					
				Meadow Vole [a]	0.10	0.17	0.048	0.160	0.70					
Raccoon- Location A, B	5.700	0.287	1.528	Grass [a]	0.25	0.27	0.076	0.382	0.80	9.4	Raccoon	0.02701	0.474	2.320
				Fruit	0.15	0.08	0.023	0.229	0.90					
				Earthworm [e,i]	0.40	0.36	0.104	0.611	0.83					
				Meadow Vole [a]	0.10	0.16	0.046	0.153	0.70					
				Aquatic Invertebrates [e]	0.10	0.13	0.038	0.153	0.75					
Red Fox - Location C, D, E, F	4.535	0.088	0.313	Grass [a]	0.20	0.14	0.013	0.063	0.80	2.8	Red fox	0.24539	0.386	1.850
				Eastern Cottontail [e]	0.48	0.51	0.045	0.150	0.70					
				Meadow Vole [e]	0.32	0.34	0.030	0.100	0.70					
Red Fox - Location A, B	4.535	0.088	0.313	Grass [a]	0.20	0.14	0.013	0.063	0.80	2.8	Red fox	0.24539	0.386	1.850
				Eastern Cottontail [e]	0.30	0.32	0.028	0.094	0.70					
				Meadow Vole [e]	0.20	0.21	0.019	0.063	0.70					
				Bufflehead [e]	0.15	0.16	0.014	0.047	0.70					
				Mallard [e]	0.15	0.16	0.014	0.047	0.70					
Common Muskrat - Location A, B	1.180	0.088	0.353[c]	Freshwater Plants [e]	1.00	1.00	0.088	0.353	0.75	3.3	based on Mallard	0.00291	0.115	0.590
Song Sparrow	0.021	0.005	0.044	Fruit [a]	0.90	0.84	0.004	0.040	0.90	5.0	based on non-dwelling birds	0.00024	0.004	0.021
				Earthworm [a,i]	0.10	0.16	0.001	0.004	0.83					
Bank Swallow	0.015 [a]	0.004	0.022	Earthworm [a,i]	1.00	1.00	0.004	0.022	0.83	5.0	based on non-dwelling birds	0.00019	0.004	0.016
Yellow Warbler	0.010 [a]	0.003	0.018	Fruit [a]	0.10	0.06	0.0002	0.002	0.90	5.0	based on non-dwelling birds (5%) same approach SENES (2009) used	0.00015	0.003	0.012
				Earthworm [a,i]	0.90	0.94	0.003	0.016	0.83					
American Robin	0.077 [a]	0.012	0.093	Fruit	0.60	0.47	0.006	0.056	0.90	9.9	based on the average for the American Woodcock (10.4%) and Wild Turkey (9.3%)	0.00118	0.011	0.057
				Earthworms [a]	0.40	0.53	0.006	0.037	0.83					

Receptor	Body Weight	Total Feed Intake		Dietary Components	Feed Type Fraction		Feed Intake		Moisture [f]	Intake of Soil / Sediment [g]	Basis of the Soil and Sediment Intake Value	Total Soil/ Sediment Intake [h]	Water Intake	Inhalation Rate
	kg	kg dw/d	kg fw/d		fw	dw	kg dw/d	kg fw/d	unitless	%		kg dw/d	L/d	m^3/d
Bufflehead - Lake Ontario	0.473 [a]	0.036	0.143	Aquatic Invertebrates [e]	1.00	1.00	0.036	0.143	0.75	1.1	average for birds	0.00039	0.036	0.230
Bufflehead - Location AB	0.473 [a]	0.036	0.143	Freshwater Plants [e]	0.10	0.10	0.004	0.014	0.75	1.1	average for birds	0.00039	0.036	0.230
				Aquatic Invertebrates [e]	0.90	0.90	0.032	0.129	0.75					
Mallard - Lake Ontario	1.082 [a]	0.063	0.250[a]	Aquatic Invertebrates [e]	1.00	1.00	0.063	0.250	0.75	3.3	based on Mallard	0.00206	0.062	0.450
Mallard - Location AB	1.082 [a]	0.063	0.250 [a]	Freshwater Plants [e]	0.25	0.25	0.016	0.063	0.75	3.3	based on Mallard	0.00206	0.062	0.450
				Aquatic Invertebrates [e]	0.75	0.75	0.047	0.188	0.75					
Green Heron – Location AB	0.175 [d]	0.019	0.075	Fish [d]	1.00	1.00	0.019	0.075	0.75	2.0	based on Blue-winged teal	0.00037	0.018	0.107

Notes:
The body weights and total feed intake rates were taken from the US EPA (1993a), unless otherwise indicated:
[a] SENES (2009).
[b] FCSAP (2012).
[c] SENES (2000).
[d] Encyclopedia of Life, hosted by the Smithsonian National Museum of Natural History: https://eol.org/pages/45511342.
[e] Fraction of diet feed type was assumed.
[f] CSA (2020).
[g] Beyer et al. (1994).
[h] Calculated by multiplying the total feed intake by the intake of soil/sediment fraction.
[i] Dietary component caterpillar used in the 2020 DN ERA (Ecometrix, 2022) and 2024 DN ERA Addendum (Ecometrix, 2024) was replaced by earthworm in this PERA.

4.2.4.2 Fraction of Time on Site and Occupancy Factors

With the exception of riparian and terrestrial birds, the fraction of time a receptor resides in the different DN areas (e.g., Lake Ontario, Location AB (which includes Coot's Pond), C, D (which includes Treefrog, Dragonfly and Polliwog ponds) is assumed to be one. For the Bufflehead, Mallard, Green Heron, American Robin, Bank Swallow and Yellow Warbler the fraction of time these birds reside in the DN area(s) is assumed to be 0.5, whereas the fraction of time the Song Sparrow resides in the DN areas is assumed to be 0.8. The fractions of time for these birds are consistent with assumptions in the 2020 DN ERA (Ecometrix, 2022) and 2024 DN ERA Addendum (Ecometrix, 2024).

An occupancy factor is defined as the fraction of time the receptor species spends in or on various media. The occupancy factors are based on the experience and judgement of the risk assessor and the known behaviour of the receptor. The occupancy factors used in the radiological dose estimation are given in **Table 4-8**.

Table 4-8: Receptor Occupancy Factors

Aquatic Biota	OF_S	OF_{SS}	OF_W	Terrestrial and Riparian Biota	OF_a	OF_S	OF_{SS}
Aquatic Plants	-	0.5	0.5	Grass	-	-	1
Benthic Invertebrates	1	-	-	Sugar Maple	-	-	1
Alewife	-	-	1	Earthworm	-	1	-
Lake Trout	-	-	1	American Robin	1	-	1
American Eel	-	0.5	0.5	Bank Swallow	1	-	0.5
Dace	-	0.5	0.5	Bufflehead	1	-	0.5
Round Whitefish	-	0.5	0.5	Green Heron	1	-	0.5
White Sucker	-	0.5	0.5	Mallard	1	-	0.5
Frogs	-	0.5	0.5	Song Sparrow	1	-	1
Turtles	-	0.5	0.5	Yellow Warbler	1	-	0.5
				Common Shrew	1	-	1
				Eastern Cottontail	1	-	1
				Meadow Vole	1	-	1
				Muskrat	1	-	1
				Raccoon	1	-	1
				Red Fox	1	0.2	0.8
				Short-tailed Weasel	1	-	1
				White-tailed Deer	1	-	1

Notes:
OFa = occupancy factor in contaminated air
OFs = occupancy factor in soil/sediment
OFss = occupancy factor on soil/sediment surface
OFw = occupancy factor in water
- = not applicable.

4.2.4.3 Bioaccumulation Factors

Bioaccumulation factors relate the COPCs in the environmental media to the concentration in the receptor. In cases where tissue concentrations were not available for the receptors at the DN site, BAFs were used to calculate COPC concentrations in aquatic biota, terrestrial plants and invertebrates. For the exposure assessment, BAFs were taken from CSA N288.1:20 (CSA, 2020), IAEA TRS 472 (2010) and literature sources (Sample et al., 1998).

The BAFs used in the assessment are presented in **Table C-1** and **Table C-2** in **Appendix C**. Bioaccumulation factors for tritium and carbon-14 are calculated using the specific activity model in IMPACT™. No BAFs are presented for noble gases or radionuclides with short half-lives because these COPCs do not bioaccumulate.

4.2.4.4 Transfer Factors

Transfer factors (TFs) represent the fraction of daily COPC intake transferred to the tissue of birds and mammals. Ingestion transfer factors are COPC and biota-specific. Ingestion TFs from forage to tissue for agricultural livestock are available in CSA N288.1:20 (CSA, 2020). An allometric equation (i.e., transfer proportional to a -3/4 power of body weight) (CSA N288.6:22) was applied to TFs available for beef and poultry from CSA N288.1:20 (CSA, 2020), the IAEA TRS 472 (2010), or the National Council on Radiation Protection and Measurements (NCRP, 1996) to estimate the TFs for the mammal and bird receptors, respectively. Inhalation TFs were calculated from the ingestion TF, by adjusting the ingestion TF by a COPC-specific inhalation/ingestion ratio (II) from CSA N288.1:20 (CSA, 2020). The derived transfer factors are presented in **Table C-3**, **Table C-4** and **Table C-5** in **Appendix C** and The transfer factors for tritium and Carbon-14 were derived using specific activity methods in IMPACT™. No TFs are presented for noble gases or radionuclides with short half-lives because these COPCs do not bioaccumulate.

4.2.4.5 Dose Coefficients

Radiation dose coefficients (DCFs) used for terrestrial and aquatic biota are shown in **Table C-6** to **Table C-13** in **Appendix C**. These DCFs were taken from ICRP (2008) and the ERICA Tool 2.0 (2016; Brown et al., 2008). The surrogate organisms from these sources were selected to represent the ecological receptors in this predictive EcoRA, considering similarities in body size and likely external exposure media. The DC values from both sources (ICRP 108 and the ERICA Tool 2.0) do not incorporate radiation quality factors for relative biological effectiveness for low beta and alpha components. The relative biological effectiveness is a radioecological weighting factor that represents the ratio of doses from different types of radiation needed to produce the same biological effect. Therefore, the “low beta” components of the DCFs were multiplied by 2, and the alpha components were multiplied by 10 (as per CSA N288.6:22), to represent their greater relative effectiveness.

Dose coefficient values to estimate external dose from noble gases by air immersion were calculated using the methodology from Copplestone et al. (2001) recommended in CSA N288.6:22. The methodology was updated using considerations presented by Ulanovsky and

Pröhl (2006, 2007, 2008). Any daughter radionuclide with a half-life under 10 days was included in the parent DCF.

The external DCF assumes immersion in a uniformly contaminated, isotropic (i.e., spherical, 4pi geometry), infinite absorbing medium. A semi-infinite external DCF (2pi geometry) was also calculated for organisms at the soil-air interface. Infinite (4pi) values were assumed to be applicable to aerial receptors, and semi-infinite (2pi) values were assumed to be applicable to remaining ground-based terrestrial receptors, as recommended by CSA N288.6:22.

4.2.4.6 Specific Activity Model for Tritium (HTO)

IMPACT™ was used to estimate tritium (HTO) tissue concentrations using specific activity models as outlined in CSA N288.1:20 (CSA, 2020) and as recommended in Clause 7.3.4.3.6 of CSA N288.6:22 (CSA, 2022a). HT (elemental tritium) released to the atmosphere is oxidized to HTO (tritium oxide) in the soil. The HT model in CSA N288.1:20 (CSA, 2020) represents the transfer of HT in air to HTO in air due to HT oxidation in soil and re-emissions into air.

Aquatic BAFs for tritium (HTO) assume that the specific activity in the aqueous component of the aquatic animal or plant is the same as the specific activity in the water. BAFs are used to calculate tritium (HTO) concentrations in plant, invertebrate and fish tissues. Therefore, the BAF (L/kg-fw) is:

$$BAF_{a\_HTO} = 1\text{-}DW_a$$

or

$$BAF_{p\_HTO} = 1\text{-}DW_p$$

where,

$1\text{-}DW_a$ = water content of the animal (L water /kg-fw)
$1\text{-}DW_p$ = water content of the plant (L water /kg-fw plant)

Aquatic BAFs for OBT assume that the specific activity of tritium (HTO) in the combustion water of the dry matter of the organism is equal to the specific activity in the aqueous phase, apart from an isotopic discrimination factor. Because the concentration in the aqueous phase is equal to the surface water concentration, the BAF from HTO concentration in surface water to OBT in aquatic organism (L/kg-fw) is:

$$BAF_{a\_OBT} = DW_{aa} \cdot ID_{aa} \cdot WE_{aa}$$

or

$$BAF_{p\_HTO} = DW_{ap} \cdot ID_{ap} \cdot WE_{ap}$$

where,

DW_{aa}	=	dry weight of aquatic animal tissue per total fresh weight (kg dw/kg fw)
ID_{aa}	=	isotopic discrimination factor for aquatic animal metabolism (unitless)
WE_{aa}	=	water equivalent of the aquatic animal dry matter (L/kg dw)
DW_{ap}	=	dry weight of aquatic plant per total fresh weight (kg dw/kg fw)
ID_{ap}	=	isotopic discrimination factor for aquatic plant metabolism (unitless)
WE_{ap}	=	water equivalent of the aquatic plant dry matter (L/kg dw)

All aquatic BAFs for HTO and OBT, which are derived from a specific activity model, are summarized in **Table C-1** in **Appendix C**.

BAFs for terrestrial plants and soil invertebrates are not required for modelling tritium (HTO) but are handled through the transfer from air as outlined in Clause 6.4.6.2 of CSA N288.1:20 (CSA, 2020).

For HTO and OBT, the majority of the tritium taken into a bird or mammal is from water ingestion and food consumption. The soil/sediment ingestion pathway is negligible for HTO and OBT. Consistent with the CSA equations, IMPACT™ was used to determine the transfer of HTO to animals through water ingestion ($P_{HTOwater\_animal}$, L/kg-fw) and is calculated as follows:

$$P_{HTOwater\_animal} = k_{aw} \cdot f_{w-w} \cdot (1-DW_a)$$

where,

k_{aw}	=	fraction of water from contaminated sources (assumed to be 1)
f_{w-w}	=	fraction of the animal water intake derived from direct ingestion of water
DW_a	=	dry/fresh weight ratio for animal products (kg-dw/kg-fw) (0.3 from CSA, 2020)

A portion of the HTO transferred from water to animal is metabolically converted to OBT ($P_{OBTwater\_animal}$, L/kg-fw), which is calculated as follows:

$$P_{OBTwater\_animal} = P_{HTOwater\_animal} \cdot f'_{OBT}$$

where,

$P_{HTOwater\_animal}$	=	transfer of HTO from drinking water to the portion of water in the animal derived from drinking water.
f'_{OBT}	=	OBT/HTO ratio in the animal as a result of HTO ingestion (unitless)

The transfer of HTO to animals through food ingestion ($P_{HTOfood\_animal}$, unitless) was also determined in IMPACT™ using the specific activity model from CSA (2020), and is calculated as follows:

$$P_{HTOfood\_animal} = k_{af} \cdot ((1-f_{OBT}) \cdot f_{w-pw} + 0.5 \cdot f_{w-dw}) \cdot (1-DW_a)/(1-DW_p)$$

where,

k_{af} = fraction of food from contaminated sources (assumed to be 1)
f_{w-pw} = fraction of the animal water intake derived from water in the plant feed
f_{w-dw} = fraction of the animal water intake that results from the metabolic decomposition of the organic matter in the feed
f_{OBT} = fraction of total tritium in the animal product in the form of OBT as a result of HTO ingestion
$1\text{-}DW_a$ = water content of the animal product (L water/kg-fw)
$1\text{-}DW_p$ = water content of the plant/food (L water/kg-fw plant)

The transfer of OBT to animals through food ingestion ($P_{OBTfood\_animal}$, unitless) was also determined in IMPACT^{TM} using the specific activity model from CSA, and is calculated as follows (CSA, 2020):

$$P_{OBTfood\_animal} = k_{af} \cdot (f_{OBT} \cdot f_{w-pw} + 0.5 \cdot f_{w-dw}) \cdot DW_a \cdot WE_a / (DW_p \cdot WE_p)$$

where,

k_{af} = fraction of food from contaminated sources
f_{w-pw} = fraction of the animal water intake derived from water in plant/food
f_{w-dw} = fraction of the animal water intake that results from the metabolic decomposition of the organic matter in the plant/food
f_{OBT} = fraction of total tritium in the animal tissue in the form of OBT as a result of HTO ingestion
WE_a = water equivalent of the animal tissue dry matter (L water/kg dw product)
WE_p = water equivalent of the plant/food dry matter (L water/kg dw product)
DW_a = dry/fresh weight ratio for animal tissue (L water/kg-fw)
DW_p = dry/fresh weight ratio for the plant/food (L water/kg-fw plant)

For each receptor, the transfer from each food item is calculated separately based on the water content of the individual food items in the receptor's diet. A summary of the input parameters is provided in **Table 4-9**.

Table 4-9: Input Parameters for Specific Activity Calculations for Tritium and Carbon-14

Receptor	f_{w_w}	f_{w_pw}	f_{w_dw}	f_{OBT}	S_a (gC/kg-fw)
Bufflehead	0.22	0.65	0.121	0.10	244
Green Heron	0.22	0.65	0.121	0.11	244
Mallard	0.22	0.65	0.121	0.10	244
Muskrat	0.413	0.509	0.071	0.11	201
American Robin	0.22	0.65	0.121	0.10	244
Bank Swallow	0.22	0.65	0.121	0.10	244
Song Sparrow	0.22	0.65	0.121	0.10	244
Yellow Warbler	0.22	0.65	0.121	0.10	244
Eastern Cottontail	0.413	0.509	0.071	0.11	201

Receptor	f_{w_w}	f_{w_pw}	f_{w_dw}	f_{OBT}	S_a (gC/kg-fw)
Meadow Vole	0.413	0.509	0.071	0.11	201
White-tailed Deer	0.33	0.582	0.081	0.11	201
Common Shrew	0.413	0.509	0.071	0.11	201
Raccoon	0.413	0.509	0.071	0.11	201
Red fox	0.413	0.509	0.071	0.11	201
Short-tailed Weasel	0.413	0.509	0.071	0.11	201

Notes:
f_{w_w}, f_{w_pw}, f_{w_dw}, and f_{OBT} are from Table 16 and 17 in CSA N288.1:20 (CSA, 2020).
S_a are the beef and poultry values from Table 18 in CSA N288.1:20 (CSA, 2020).

4.2.4.7 Specific Activity Model for Carbon-14

Aquatic BAFs for C-14 assume that the C-14 to stable carbon ratio in aquatic organisms is equal to the ratio in dissolved inorganic carbon in the water. Therefore, the BAF (L/kg-fw) for aquatic animals, invertebrates, and plants is calculated as follows:

$$BAFa_{C14} = S_a/S_w$$

where,

S_a = stable carbon content in the aquatic animal/invertebrate/plant (gC/kg-fw)
S_w = mass of stable carbon in the dissolved inorganic phase in water (gC/L)

Consistent with CSA N288.1:20 (CSA, 2020), S_w is 0.0213 gC/L. The stable carbon content for fish of 121.75 gC/kg-dw was used. For benthic invertebrates the stable carbon content of 120 gC/kg-fw or 480 gC/kg-dw was considered appropriate based on benthic insects. For aquatic plants the stable carbon content for terrestrial plants of 500 gC/kg-dw or 125 gC/kg-fw was considered appropriate.

All aquatic BAFs for C-14, which are derived from a specific activity model, are summarized in **Table C-1** in **Appendix C**.

BAFs for terrestrial plants and soil invertebrates are not required for modelling tritium (HTO) and C-14 but are handled through the transfer from air as outlined in Clause 6.4.9.2 of CSA N288.1:20 (CSA, 2020).

For C-14, food consumption contributes to the majority of the carbon ingested by the animal, compared to inhalation, water and soil ingestion. Consistent with CSA N288.1:20 (CSA, 2020), the specific activity model in IMPACT was used to determine the transfer of C-14 from food to animals, as follows:

$$P_{C14food_{animal}} = k_{af} \cdot S_a/S_p$$

where,

k_{af} = fraction of food from contaminated sources
S_a = stable carbon content in the animal (gC/kg-fw), X5_C (CSA, 2020)
S_p = stable carbon content in the food (gC/kg-fw), X4_C·DWp (CSA, 2020)

The stable carbon content in the animal (S_a) was obtained from Table 18 in CSA N288.1:20 (CSA, 2020), and can be found in **Table 4-9**. The beef value was applied for all mammals and the poultry value was applied for all birds. This is reasonable since the stable carbon values presented by IAEA (2010) for various domestic species within each category are all very close to each other, and since values are not available for wild species. CSA N288.1:20 has noted this and has used poultry values for wild waterfowl.

4.2.5 Dispersion Models

Dispersion models used to estimate COPC concentrations in physical media are described in **Section 2.2.2.1.2**. The dispersion equations are consistent with CSA N288.1:20 (CSA, 2020), as implemented in the IMPACT™ model.

4.2.6 Exposure Point Concentrations and Doses

This section presents the estimated concentrations (environmental media and receptor tissue concentrations), as well as estimated radiation doses to ecological receptors due to atmospheric releases from the DNNP during operation, summarized in **Table D-1**, **Table D-2** and **Table D-3** in **Appendix D**. Sample calculations are provided in **Appendix F**. The results are based on releases from four SMRs.

It is noted that all ecological receptors indicated in the ecological CSM have been included in the tables below, including aquatic receptors that are present in Lake Ontario only, regardless that radiological liquid effluent is not expected to be released. The release of radiological liquid effluent is evaluated in the sensitivity analysis in **Section 7.0**.

The maximum predicted radiation dose is to the Song Sparrow in location F, the location closest to the SMR release. The maximum predicted radiation dose to the Song Sparrow is 1.78E-04 mGy/d. The major contributors to total dose are C-14 (57%) and Xe-138 (35%).

4.2.7 Uncertainties in the Exposure Assessment

Uncertainties in the exposure assessment are summarized in **Table 4-10**. Uncertainties include the representativeness of the predicted concentrations used in the assessment. The exposure assessment was designed to be conservative by assessing locations assumed to reflect the maximum exposure for all ecological receptors. Maximum values are representative for exposures of any sessile organisms that reside at the location of the maximum value; however, maximum concentrations are considered to overestimate exposure for all mobile receptors that can move around the site, effectively lowering their average exposure concentrations.

Exposure factors were based on best-available information from literature with preference for exposure factors identified in CSA N288.1:20 (CSA, 2020). Since the exposure assessment is predictive, BAFs were used to calculate uptake into tissues. BAFs are not species specific, e.g., the same BAFs are used for berries as for grasses. Additionally, the BAFs used for the exposure assessment were not site-specific; they were taken from reputable sources (e.g., CSA N288.1:20) and are considered to be representative of the conditions found at the site.

Wildlife exposure factors, such as intake rates and diets, are a potential source of uncertainty. Reputable sources are used for these factors, and they are considered to be representative for the organisms assessed.

Dose coefficients were obtained from reputable sources for reference organisms but have not been derived specifically for all the organisms assessed. Dose coefficients for surrogate organisms were often used. They were selected with attention to similar body size and exposure habits, and are believed to adequately represent the organism assessed. Dose coefficients for each receptor were not adjusted for body size and dimensions at a species level.

Uncertainties in the IMPACT model are described in **Section 3.2.7**.

Table 4-10: Uncertainties in the Exposure Assessment

Risk Assessment Assumption	Justification	Over/Under Estimate Risk?
Ecological receptors are assumed to be present, and assessed at the location of maximum exposure	Intent was to ensure a conservative condition to not under estimate risk. This would be an over estimate for mobile organisms that would be exposed to lower concentrations at different locations around the site.	Over estimate
Kds, BAFs, intake rates, etc. are from literature when site-specific information as not available	Reputable literature sources were used.	Neither (value is best estimate)
Dose coefficients for each receptor were not adjusted for exact body size and dimensions	Surrogates selected with attention to similar body size and exposure habits.	Neither (value is best estimate)

4.3 Effects Assessment

4.3.1 Toxicological Benchmarks

There are no non-radiological COPCs identified for quantitative assessment for all ecological biota; therefore, no TRVs have been identified.

4.3.2 Radiation Benchmarks

Radiation dose benchmarks of 400 µGy/h (9.6 mGy/d) and 100 µGy/h (2.4 mGy/d) (UNSCEAR, 2008) were selected for the DNNP PERA assessment of effects on aquatic biota and terrestrial biota, respectively, as recommended in the CSA N288.6:22 standard. This is a total dose benchmark, therefore the dose to biota due to each radionuclide of concern is summed to compare against this benchmark.

The aquatic biota dose benchmark of 10 mGy/d was initially developed by the NCRP (NCRP, 1991) and was recommended by the IAEA which 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 (IAEA, 1992). Later reviews by the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) have supported this recommendation (UNSCEAR, 1996, 2008).

The aquatic biota considered by UNSCEAR are organisms such as fish and benthic invertebrates that reside in water. Birds and mammals with riparian habits are considered to be terrestrial biota. Dose calculations in this ERA follow the same convention.

For terrestrial biota, a level of 1 mGy/d has been widely used as an acceptable level based on IAEA and UNSCEAR (IAEA, 1992; UNSCEAR, 1996). More recently, UNSCEAR has supported a slightly higher exposure level of 100 µGy/h (2.4 mGy/d) as the threshold for effects of population significance in terrestrial organisms (UNSCEAR, 2008). UNSCEAR updated its review of radiation effects on natural biota, and noted that the 0.04 mGy/h (1 mGy/d) exposure produced no effect in the most sensitive mammalian study (with dogs), while 0.18 mGy/h produced eventual sterility (UNSCEAR, 2008). Therefore, UNSCEAR chose an intermediate exposure level of 0.1 mGy/h (2.4 mGy/d) as the threshold for effects of population significance in terrestrial organisms. UNSCEAR concluded that lower dose rates to the most highly exposed individuals would be unlikely to have significant effects on most terrestrial communities.

It is recognized that the selection of reference dose levels is a topic of ongoing debate. For example, the CNSC has recommended dose limit values of 0.6 mGy/d for fish, 3 mGy/d for aquatic plants (algae and macrophytes), 6 mGy/d for invertebrates, and 3 mGy/d for mammals and terrestrial plants (EC and HC, 2003). The dose limit value 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 benchmark 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.

The International Commission on Radiological Protection (ICRP) has suggested "derived consideration levels" as a range of dose rates reflecting a range in potential for effect, for each of several taxonomic groups (ICRP, 2008). The ICRP states that the ranges of dose rates they provide are preliminary and need to be revised as more data become available.

Considering the history and discussions surrounding the selection of radiation benchmarks, 400 µGy/h (9.6 mGy/d) and 100 µGy/h (2.4 mGy/d) (UNSCEAR, 2008) were selected for the assessment of effects on aquatic biota and terrestrial biota, respectively. These benchmarks were recommended in CSA N288.6:22 (CSA, 2022a), and are appropriate for this assessment.

4.3.3 Thermal Benchmarks

As part of the DNNP Commitments Report, OPG has committed that the maximum surface water temperature change would not exceed 2°C above ambient lake water temperatures in the winter. This is to protect round whitefish eggs and larvae and prevent formation of a sinking plume during the winter.

4.3.4 Uncertainties in the Effects Assessment

Radiation dose benchmarks for biota are a topic of ongoing debate. Several sources of biota dose benchmarks were considered within CSA N288.6:22 (CSA, 2022a), and the benchmarks recommended by UNSCEAR (2008) were recommended by CSA. While some lower values have been suggested, based on field studies around Chernobyl, there may be confounding factors in such studies. The radiation dose benchmarks used here follow UNSCEAR (2008) and CSA N288.6:22 (CSA, 2022a) in giving more credence to values based on controlled laboratory studies and demonstrated low levels of effect.

4.4 Risk Characterization

4.4.1 Risk Estimation and Discussion of Radiation Effects

The total doses are compared to the dose benchmarks of 2.4 mGy/d for terrestrial and riparian biota and 9.6 mGy/d for aquatic biota. A summary of the total dose for each ecological receptor is provided in **Table 4-11** along with a comparison to their respective dose benchmarks.

There were no predicted exceedances of the 2.4 mGy/d radiation dose benchmark for the terrestrial biota assessed. Additionally, there were no predicted exceedances of the 9.6 mGy/d radiation dose benchmark for aquatic biota.

As shown in **Table 4-11**, all predicted doses were a small fraction of their respective dose benchmarks (ranging from <0.0001% to 0.0074% of the benchmark). Therefore, it is unlikely that there would be adverse effects on terrestrial populations or communities as a result of radionuclide releases from the DNNP.

Additionally, with respect to species at risk, since there were no exceedances of any dose benchmarks for the surrogate species, individual species at risk would also be considered protected.

Table 4-11: Summary of Total Dose to Ecological Receptors and Comparison to Dose Benchmark

Ecological Receptors	Lake Ontario		AB		C		D		E		F		Maximum	
	Total Dose (mGy/d)	% of Benchmark	Total Dose (mGy/d)	% of Benchmark	Total Dose (mGy/d)	% of Benchmark	Total Dose (mGy/d)	% of Benchmark	Total Dose (mGy/d)	% of Benchmark	Total Dose (mGy/d)	% of Benchmark	Total Dose (mGy/d)	% of Benchmark
Aquatic Plants	NA	NA	6.19E-06	0.0001%	NA	NA	7.69E-06	0.0001%	NA	NA	NA	NA	7.69E-06	0.0001%
Benthic Invertebrates	0.00E+00	0.0000%	7.12E-06	0.0001%	NA	NA	NA	NA	NA	NA	NA	NA	7.12E-06	0.0001%
Alewife	0.00E+00	0.0000%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00E+00	0.0000%
Lake Trout	0.00E+00	0.0000%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00E+00	0.0000%
American Eel	0.00E+00	0.0000%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00E+00	0.0000%
Dace	NA	NA	5.94E-06	0.0001%	NA	NA	NA	NA	NA	NA	NA	NA	5.94E-06	0.0001%
Round Whitefish	0.00E+00	0.0000%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00E+00	0.0000%
White Sucker	0.00E+00	0.0000%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00E+00	0.0000%
Frogs	NA	NA	5.98E-06	0.0001%	NA	NA	7.42E-06	0.0001%	NA	NA	NA	NA	7.42E-06	0.0001%
Turtles	NA	NA	5.97E-06	0.0001%	NA	NA	7.41E-06	0.0001%	NA	NA	NA	NA	7.41E-06	0.0001%
Grass	NA	NA	8.37E-06	0.0003%	8.71E-06	0.0004%	1.11E-05	0.0005%	2.76E-05	0.0012%	1.22E-04	0.0051%	1.22E-04	0.0051%
Sugar Maple	NA	NA	NA	NA	NA	NA	7.02E-06	0.0003%	1.69E-05	0.0007%	7.47E-05	0.0031%	7.47E-05	0.0031%
Earthworm	NA	NA	4.19E-06	0.0002%	4.25E-06	0.0002%	5.13E-06	0.0002%	1.21E-05	0.0005%	5.22E-05	0.0022%	5.22E-05	0.0022%
American Robin	NA	NA	6.29E-06	0.0003%	6.68E-06	0.0003%	9.03E-06	0.0004%	2.28E-05	0.0009%	1.04E-04	0.0043%	1.04E-04	0.0043%
Bank Swallow	NA	NA	5.50E-06	0.0002%	NA	NA	NA	NA	2.05E-05	0.0009%	9.44E-05	0.0039%	9.44E-05	0.0039%
Bufflehead	1.84E-06	0.0001%	6.40E-06	0.0003%	NA	NA	NA	NA	NA	NA	NA	NA	6.40E-06	0.0003%
Common Shrew	NA	NA	7.37E-06	0.0003%	7.57E-06	0.0003%	9.73E-06	0.0004%	2.34E-05	0.0010%	1.04E-04	0.0043%	1.04E-04	0.0043%
Eastern Cottontail	NA	NA	1.02E-05	0.0004%	1.05E-05	0.0004%	1.33E-05	0.0006%	3.16E-05	0.0013%	1.40E-04	0.0058%	1.40E-04	0.0058%
Green Heron	NA	NA	6.36E-06	0.0003%	NA	NA	NA	NA	NA	NA	NA	NA	6.36E-06	0.0003%
Mallard	1.84E-06	0.0001%	6.40E-06	0.0003%	NA	NA	NA	NA	NA	NA	NA	NA	6.40E-06	0.0003%
Meadow Vole	NA	NA	1.00E-05	0.0004%	1.03E-05	0.0004%	1.30E-05	0.0005%	3.11E-05	0.0013%	1.38E-04	0.0057%	1.38E-04	0.0057%
Muskrat	NA	NA	1.04E-05	0.0004%	NA	NA	NA	NA	NA	NA	NA	NA	1.04E-05	0.0004%
Raccoon	NA	NA	1.01E-05	0.0004%	1.03E-05	0.0004%	1.30E-05	0.0005%	3.10E-05	0.0013%	1.37E-04	0.0057%	1.37E-04	0.0057%
Red Fox	NA	NA	9.87E-06	0.0004%	1.01E-05	0.0004%	1.29E-05	0.0005%	3.08E-05	0.0013%	1.37E-04	0.0057%	1.37E-04	0.0057%
Short-tailed Weasel	NA	NA	9.93E-06	0.0004%	1.01E-05	0.0004%	1.29E-05	0.0005%	3.07E-05	0.0013%	1.36E-04	0.0057%	1.36E-04	0.0057%

Ecological Receptors	Lake Ontario		AB		C		D		E		F		Maximum	
	Total Dose (mGy/d)	% of Benchmark	Total Dose (mGy/d)	% of Benchmark	Total Dose (mGy/d)	% of Benchmark	Total Dose (mGy/d)	% of Benchmark	Total Dose (mGy/d)	% of Benchmark	Total Dose (mGy/d)	% of Benchmark	Total Dose (mGy/d)	% of Benchmark
Song Sparrow	NA	NA	1.10E-05	0.0005%	1.16E-05	0.0005%	1.56E-05	0.0007%	3.91E-05	0.0016%	1.78E-04	0.0074%	1.78E-04	0.0074%
White-tailed Deer	NA	NA	1.01E-05	0.0004%	1.03E-05	0.0004%	1.24E-05	0.0005%	2.93E-05	0.0012%	1.29E-04	0.0054%	1.29E-04	0.0054%
Yellow Warbler	NA	NA	3.91E-06	0.0002%	3.96E-06	0.0002%	4.84E-06	0.0002%	1.13E-05	0.0005%	4.92E-05	0.0020%	4.92E-05	0.0020%

Note:
NA = Not applicable, the ecological receptor was not assessed at this location.
There are no exceedances of the aquatic benchmark of 9.6 mGy/d or the terrestrial benchmark of 2.4 mGy/d.

4.4.2 Thermal Effects

A predictive study of thermal impact from DNNP on receiving water near the discharge is being conducted (Baird, 2024). The results discussed below are for simulations based on an average temperature year (2019). Based on this study, considering both DNNP and DNGS, a small plume area around the DNNP discharge will have water temperature elevated by 2°C or more above the ambient at least 10% of the time. Based on a one-year model simulation, this area of exceedance is 0.05 km^2. Based on a winter (December 15th to March 15th) simulation, this area is 0.11 km^2, due to water recirculation for ice control in winter.

The thermal plumes from DNNP and DNGS are predicted to overlap only occasionally. The typical (50th percentile) temperature elevation at the DNGS intake due to the operation of DNNP is 0.1°C, for a one-year model simulation, again for an average year (2019). The fraction of time with a 1°C elevation at the DNGS intake, due to DNNP, is 0.2% of the time. For a winter simulation there is even less effect at the DNGS intake, due to DNNP.

These results indicate a relatively small area of new thermal impact around the DNNP discharge, and very little effect on existing thermal conditions in the vicinity of DNGS. Further assessment will be undertaken to address the implications of the modified thermal regime for key aquatic species, considering their likely exposure to the new thermal plume, and their thermal sensitivities.

4.4.3 Impingement and Entrainment

Several studies have been completed to identify the existing conditions of the lake, considering the habitat features and distribution and abundance of eggs, larvae, and adult fish. These considerations, along with the design features of the DNNP, were used to develop and predict the cause-and-effect relationships of the construction and minimize the potential impingement and entrainment of fish. Each cause-and-effect pathway represents an area where a mitigation measure can be applied to reduce or eliminate potential effects. The higher up the 'path' that the links are broken, the higher the probability that the mitigation will work to avoid the effect. When mitigation measures cannot be applied, or cannot fully address a stressor, the remaining effect is referred to as a residual effect. The current project design, along with the existing fish community and potential impingement and entrainment effects are discussed in detail below.

4.4.3.1 Circulating Cooling Water System

The Project will use a Once-Through Cooling (OTC) system using water from Lake Ontario to remove heat from the condenser. The process involves drawing lake water through an offshore intake structure into an onshore forebay via a subterranean tunnel; then pumping it through the condenser and closed loop cooling water heat exchanger before returning it to the lake through diffuser ports (illustrated in **Figure 4-4**). The OTC system does not interact with the active liquid waste management system and does not contain radioactive liquid effluent. The OTC system is comprised of intake and outfall structures, including an intake and outfall tunnel, an onshore discharge structure, and an offshore diffuser system. The forebay structure houses both the circulating water and service water pumps which direct water to the main condenser and the plant cooling water system, respectively.

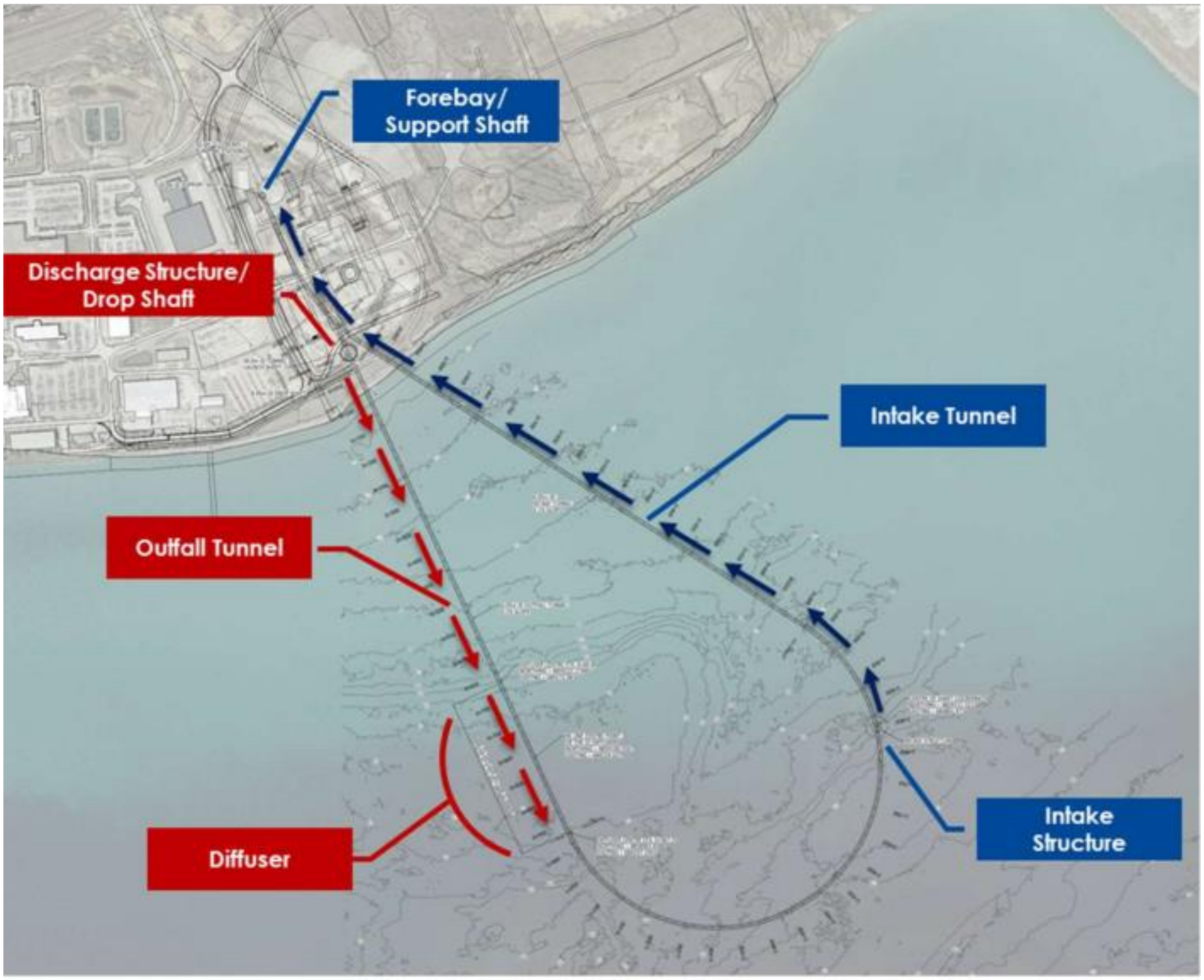


Figure 4-4: Depiction of the DNNP Circulating Cooling Water System

4.4.3.2 Existing Fish Community

Entrainment studies were completed on invertebrates in 2009 to 2018 at the DNGS site. The DNGS site intake is located on the bottom of Lake Ontario at a depth of approximately 10 m. During this entrainment study larger numbers of invertebrate occurred in the spring (March – May) compared to fall (September – November) (Arcadis, 2017). A statistical difference related to diurnal effect was observed with greater entrainment occurring at night. The most abundant entrained species were *Echinogammarus* and other amphipods (likely *Gammarus*) (Arcadis, 2017).

The nearshore aquatic habitat in the vicinity of the proposed shoreline protection has been studied extensively by OPG as part of the DNNP EA as well as follow-up studies to address EA commitments and inform siting and design elements of the project. Studies of the nearshore aquatic habitats where fish spawn indicated that the habitat is between 0 and 2 m in depth and generally characterized by fine sediment with intermittent large surface boulders (Ecometrix, 2021). The aquatic vegetation is sparse, instead there are areas with high algae coverage. Generally, the nearshore spawning habitat is variable with better conditions further from the lake outlet. Overall, the nearshore fish community has been described as a low density, relatively diverse and seasonally dynamic assemblage due to the intersection of species assemblages typical of both the pelagic zone and more protected nearshore, tributary, and coastal marsh and *embayment habitats* (Ecometrix, 2021).

In spring 2009, the larval fish species were predominantly Round Goby, comprising ~97% of all larval fish caught (Golder and SENES, 2009). Following, in spring 2011 a fish community assessment targeting larval Round Whitefish found only 6% whitefish larvae in the community. The dominant species was Round Goby (89%) (OPG, 2011a, 2022d). The most recent aquatic community characterization took place in 2018 (Ecometrix, 2021). When considering all depths (shallow to deepwater), the Ichthyoplankton species community comprised of Rainbow Smelt eggs (87.7%), Alewife eggs (6.9%), and Round Goby larvae. In the same 2018 study, the adult species in the nearshore are Round Goby (80% of total catch), followed by smaller proportions of White Sucker and seven other species (OPG, 2022d). Gillnetting the deepwater portions of the study area in 2018 yielded similar results in terms of diversity and evenness. In spring, summer, and fall of 2018, the dominant species was Alewife, followed by small proportions of Round Goby, Rainbow Smelt and Round Whitefish (OPG, 2022d). In deeper areas (>20 m) surveyed in 2018, Lake Trout were also caught (OPG, 2022d) . Visual and bathymetric surveys from 2010 to 2019 identified potential spawning habitat for Lake Trout and Round Whitefish, but there was no confirmed spawning (Ecometrix, 2021; Golder and SENES, 2009; OPG, 2013, 2016; SENES, 2011b, 2011c). Across aquatic community studies from 2009 to 2018, other species-at-risk that have been occasionally encountered in the study area, but at low numbers, including Lake Sturgeon, Atlantic Salmon, American Eel, and Deepwater Sculpin (OPG, 2022d).

Overall, the 10+ years of fish community studies have provided a comprehensive overview of the nearshore aquatic habitat, fish community, and spawning behaviours. Small-bodied forage fish dominate spring and summer communities, while fall communities are characterized by larger-bodied bottom feeders, salmonids, and predatory fish. The community density, evenness and diversity are low, with differences in community primarily driven by water depth.

4.4.3.3 Effects on Fish Community

Construction will have a variety of effects on the fish spawning habitat and fish community. Some of the concerns are the primary effects from the construction, as well as residual effects following the implementation of avoidance and mitigation measures.

The pathways-of-effect of the construction on fish can be summarized by the following three categories of Project activity:

1. Use of industrial equipment
2. Lakebed dredging
3. Potential placement of material or structures in the water

Considering the existing fish community, the pathways-of-effect will impact fish primarily through habitat loss and alteration. The construction of the intake structure, diffuser outlet, and associated infrastructure will result in the loss and alteration of fish habitat. This includes the destruction and harmful alteration of nearshore habitat due to construction activities, which may impact foraging habitat for several indicator species. Furthermore, construction may increase turbidity and affect sedimentation. Lakebed dredging activities, concrete placement, and other construction processes can lead to increased turbidity and sedimentation in the water. The primary expected impact is the temporary removal of substrate (i.e., potential fish habitat). Additionally, there will be temporary elevated turbidity associated with sediment plumes during construction.

Dredging of the DNGS harbour is also required to ensure marine equipment can safely enter the dock area. The DNGS harbour dredging activities include conducting mechanical dredging of the existing dock at the Darlington Harbour and potential disposal of the dredged materials offshore in Lake Ontario. OPG has received a DFO letter of advice indicating that an authorization under the Fisheries Act or permit under the Species at Risk Act are not required, provided mitigation measures outlined are implemented. The contractor will include these measures in their Site Specific Environmental Management (SSEMP) and will carry out implementation of these measures during DNGS harbour dredging.

Overall, no impacts to the aquatic community are expected as a result of dredging activities. The aquatic environment at the location of potential sediment disposal approximately 4 km into Lake Ontario is considered low in productivity and biodiversity; furthermore, sediment designated for removal from the DNGS harbour was found to be below provincial and federal sediment quality guidelines (Patrick, 2024). Additional monitoring activities at the disposal site post-disposal of dredged material are planned to ensure impacts to the aquatic environment are avoided.

4.4.3.4 Proposed Mitigation Measures

The protection and management of fish will be accomplished by following the SSEMP. The SSEMP will detail site-specific erosion and sediment control measures (including management of construction waste), an isolation/containment plan as appropriate, a dewatering plan, and a spill management plan. The SSEMP will also detail the management of any accidental spills. OPG will independently monitor aspects of the contractor's performance where there is a risk to the environment identified by construction activities.

There are several mitigation measures to minimize the impacts and residual effects on the fish communities and are expected to vary depending on the project needs (Black & Veatch, 2024). Initially, the construction schedule for the in-water works considers the fish breeding and will avoid spawning periods; however, the schedule is subject to change based on project needs. Further, the impacts of industrial equipment will be mitigated by using floating vessels to minimize sediment disturbance, and construction methods will be selected to minimize general disturbances. To mitigate the impacts of lakebed dredging, floating vessels will be used in conjunction with placing waste in scows and monitoring turbidity. The impacts of the potential placement of material and structures in the water will be mitigated through regular water quality monitoring. Overall, the preplanning and existing conditions work, SSEMP, and mitigation efforts should minimize the impacts of the construction on the fish communities.

During operation, the protection and management of fish at DNNP will rely on existing OPG policies and procedures relating to impingement and entrainment mitigation and other environmental management policies, similar to existing measures currently implemented at the DNGS.

4.4.4 Uncertainties in the Risk Characterization

The uncertainties in the characterization of risk consist of those identified in the exposure assessment (**Section 4.2.7**) and effects assessment (**Section 4.3.4**), since these two assessments are the inputs to the risk characterization.

The uncertainties from the exposure assessment (**Section 4.2.7**) include model uncertainty and uncertainty in the exposure factors selected such as transfer factors, intake rates, BAFs, and dose coefficients. The uncertainties from the effects assessment (**Section 4.3.4**) are related to dose benchmark values used to determine risk of potential effects.

Overall, considering uncertainties in the exposure assessment and in the dose benchmark values, the risk characterization has been undertaken in a manner that has not underestimated risk; the results are either overestimates or realistic estimates of risk, both of which are considered acceptable.

5.0 Comparison Against DNNP EIS

As characterized in **Section 1.1**, the DNNP was subject to an environmental assessment (EA) under the Canadian Environmental Assessment Act (CEAA). In 2006, OPG submitted a preliminary Licence to Prepare Site Application to the CNSC, which confirmed that an EA was required for the Project and a Joint Review Panel (JRP) was established to review the EA and Licence Application. In September of 2009, OPG submitted the *Environmental Impact Statement New Nuclear – Darlington Environmental Assessment* report to the JRP (SENES & MMM, 2009).

At the time the 2009 DNNP EIS was completed, OPG had not yet chosen a specific reactor technology; rather, the EIS considered a Plant Parameter Envelope as the basis for the EA. The Plant Parameter Envelope was developed based on the bounding parameters for four different reactor types that were under consideration by OPG, and it was concluded that these bounding parameters may need to be updated when a specific reactor technology was finally selected (OPG, 2023b). In December 2021, OPG selected the BWRX-300 SMR for deployment at the DNNP.

5.1 Comprehensive EIS Review

The Comprehensive EIS Review report (OPG, 2023b) presents a section-by-section evaluation of the 2009 DNNP EIS to determine if, considering the design details of the BWRX-300, the bounding parameters and conclusions presented in the EIS remain valid for the selected reactor technology.

Calian (2023b) determined that many components of the 2009 EIS remain valid and are overall not affected by the selected reactor technology. Generally, the *Introduction* (Chapter 1), *Methodologies Used in the EIS* (Chapter 3) and the *Communications and Consultation Program* (Chapter 10) sections remain unchanged from the 2009 EIS. Additionally, the selection of the BWRX-300 technology does not result in any changes from the EIS when considering the *Assessment of Other Likely Effects* (Chapter 6) or *Malfunctions, Accidents and Malevolent Acts* (Chapter 7) sections.

In their review of EIS Chapter 2 (*The Project for EA Purposes*), Calian (2023b) determined the BWRX-300 reactor technology is equivalent to the other reactor technologies examined in the EIS. The BWRX-300 was noted to have a more refined heating system, in which the primary and secondary heat transport systems are combined, but otherwise is comparable to the Pressurized Water Reactor (PWR) technology assessed in the EIS.

Though the Project timeline has been altered and is starting later than what was assessed in the 2009 EIS, Project activities generally remain the same, with the following refinements noted (that are regardless bounded by the other reactor technologies assessed in the EIS):

- The BWRX-300 will not utilize cooling towers as part of its operation. This change is viewed positively by local community members, who expressed concerns over the visual and socioeconomic impacts of these large structures. The lack of cooling towers is also expected to result in fewer bird strikes than what was predicted in the EIS;

- The BWRX-300 is designed to be a zero radioactive liquid effluent release facility, resulting in no routine radiological releases to surface water during normal operations;
- The cooling water flow rate for the BWRX-300 is substantially lower than that considered in the EIS and will result in lessened effects to the aquatic environment;
- Lake infilling is no longer required; resulting in less shoreline works (e.g., excavation) and a reduced impact on aquatic habitat than what was assessed in the EIS, and,
- The BWRX-300 reactors are situated on a smaller footprint and produce less electrical power, likely resulting in less habitat destruction, a smaller construction workforce and the need for less construction resources than what was predicted in the EIS. This will result in lower atmospheric emissions and less noise generation than what was assessed in the EIS.

Existing conditions assessed in Chapter 4 (*Description of the Existing Environment*) of the 2009 EIS were compared with updated existing conditions in the Project LSA and RSA. Additionally, Chapter 11 (*Preliminary Plan for EA Follow-up Program*) of the EIS was compared with refinements made to the EA follow-up programs. Overall, Calian (2023b) determined that existing conditions and the monitoring programs remain suitable for the BWRX-300 technology.

Following a review of EIS Chapter 5 (*Assessment and Mitigation of Likely Environmental Effects*), Calian (2023b) concluded that deployment of the BWRX-300 was found to be comparable with the information presented in the EIS. For the Terrestrial Environment, positive outcomes of the BWRX-300 deployment are expected to be realized through the preservation of some terrestrial habitats originally expected to be removed in the EIS due to the larger footprint of the other assessed reactors. Air quality, noise, vibration, hydrology, and hydrogeology modelling were completed with respect to the retained habitats, and the results indicated that residual adverse effects are expected to be minor.

Calian's (2023b) review of EIS Chapter 9 (*Significance of Residual Adverse Effects*) determined that residual effects were consistent with those predicted in the EIS, except for the retainment of more terrestrial habitat owing to the smaller footprint of the BWRX-300 technology. Additional studies have indicated that there are suitable mitigation measures available such that no significant residual adverse effects will occur.

Lastly, a review of EIS Chapter 12 (*Preliminary Decommissioning Plan*) found that the preliminary decommissioning information presented in the EIS was found to remain valid for the BWRX-300. When considering environmental effects from future decommissioning, Calian (2023b) determined that there would be less expected effects to the terrestrial habitat than was predicted in the EIS due to the BWRX-300's smaller footprint.

In summary, due to its smaller size and reduced resources and personnel requirements, the conclusions of the 2009 DNNP EIS remain valid and bounding of the selected BWRX-300 reactor technology. Overall, the Comprehensive EIS Review determined that the DNNP would not result in any significant adverse environmental effects, a conclusion aligned with the original 2009 EIS.

5.2 EIS Comparison with DNNP PERA

Consistent with the above conclusion, this DNNP PERA determined that the operation of the BWRX-300 reactor is not expected to result in any chemical or radiological impacts to human health or the environment.

As noted by Calian (2023b) and in previous sections of this PERA, the BWRX-300 is a zero radiological liquid effluent design, resulting in no routine liquid radiological releases to surface water (**Section 2.2.1.1**). This is different compared to the 2009 EIS, which assessed a reactor technology requiring the operation of a Radioactive Liquid Waste Management System that would routinely introduce liquid effluents to receiving waters, similar to the existing DNGS facility. Therefore, the radiological impact to surface water is lower compared to the conclusions of the 2009 EIS.

The 2009 EIS assumed the assessed reactor technology would require the periodic chemical cleaning of components (e.g., steam generators, pressure tubes) that could result in water quality impacts due to the release of chemicals (e.g., hydrazine) in liquid effluent. However, Calian (2023b) determined that the BWRX-300 reactor would not require chemical cleaning of components, as the design does not include the use of steam generators or pressure tubes. Thus, water quality impacts associated with deployment of the BWRX-300 are negligible compared to those concluded in the EIS. The BWRX-300's backup chlorination system, if implemented, may result in the occasional release of chlorinated effluent, though this was found to occur at concentrations below applicable human health and ecological surface water screening guidelines (Human Health: **Section 3.1.2.1.2**; Ecological Health: **Section 4.1.3.1.2)**.

The 2009 EIS predicted that air concentrations for most non-radiological airborne COPCs would infrequently exceed the MECP AAQC at the nearest residential receptors during site preparation and construction, and to a lesser extent during operation (OPG, 2023b). Maximum 24-hour TSP and PM_{10} concentrations were predicted to exceed AAQC at four receptors, while $PM_{2.5}$ was modelled to exceed the 24-hour CAAQS at two residential receptors. NO_2 concentrations were expected to remain below the 1-hour AAQC at most receptor locations, with the exception of two locations, where the AAQC was infrequently exceeded. The 24-hour average concentration of acrolein was predicted to exceed the AAQC at the residential receptors during the site preparation and construction phases. Overall, while the 2009 EIS determined that Project activities would result in measurable increases to airborne COPC concentrations, no residual effects to human health were expected. This was attributed to in-design mitigation measures, including the development of a dust management plan for the site preparation and construction phases, which would include methods and techniques adequate for dust suppression (OPG, 2023b).

The air quality modelling in this PERA predicted COPC exceedances of the MECP AAQC and CCME CAAQS criteria at multiple receptor locations. However, consistent with the conclusion of the 2009 EIS, no residual human health effects are expected. As described in **Section 3.1.2.1.1**, the predicted air quality results are the maximum predicted concentrations at each receptor location at any time during the modelling period. These results do not represent a single point in time but rather a consolidation of potential worst-case concentrations experienced by each receptor, which may occur at different times and frequencies under varying real-world conditions. Furthermore, the modelling is considered conservative as emission rates were calculated assuming maximum equipment usage and activity rates (e.g., 24-hour continuous usage) during each applicable Project phase. It is expected that equipment usage/activity rates, meteorological conditions and background COPC concentrations will vary over the lifetime of the Project; the likelihood that "worst-case conditions" would occur at the same time and persist long enough for appreciable health effects to occur is relatively low. Furthermore, as part of OPG's Environmental Monitoring and Environmental Assessment Follow-up (EMEAF) Plan, OPG is committed to monitoring TSP, PM_{10}, $PM_{2.5}$, BaP, acrolein, NO_2, SO_2 and CO during the site preparation and construction phases of the DNNP, and for a minimum of one year during operation phase. OPG will continue to evaluate the air monitoring data to determine if additional mitigation measures are needed. BaP, retained for further quantitative assessment in this PERA, was found to not pose any carcinogenic risks to human health.

When considering potential air quality impacts on ecological receptors, the 2009 EIS determined that adverse effects to vegetation was unlikely, a result that was determined to have positive downstream effects for mammals and birds that rely on vegetation for habitat (OPG, 2023b). The 2009 EIS also noted that mitigation measures established to protect vegetation communities were also beneficial for amphibians/reptiles and insects. As discussed in **Section 4.1.3.1.1**, this PERA concludes that adverse effects to ecological receptors from atmospheric COPCs are unlikely to occur, either because the applicable air quality criteria are met and/or the inhalation pathway is considered a minor exposure relative to the ingestion pathway and can be ignored for many substances, excluding those that do not partition to soil (CSA, 2022a). Dust (TSP) generation assumptions used in the modelling within this PERA are considered conservative and represent worst-case scenarios that are unlikely to occur. In addition, consistent with the 2009 EIS, a dust management plan will be implemented that could involve mitigative measures such as the application of dust suppressants; stabilization of completed soil surfaces; and suspension of dust-generating activities during periods of inclement weather. Given the above, no adverse effects to vegetation (or endangerment to bat or bank swallow habitat associated with the vegetation) are expected as a result of Project activities.

The 2009 EIS predicted that noise effects on residential receptors would mostly be attributed to background traffic noise on local roads and highways and from ongoing operations at the nearby SMC plant. A moderate noise effect was predicted at the nearest residential receptor during the site preparation phase; however, this was noted to be limited to daytime hours. Generally, the predicted noise increases for the selected residential receptors were considered negligible for the remaining phases of the DNNP (OPG, 2023b). The 2009 DNNP EIS further described that a Noise Management Plan would be developed for the site preparation and construction phases, which would include measures to mitigate noise generation at the source, alert residents when nuisance noise generating activities were occurring (e.g., bedrock removal), maintaining equipment in proper mechanical condition, and generally complying with applicable noise standards and regulations (OPG, 2023b).

As described in **Section 3.1.2.3.1**, this PERA determined that there are no adverse impacts associated with noise levels generated from DNNP activities at any modelled human receptor location. This result represents an improvement from the 2009 EIS, where a moderate daytime noise effect was predicted at the nearest residential receptor during the site preparation phase. It should be noted that the assessment of noise impacts on human health in this PERA relies on guidance provided by Health Canada (2017), which did not exist at the time the 2009 EIS was completed. The 2009 EIS relied on available noise guidance documents from municipal, provincial and federal sources to establish appropriate assessment criteria; a review of available regulatory documents determined that different assessment criteria would apply to different Project phases, whereas the Health Canada (2017) criteria are applicable to all Project phases.

Regarding ecological receptors, the 2009 EIS considered the potential for the DNNP to affect breeding birds at the DN site. The 2009 EIS noted that the DN site already experiences constant and intermittent noises generated by several nearby sources, including DNGS, and nearby railway and vehicle traffic (particularly Highway 401) and St. Marys Cement. The existing L90 24-hour sound level was determined to be 54.2 dBA in the 2009 EIS. Additionally, most receptor locations within retained bird habitats modelled in the 2009 EIS experienced an increase less than 10 dB above the existing noise levels (OPG, 2023b), with the exception of one location (T2022_A). This location was not retained for this PERA as it does not correspond with the existing ecological receptor locations from the 2020 DN ERA and 2024 DN ERA Addendum, and more importantly, its location within the excavation footprint of the four BWRX-300 unit scenario means this location is assumed to be removed in the future. Ultimately, the 2009 EIS concluded there would be no adverse affects to non-human biota from Project-related noise, and thus noise was not investigated as a likely effect.

As discussed in **Section 4.1.3.3.1**, noise modelling for this PERA indicates an exceedance of the 50 dB guideline from ECCC during site preparation and construction; however, it should be noted that, as in the 2009 EIS, existing noise levels already exceed this guideline. Given the abundance of bird species currently existing at the DN site, it's likely that bird populations are already accustomed to sound levels above 50 dB from current activities and operations at the DN site. When considering the ECCC guideline for the exceedance of ambient noise levels by more than 10 dB, no incremental noise level changes were found to exceed this guideline, a result consistent with the 2009 EIS and providing further evidence that birds at the DN site are not expected to be impacted by DNNP activities any more than what they would already be accustomed to. Overall, both the 2009 EIS and this PERA determined there are no expected adverse effects to non-human biota from DNNP-related noise.

When considering radiological impacts, the maximum radiological dose estimates for human receptors only reaches as high as 0.66 μSv/a from the operation of four BWRX-300 reactors, or approximately 0.07% of the regulatory public dose limit (**Section 3.4.1**). For ecological receptors, there were no exceedances of either the terrestrial or aquatic radiological dose limits (**Section 4.4.1**). This result is less than the dose prediction of 4.4 µSv/a for the four reactor scenario assessed in the 2009 EIS. The recent Dose Estimate Report (OPG, 2023e) calculated that the most exposed members of the public would receive a dose of 1.2 µSv/a from the operation of four BWRX-300 reactors; however, the updated dose in the DNNP PERA is lower due to use of more realistic central intake rates for human receptors instead of 95th percentile values, and adjustments to the stack characteristics based on current design information such as smaller stack diameter and higher stack exit velocity. Ultimately, neither the 2009 EIS nor this DNNP PERA predicts any adverse radiological effects as a result of DNNP activities and operations.

Since the completion of the Comprehensive EIS Review, a number of post-EIS review updates was compiled and considered for this DNNP PERA. The Comprehensive EIS Review noted that the loss of nesting habitat for the Bank Swallow assessed in the 2009 EIS was comparable to the loss of habitat resulting from the deployment of four BWRX-300 reactors (OPG, 2023b). However, the post-EIS review updates include OPG's aim to retain as much Bank Swallow nesting habitat as possible, including potentially avoiding the construction of shoreline protection infrastructure in areas that represent Bank Swallow nesting habitat. Other changes noted in the post-EIS review do not measurably change or influence the assessments and conclusions of this DNNP PERA.

6.0 Cumulative Effects Assessment

Cumulative effects are those that may result from the combined effects of one project with those of other existing, planned, and/or reasonably anticipated future projects. A cumulative effects assessment was carried out in the 2009 EIS (OPG, 2009a) and revisited in the EIS Review for the BWRX-300 (OPG, 2023b). No residual cumulative adverse effects were identified (Note: the only residual cumulative adverse effect identified was related to negative visual and community effects related to cooling towers, which is no longer relevant since the BWRX-300 will not have cooling towers).

The DNNP Commitments Report identifies as part of the Environmental Monitoring and Environmental Assessment Follow-up Program in D-P-12.4 Aquatic Environment that the thermal plume, habitat loss, impingement and entrainment, and climate change will be integrated to inform a cumulative effects assessment for the aquatic environment. The cumulative effects assessment for the aquatic environment is being performed as part of a separate assessment outside of this PERA.

6.1 Darlington Nuclear Site

The cumulative effects assessment in this chapter considers the combined human and ecological dose from existing sources on the DN site (including DNGS, Tritium Removal Facility (TRF), NSS-DWMF, DNNP lands and other OPG site activities within the DN property boundary) and the predicted doses from this DNNP PERA. The cumulative effects assessment also considers those future activities on the DN site including completion of refurbishment of the DNGS, operation of the TDS which produces radiopharmaceutical grade Tc-99m from Mo-99, and the Co-60 Production System. The Mo-99 TDS project is already operational at Unit 2 and would be partially included in dose results from 2023. The predicted doses for these projects ultimately do not result in any adverse impacts to human health or the environment.

Considering the DN site is approximately 34 km east of the PN Site, the influence from PNGS emissions at DN would be relatively small; however, environmental monitoring data collected at DN, would include the contribution, if any, from PNGS effluent and emissions.

6.1.1 Human Dose

The annual public dose is routinely reported for the top three DN potential critical groups, as identified through the pathways analysis. These are the Farm, West/East Beach Resident and the Rural Resident. The annual public dose is also calculated for the Dairy Farm potential critical group as the Dairy Farm group is exposed to the most media types and pathways. In the latest 2023 EMP report (OPG, 2024a), the assessments of the West/East Beach Resident, Farm, Dairy Farm and Rural Resident potential critical groups are expected to be protective of the other receptors.

The annual average doses to the Dairy Farm, Farm, Rural Resident, and West/East Beach from 2020 to 2023 are summarized in **Table 6-1.** It is noted that these doses incorporate any emissions from the TDS which was placed in operation at Unit 2 starting in 2023. The TDS produces radiopharmaceutical grade Tc-99m from Mo-99. The highest annual average dose of 0.7 µSv/a was in 2023 to the Farm receptor.

For the DNNP, the top three critical groups are the Dairy Farm, Farm, and West/East Beach; however, the Rural Resident is also included here for comparison purposes. The annual average dose to the Dairy Farm, Farm, Rural Resident, and West/East Beach from 2020 to 2023 was summed together with the predicted dose for the DNNP (from 4 SMRs). The maximum predicted cumulative dose is 1.24 µSv/a for the Farm (adult) as shown in **Table 6-2**. This predicted dose is still well below the public dose limit (0.11% of the dose limit of 1000 µSv/a) and a small fraction of natural background radiation of 1400 µSv/a. The cumulative dose is considered conservative as the dose from the DNNP is modelled from emissions, whereas in the future, environmental monitoring data will be used to calculate dose; therefore, it is likely that the cumulative dose is an overestimate as modelled emissions are typically more conservative than measured data due to conservatisms in the dispersion models in IMPACT as described in **Section 3.2.7**.

Since the predicted cumulative dose estimates from existing conditions at DN site and the DNNP are a small fraction of the public dose limit and natural background exposure, no discernable health effects are anticipated due to exposure of potential critical groups to incremental radiological emissions from the DNNP and no unacceptable cumulative effects are expected.

Table 6-1: Summary of Dose from Existing Conditions at DN Site to Critical Groups

Year	Age Class	Radiological Dose (µSv/a)			
		Dairy Farm	Farm	Rural Resident	West/East Beach
2020	Adult	0.2	0.4	0.3	0.2
	Child	0.2	0.4	0.2	0.2
	Infant	0.2	0.3	0.1	0.2
2021	Adult	0.2	0.6	0.3	0.3
	Child	0.1	0.6	0.3	0.2
	Infant	0.1	0.4	0.2	0.1
2022	Adult	0.2	0.6	0.3	0.3
	Child	0.3	0.5	0.2	0.2
	Infant	0.4	0.4	0.2	0.2
2023	Adult	0.3	0.7	0.4	0.6
	Child	0.3	0.7	0.3	0.5
	Infant	0.4	0.5	0.2	0.3
Average	**Adult**	**0.2**	**0.6**	**0.3**	**0.4**
	Child	**0.2**	**0.5**	**0.3**	**0.3**
	Infant	**0.3**	**0.4**	**0.2**	**0.2**

Table 6-2: Cumulative Dose to Critical Groups Including DNNP

Age Groups	Dose from Existing DN Site (µSv/a)				Predicted Dose from DNNP (µSv/a)			
	Dairy Farm	Farm	Rural Resident	WEB Resident	Dairy Farm	Farm	Rural Resident	WEB Resident
Adult	0.23	0.59	0.33	0.35	0.31	0.65	0.24	0.33
Child	0.23	0.54	0.25	0.28	0.38	0.6	0.23	0.32
Infant	0.26	0.39	0.18	0.20	0.66	0.49	0.24	0.35
Age Groups	**Total Dose (including DN and DNNP) (µSv/a)**				**% of Dose Limit**			
	Dairy Farm	**Farm**	**Rural Resident**	**WEB Resident**	**Dairy Farm**	**Farm**	**Rural Resident**	**WEB Resident**
Adult	0.53	1.24	0.56	0.68	0.05%	0.12%	0.06%	0.07%
Child	0.61	1.14	0.48	0.60	0.06%	0.11%	0.05%	0.06%
Infant	0.92	0.88	0.42	0.55	0.09%	0.09%	0.04%	0.05%

6.1.2 Ecological Dose

The estimated ecological dose to receptors at ecological receptor locations AB, C, D, E, and Lake Ontario was presented in the DN ERA Addendum, based on recent environmental monitoring data. The estimated maximum dose to ecological receptors is shown in the first few columns of **Table 6-3** below. The predicted dose at all locations from DNNP combined with the existing dose from the DN site is also shown in **Table 6-3**. Location F was added specifically for the DNNP PERA and thus is not shown for existing conditions; therefore, the cumulative dose was calculated using the existing conditions for location E and the predicted dose for location F.

The maximum cumulative terrestrial dose is 5.67E-04 mGy/d to grass in location F, where 78% of the dose is from existing conditions at the DN site, and 22% of the dose is from the DNNP. The grass dose is a small fraction (0.02%) of the terrestrial dose benchmark. The cumulative dose is considered conservative as the dose from the DNNP is modelled from emissions, whereas in the future, environmental monitoring data will be used to calculate dose; therefore, it is likely that the cumulative dose is an overestimate.

The maximum cumulative aquatic dose is 2.21E-02 mGy/d to fish (Lake Trout and American Eel) in Lake Ontario near the outfall of DNGS; however, this is 100% from existing conditions at the DN site as the DNNP does not release radiological liquid effluent to Lake Ontario.

For the cumulative dose, there were no predicted exceedances of the 2.4 mGy/d radiation dose benchmark for the terrestrial biota assessed. Additionally, there were no predicted exceedances of the 9.6 mGy/d radiation dose benchmark for aquatic biota. Additionally, with respect to species at risk, since there were no exceedances of any dose benchmarks for the surrogate species, individual species at risk are also considered protected. Overall, no unacceptable cumulative effects are expected.

Table 6-3: Cumulative Dose to Ecological Receptors for DNGS and DNNP

Receptor	Maximum Dose from Existing DNGS (mGy/d)					Predictive Dose from DNNP (mGy/d)						Total Dose (DNGS + DNNP) (mGy/d)						% of Dose Benchmark					
	Lake Ontario	AB	C	D	E	Lake Ontario	AB	C	D	E	F	Lake Ontario	AB	C	D	E	F	Lake Ontario	AB	C	D	E	F
Aquatic Plants	-	4.66E-05	-	1.28E-04	-	-	6.19E-06	-	7.69E-06	-	-	-	5.28E-05	-	1.36E-04	-	-	-	0.001%	-	0.001%	-	-
Benthic Invertebrates	2.50E-04	4.24E-04	-	-	-	0.00E+00	7.12E-06	-	-	-	-	2.50E-04	4.31E-04	-	-	-	-	0.003%	0.004%	-	-	-	-
Alewife	8.43E-05	-	-	-	-	0.00E+00	-	-	-	-	-	8.43E-05	-	-	-	-	-	0.001%	-	-	-	-	-
Lake Trout	2.21E-02	-	-	-	-	0.00E+00	-	-	-	-	-	2.21E-02	-	-	-	-	-	0.230%	-	-	-	-	-
American Eel	2.21E-02	-	-	-	-	0.00E+00	-	-	-	-	-	2.21E-02	-	-	-	-	-	0.230%	-	-	-	-	-
Northern Redbelly Dace	-	1.10E-03	-	-	-	-	5.94E-06	-	-	-	-	-	1.11E-03	-	-	-	-	-	0.012%	-	-	-	-
Round Whitefish	5.28E-05	-	-	-	-	0.00E+00		-	-	-	-	5.28E-05	-	-	-	-	-	0.001%	-	-	-	-	-
White Sucker	3.61E-05	-	-	-	-	0.00E+00	-	-	-	-	-	3.61E-05	-	-	-	-	-	0.000%	-	-	-	-	-
Turtles	-	3.88E-03	-	3.38E-03	-	-	5.98E-06	-	7.42E-06	-	-	-	3.89E-03	-	3.39E-03	-	-	-	0.040%	-	0.035%	-	-
Frogs	-	3.88E-03	-	1.83E-04	-	-	5.97E-06	-	7.41E-06	-	-	-	3.89E-03	-	1.90E-04	-	-	-	0.040%	-	0.002%	-	-
Terrestrial Plants (Grass)	-	1.40E-04	1.20E-04	1.14E-04	4.45E-04	-	8.37E-06	8.71E-06	1.11E-05	2.76E-05	1.22E-04	-	1.48E-04	1.29E-04	1.25E-04	4.73E-04	5.67E-04	-	0.006%	0.005%	0.005%	0.020%	0.024%
Terrestrial Plants (Sugar Maple)	-	-	-	2.30E-04	2.68E-04	-	-	-	7.02E-06	1.69E-05	7.47E-05	-	-	-	2.37E-04	2.85E-04	3.43E-04	-	-	-	0.010%	0.012%	0.014%
Earthworm	-	7.31E-05	7.26E-05	7.76E-05	2.62E-04	-	4.19E-06	4.25E-06	5.13E-06	1.21E-05	5.22E-05	-	7.73E-05	7.69E-05	8.27E-05	2.74E-04	3.14E-04	-	0.003%	0.003%	0.003%	0.011%	0.013%
American Robin	-	8.60E-05	6.71E-05	8.73E-05	1.18E-04	-	6.29E-06	6.68E-06	9.03E-06	2.28E-05	1.04E-04	-	9.23E-05	7.38E-05	9.63E-05	1.41E-04	2.22E-04	-	0.004%	0.003%	0.004%	0.006%	0.009%
Bank Swallow	-	6.46E-05	-	-	9.74E-05	-	5.50E-06	-	-	2.05E-05	9.44E-05	-	7.01E-05	-	-	1.18E-04	1.92E-04	-	0.003%	-	-	0.005%	0.008%
Bufflehead	4.00E-05	3.53E-04	-	-	-	1.84E-06	6.40E-06	-	-	-	-	4.18E-05	3.53E-04	-	-	-	-	0.002%	0.015%	-	-	-	-
Common Shrew	-	1.55E-04	1.51E-04	1.51E-04	2.20E-04	-	7.37E-06	7.57E-06	9.73E-06	2.34E-05	1.04E-04	-	1.62E-04	1.59E-04	1.61E-04	2.43E-04	3.24E-04	-	0.007%	0.007%	0.007%	0.010%	0.013%
Eastern Cottontail	-	1.85E-04	1.70E-04	1.94E-04	2.33E-04	-	1.02E-05	1.05E-05	1.33E-05	3.16E-05	1.40E-04	-	1.95E-04	1.80E-04	2.07E-04	2.65E-04	3.73E-04	-	0.008%	0.008%	0.009%	0.011%	0.016%
Green Heron	-	3.95E-05	-	-	-	-	6.36E-06	-	-	-	-	-	4.59E-05	-	-	-	-	-	0.002%	-	-	-	-
Mallard	3.96E-05	2.96E-04	-	-	-	1.84E-06	6.40E-06	-	-	-	-	4.14E-05	2.96E-04	-	-	-	-	0.002%	0.012%	-	-	-	-
Meadow Vole	-	1.72E-04	1.58E-04	1.78E-04	2.32E-04	-	1.00E-05	1.03E-05	1.30E-05	3.11E-05	1.38E-04	-	1.82E-04	1.68E-04	1.91E-04	2.63E-04	3.70E-04	-	0.008%	0.007%	0.008%	0.011%	0.015%
Muskrat	-	6.07E-05	-	-	-	-	1.04E-05	-	-	-	-	-	7.11E-05	-	-	-	-	-	0.003%	-	-	-	-
Raccoon	-	1.71E-04	1.48E-04	1.62E-04	2.14E-04	-	1.01E-05	1.03E-05	1.30E-05	3.10E-05	1.37E-04	-	1.71E-04	1.58E-04	1.75E-04	2.45E-04	3.51E-04	-	0.007%	0.007%	0.007%	0.010%	0.015%
Red Fox	-	2.57E-04	1.56E-04	2.34E-04	2.46E-04	-	9.87E-06	1.01E-05	1.29E-05	3.08E-05	1.37E-04	-	2.67E-04	1.66E-04	2.7E-04	2.77E-04	3.83E-04	-	0.011%	0.007%	0.010%	0.012%	0.016%
Short-tailed Weasel	-	1.52E-04	1.56E-04	1.70E-04	1.99E-04	-	9.93E-06	1.01E-05	1.29E-05	3.07E-05	1.36E-04	-	1.62E-04	1.66E-04	1.83E-04	2.30E-04	3.35E-04	-	0.007%	0.007%	0.008%	0.010%	0.014%
Song Sparrow	-	1.43E-04	1.16E-04	1.45E-04	1.82E-04	-	1.10E-05	1.16E-05	1.56E-05	3.91E-05	1.78E-04	-	1.54E-04	1.28E-04	1.61E-04	2.21E-04	3.60E-04	-	0.006%	0.005%	0.007%	0.009%	0.015%
White-tailed Deer	-	1.94E-04	1.93E-04	2.06E-04	1.93E-04	-	1.01E-05	1.03E-05	1.24E-05	2.93E-05	1.29E-04	-	2.04E-04	2.03E-04	2.18E-04	2.22E-04	3.22E-04	-	0.009%	0.008%	0.009%	0.009%	0.013%
Yellow Warbler	-	6.55E-05	7.47E-05	6.67E-05	9.67E-05	-	3.91E-06	3.96E-06	4.84E-06	1.13E-05	4.92E-05	-	6.94E-05	7.87E-05	7.15E-05	1.08E-04	1.46E-04	-	0.003%	0.003%	0.003%	0.004%	0.006%

Note:
There are no exceedances of the aquatic benchmark of 9.6 mGy/d or the terrestrial benchmark of 2.4 mGy/d

6.1.3 Future DN Site Activities

Future activities on the DN site include completion of refurbishment of the DNGS, operation of the TDS which produces radiopharmaceutical grade Tc-99m from Mo-99, and the Co-60 Production System which would irradiate Co-59 to produce Co-60 in order to ensure a long-term supply of Co-60 production, an isotope used for medical applications. As well, further NSS-DWMF expansion is planned for additional storage of Dry Storage Containers, with construction of Storage Building 3 underway and future development of Storage Building 4.

The dose to human and ecological receptors from DNGS refurbishment and continued operation is similar to the dose from existing DNGS operations. The dose to human and ecological receptors from additional storage of used fuel at the NSS-DWMF will marginally increase; however, dose rates at the NSS-DWMF perimeter fenceline will continue to remain below regulatory limits.

With respect to the TDS, the TDS is already installed and operating in Unit 2 and it is anticipated that the TDS will be installed in Unit 3. The Co-60 Production System has not yet been installed. A PERA for the Co-60 Production System was completed in 2022 to assess any impacts of the system, but also evaluated any cumulative effects due to the operation of the TDS, the Co-60 Production System, as well as the existing facilities on the DN site. The PERA concluded that operation of the Co-60 Production System and the TDS in combination with existing DN site facilities will not result in any unacceptable risks to human and ecological receptors residing in the vicinity of the DN site. The additional emissions of the Co-60 and TDS Systems are a small fraction (approximately 1%) of existing DN emissions, and the predicted doses are well below regulatory limits. OPG has a comprehensive Environmental Monitoring Program that provides data to confirm acceptable doses from the existing DNGS and the Co-60 and TDS facilities. These conclusions are still valid with the addition of emissions from the DNNP.

There is uncertainty related to the potential effects of climate change on the future physical conditions. Predicted future changes to meteorological parameters may influence deposition rates and subsequent environmental media concentrations. Additionally, increases to air temperature will impact lake water temperatures, and the likely increased frequency and severity of extreme weather events over the coming decades may result in increased precipitation and additional runoff. The DNNP is being designed using engineering best practices which account for consideration of climate change such as extreme weather events.

Further discussion on climate change is provided in **Section 6.2**.

6.2 Climate Change Considerations

A Phase 1 Climate Change Risk Assessment (CCRA) (OPG, 2023f) was completed for the DNNP, which focused on the identification of climate change hazards, performing a bounding analysis and identifying structures, systems, and components potentially vulnerable to climate change hazards. Then a Phase 2 Climate Change Risk Treatment (CCRT) (OPG, 2024b) was completed to analyze the margins of vulnerable systems and develop risk treatments for the DNNP. The purpose of the CCRA is to ensure that the design of the DNNP including its structures, systems, and components is resilient against projected changes in climate.

The CCRA included a bounding analysis for gradual climate change and extreme weather event climate change hazards performed for two scenarios, representative concentration pathway (RCP) 4.5 (intermediate mitigation scenario) and RCP8.5 (very high GHG emission scenario), based on a surplus energy of 4.5 W/m^2 and 8.5 W/m^2 in Earth's atmosphere. This bounding analysis is detailed by OPG (2023g).

6.2.1 Ambient Air Temperature Impacts to PERA

Climate change is expected to result in increased ambient air temperatures. The annual mean air temperature in 2100 using RCP8.5 is 13.8°C (OPG, 2023g) until 2100. Ambient air temperatures are used as one of the inputs to the model of atmospheric dispersion as described in **Section 2.2.2**. The ambient air temperature used for modelling radiological atmospheric releases was 20°C and the air emissions temperature used was 21°C in this PERA (**Table 2-4**). A lower difference between the gas and ambient air temperature results in lower atmospheric dispersion, which results a greater estimate of risk for receptors proximal to the site. The 2100 predicted annual mean air temperature of 13.8°C would result in a greater temperature difference between the ambient air and emissions, resulting in greater atmospheric dispersion of the emissions. Therefore, the ambient air temperature of 20°C used in this PERA is conservatively elevated and is therefore considered to be bounding of the climate change projections.

6.2.2 Wind Speeds

Observed wind speeds averaged over the 2019 to 2023 period were used to model risk from atmospheric emissions in this PERA. The occurrence and intensity of storm events are expected to increase with climate change, resulting in greater maximum wind speeds. Wind speeds for tropical storms are expected to increase 1-10%, topical cyclone wind speeds can increase by a range of 0.5 to 5.2 km/h, and extra topical cyclones can increase by a range of 0.6 to 6.6 km/h compared to historical observations (OPG, 2023g). The increased wind speeds during these storm events may result in greater dispersion of the atmospheric emissions over a greater area during these storm events compared to what is currently predicted in this PERA. Therefore, this PERA may conservatively represent risk to both human and ecological receptors.

6.2.3 Thermal Plume

A predictive study of thermal impact from DNNP on receiving water near the discharge is in progress and preliminary results are summarized in **Section 4.4.2**. These preliminary results indicate a relatively small area of new thermal impact around the DNNP discharge, and very little effect on existing thermal conditions in the vicinity of DNGS.

The potential impact of climate change on the thermal plume is also being studied (in progress) using the daily air temperatures of the RCP8.5 scenario for 2100. The predicted mixing zone results show that climate change will not significantly impact the size of the thermal plumes for the annual scenario, which ranged from 0.04 km^2 to 0.06 km^2. A smaller thermal plume was also predicted for the winter scenario, due to the reduction in the temperature differences between the lake and effluent during the winter months. Therefore, climate change impacts on the thermal plume are not considered to be significant based on these preliminary predictions.

6.2.4 Construction/Operations

The construction phase of the DNNP is expected to occur on a short-term scale. The climate change impacts described in **Section 6.2.1** to **Section 6.2.3** are not expected to occur during the construction phase of the project, however this PERA is considered to be bounding of these impacts in the short term as impacts to human health and ecological receptors have been conservatively assessed, or the climate change impacts were considered to be negligible.

During operation, standby diesel generators and/or other equipment are expected to emit a small amount of greenhouse gases. However, as backup sources of power, and these are expected to be only operated intermittently for required testing and maintenance.

6.2.5 SMR Technology

The SMR technology generates power through nuclear fission. As climate change is exacerbated through greenhouse gas emissions, SMRs are able to generate electricity and heat with minimal carbon emissions. This SMR technology is one initiative that aims to replace carbon-sourced energy in Ontario and aims to reduce greenhouse gas emissions in the province.

7.0 Sensitivity Analysis

As indicated in **Section 2.2.1.1**, the BWRX-300 is expected to operate following a zero liquid release philosophy for radiological liquid waste, meaning that processed water from the LWM will not need to be routinely released to Lake Ontario, since all water is expected to be reused in the plant. However, for the purposes of the analysis and licensing of the standard BWRX-300 LWM, a conservative amount of LWM releases is assumed as detailed below. This section assesses the impacts on human health and the environment from release of radioactive liquid effluent to Lake Ontario, based on the conservative assumption that DNNP operates with routine liquid releases. It is expected that the actual standard BWRX-300 plant will rarely have liquid effluent releases.

The list of radionuclides and associated radiological liquid release rates for one and four SMRs during operation are shown in **Table 7-1** which include AOOs. The tritium liquid release represents 50% of the atmospheric tritium emissions that are instead released as liquid effluent (U.S. Nuclear Regulatory Commission, 2020). Under the zero liquid release philosophy all tritium released is to the atmosphere. The liquid release rates for other radionuclides were provided by GEH.

This sensitivity analysis models the scenario if DNNP operated with routine radiological liquid effluent releases to Lake Ontario rather than a zero release philosophy. The human and ecological receptors considered are consistent with those assessed in the Predictive HHRA (**Section 3.0**) and Predictive EcoRA (**Section 4.0**).

Table 7-1: Annual Liquid Radiological Release from BWRX-300 SMR

Isotope	Liquid Source Term – One SMR (Bq/a)	Liquid Source Term – Four SMR (Bq/a)
Ag-110m	2.59E+06	1.04E+07
Ba-139	8.14E+06	3.26E+07
Ba-140	1.81E+08	7.24E+08
Br-83	2.48E+07	9.92E+07
Ce-141	1.22E+07	4.88E+07
Ce-143	5.92E+06	2.37E+07
Ce-144	8.51E+06	3.40E+07
Co-58	1.26E+08	5.04E+08
Co-60	2.44E+08	9.76E+08
Cr-51	4.44E+08	1.78E+09
Cs-134	8.51E+07	3.40E+08
Cs-136	4.81E+07	1.92E+08
Cs-137	1.30E+08	5.20E+08
Cu-64	2.74E+08	1.10E+09
Fe-55	5.18E+08	2.07E+09
Fe-59	1.30E+08	5.20E+08
H-3	4.85E+11	1.94E+12
I-131	4.07E+07	1.63E+08
I-132	5.55E+06	2.22E+07

Isotope	Liquid Source Term – One SMR (Bq/a)	Liquid Source Term – Four SMR (Bq/a)
I-133	7.03E+07	2.81E+08
I-135	3.18E+07	1.27E+08
La-142	6.66E+06	2.66E+07
Mn-54	2.41E+08	9.64E+08
Mn-56	7.40E+06	2.96E+07
Mo-99	1.04E+08	4.16E+08
Na-24	7.03E+07	2.81E+08
Nb-95	4.44E+07	1.78E+08
Nb-98	3.70E+05	1.48E+06
Nd-147	1.48E+06	5.92E+06
Ni-63	3.70E+06	1.48E+07
Ni-65	1.48E+06	5.92E+06
Np-239	7.77E+07	3.11E+08
P-32	1.74E+07	6.96E+07
Pr-143	2.18E+07	8.72E+07
Ru-103	9.99E+06	4.00E+07
Ru-105	2.92E+07	1.17E+08
Ru-106	1.78E+07	7.12E+07
Sr-89	1.85E+06	7.40E+06
Sr-91	7.40E+07	2.96E+08
Sr-92	1.78E+07	7.12E+07
Tc-99m	1.04E+08	4.16E+08
Te-129m	1.85E+07	7.40E+07
Te-131m	7.77E+06	3.11E+07
Te-132	2.59E+06	1.04E+07
W-187	2.74E+07	1.10E+08
Y-91	2.48E+07	9.92E+07
Y-92	5.55E+07	2.22E+08
Y-93	5.92E+06	2.37E+07
Zn-65	9.99E+07	4.00E+08
Zn-69m	1.55E+08	6.20E+08
Zr-95	4.07E+07	1.63E+08
Zr-97	7.40E+05	2.96E+06

7.1 Constituents of Potential Concern

A screening evaluation for the constituents of potential concern (COPC) was conducted in order to estimate the relative importance of each radionuclide with respect to public dose, and to support a conservative selection of radionuclide COPCs for further assessment, such that all appreciable contributions to dose are included in the sensitivity analysis.

It is noted that some very short-lived radionuclides listed in **Table 7-1** are unable to persist, even for a short time of travel to a receptor location. Using 24 hours as a conservatively short travel time, from CSA N288.1:20 (CSA, 2020), a radionuclide with a half life less than 288 minutes (4.8 hours) must effectively disappear during travel to a receptor. Radionuclides with shorter half-lives were considered unimportant.

For the purposes of the screening assessment the release rates for one SMR were used from **Table 7-1**; however, the results of relative importance of each radionuclide apply as well to four SMRs.

The effective dose per annum from immersion and ingestion from liquid releases for adults was calculated as follows:

$$Dose_{\,f}\left(\frac{Sv}{a}\right) = Liquid\ release\ \left(\frac{Bq}{s}\right) \times transfer\ parameter\ \left(\frac{s}{L}\right) \times Drinking\ Water\ Ingestion\ Rate\,\frac{L}{a} \times Ingestion\ DCF\ (\frac{Sv}{Bq})$$

$$Dose_{\,w}\left(\frac{Sv}{a}\right) = Liquid\ release\ \left(\frac{Bq}{s}\right) \times transfer\ parameter\ \left(\frac{s}{L}\right) \times Immersion\ DCF\ (\frac{Sv}{a}\,per\,\frac{Bq}{L})$$

The total effective dose from water was calculated as the sum of ingestion and immersion doses.

The transfer parameter (P_{02}), according to CSA N288.1:20 (CSA, 2020), represents the transfer from source to water and is calculated according to the following equation:

$$P_{o2} = \frac{\alpha\beta}{D_F Q_V} \exp\,(-(l_r + l_s)\frac{x}{U_c})$$

where;

α = annual average fraction of time that the current direction is towards the point of interest (unitless)
β = annual average effluent recirculation factor (unitless)
D_F = annual average dilution ratio for steady-state currents (unitless)
Q_v = annual average volumetric discharge rate of liquid effluent (m^3/s)
λ_r = radioactive decay constant (s^{-1})
λ_s = removal constant for sedimentation (s^{-1})
x = distance between the source and the point of interest (m)
U_c = annual average current speed in the direction towards the point of interest (m/s^{-1})

For the transfer parameter (P_{02}), a site-specific flowrate (Q_v) of 10.45 m^3/s and an initial dilution factor of 7 was used (assumed for the SMR diffuser, consistent with the DNGS diffuser). A value of 1.15 was used for the annual average effluent recirculation factor (β), which is the default value for the condenser cooling water discharge at Darlington as recommended in Table F.5 in CSA N288.1:20 (CSA, 2020) and a value of 1 was used for the annual average fraction of time that the current direction is towards the point of interest (α) (OPG, 2022b). The distance x from the source to point of interest was kept at 0 m with 0.16 m/s (CSA, 2020) used as the annual average current speed in the direction towards the point of interest (U_c). The removal constant for sedimentation (λ_s) was conservatively assumed to be 0 s^{-1}, based on guidance provided in CSA N288.1:20 (CSA, 2020). This is intended as a conservative assumption with respect to radionuclide concentrations in water.

An adult drinking water ingestion rate of 2.96 L/d was used, which represents the 95th percentile drinking water rate from CSA N288.1:20 (CSA, 2020). The DCFs were taken from CSA N288.1:20 (CSA, 2020) for ingestion and for select parameters for immersion, with the remaining immersion values not in CSA N288.1:20 sourced from Eckerman and Ryman in U.S. EPA (Eckerman and Ryman, 1993).

The resulting effective doses for screening purposes both for ingestion and immersion (assuming a single SMR) are presented in **Table 7-2**.

A liquid release estimated dose greater than 1E-10 Sv/a (1.0E-04 µSv/a) was used as a cut-off for COPC selection, which accounted for approximately 94% of total dose from waterborne emissions. Based on the screening process described and shown in **Table 7-2**, the 16 radionuclides to be modelled as part of the sensitivity analysis are summarized in **Table 7-3** below for one SMR and four SMRs.

Table 7-2: Screening of Radionuclides Released from the LWS to Lake Ontario

Isotope	Liquid Source Term (Bq/a)	Liquid Source Term (Bq/s)	Half-life (s)	Decay constant (s^{-1})	Water Concentration (Bq/L)	DCF Immersion (Sv/a per Bq/L)	DCF Ingestion (Sv/Bq)	Dose from Immersion (Sv/a)	Dose from Ingestion (Sv/a)	Total Dose (Sv/a)
Ag-110m	2.59E+06	8.21E-02	2.16E+07	3.21E-08	1.29E-06	8.68E-06	2.80E-09	1.12E-11	3.91E-12	1.51E-11
Ba-139*	8.14E+06	2.58E-01	4.97E+03(b)	1.40E-04	4.06E-06	1.49E-07	1.20E-10	6.05E-13	5.26E-13	1.13E-12
Ba-140	1.81E+08	5.74E+00	1.10E+06	6.29E-07	9.02E-05	5.49E-07	2.60E-09	4.95E-11	2.53E-10	3.03E-10
Br-83*	2.48E+07	7.86E-01	8.60E+03(b)	8.06E-05	1.24E-05	2.60E-08	4.30E-11	3.22E-13	5.74E-13	8.96E-13
Ce-141	1.22E+07	3.87E-01	2.81E+06	2.47E-07	6.08E-06	2.15E-07	7.10E-10	1.31E-12	4.67E-12	5.97E-12
Ce-143	5.92E+06	1.88E-01	1.19E+05	5.83E-06	2.95E-06	8.23E-07	1.10E-09	2.43E-12	3.51E-12	5.94E-12
Ce-144	8.51E+06	2.70E-01	2.46E+07	2.82E-08	4.24E-06	5.30E-08	5.20E-09	2.25E-13	2.38E-11	2.41E-11
Co-58	1.26E+08	4.00E+00	6.12E+06	1.13E-07	6.28E-05	3.04E-06	7.40E-10	1.91E-10	5.02E-11	2.41E-10
Co-60	2.44E+08	7.74E+00	1.66E+08	4.17E-09	1.22E-04	8.11E-06	3.40E-09	9.86E-10	4.47E-10	1.43E-09
Cr-51	4.44E+08	1.41E+01	2.39E+06	2.90E-07	2.21E-04	9.53E-08	3.80E-11	2.11E-11	9.09E-12	3.02E-11
Cs-134	8.51E+07	2.70E+00	6.52E+07	1.06E-08	4.24E-05	4.83E-06	1.90E-08	2.05E-10	8.71E-10	1.08E-09
Cs-136	4.81E+07	1.53E+00	1.14E+06	6.10E-07	2.40E-05	6.82E-06	3.00E-09	1.64E-10	7.77E-11	2.41E-10
Cs-137	1.30E+08	4.12E+00	9.49E+08	7.30E-10	6.48E-05	3.27E-09	1.30E-08	2.12E-13	9.10E-10	9.10E-10
Cu-64*	2.74E+08	8.69E+00	4.57E+04	1.52E-05	1.37E-04	6.24E-07	1.20E-10	8.53E-11	1.77E-11	1.03E-10
Fe-55	5.18E+08	1.64E+01	8.66E+07	8.01E-09	2.58E-04	0.00E+00	3.30E-10	0.00E+00	9.21E-11	9.21E-11
Fe-59	1.30E+08	4.12E+00	3.85E+06	1.80E-07	6.48E-05	3.85E-06	1.80E-09	2.50E-10	1.26E-10	3.76E-10
H-3	4.85E+11	1.54E+04	3.89E+08	1.78E-09	2.42E-01	0.00E+00	2.00E-11	0.00E+00	5.22E-09	5.22E-09
I-131	4.07E+07	1.29E+00	6.93E+05	1.00E-06	2.03E-05	1.16E-06	2.20E-08	2.35E-11	4.82E-10	5.06E-10
I-132	5.55E+06	1.76E-01	8.26E+03(b)	8.39E-05	2.77E-06	7.16E-06	2.90E-10	1.98E-11	8.67E-13	2.07E-11
I-133	7.03E+07	2.23E+00	7.49E+04	9.26E-06	3.50E-05	1.88E-06	4.30E-09	6.59E-11	1.63E-10	2.29E-10
I-135	3.18E+07	1.01E+00	2.37E+04	2.93E-05	1.59E-05	5.14E-06	9.30E-10	8.15E-11	1.59E-11	9.74E-11
La-142*	6.66E+06	2.11E-01	5.54E+03(b)	1.25E-04	3.32E-06	9.84E-06	1.80E-10	3.27E-11	6.46E-13	3.33E-11
Mn-54	2.41E+08	7.64E+00	2.70E+07	2.57E-08	1.20E-04	2.62E-06	7.10E-10	3.15E-10	9.22E-11	4.07E-10
Mn-56*	7.40E+06	2.35E-01	9.28E+03(b)	7.47E-05	3.69E-06	5.87E-06	2.50E-10	2.16E-11	9.96E-13	2.26E-11
Mo-99	1.04E+08	3.30E+00	2.38E+05	2.92E-06	5.18E-05	4.70E-07	6.00E-10	2.44E-11	3.36E-11	5.80E-11
Na-24	7.03E+07	2.23E+00	5.40E+04	1.28E-05	3.50E-05	1.42E-05	4.30E-10	4.98E-10	1.63E-11	5.14E-10
Nb-95	4.44E+07	1.41E+00	3.02E+06	2.29E-07	2.21E-05	2.39E-06	5.80E-10	5.29E-11	1.39E-11	6.68E-11
Nb-98*	3.70E+05	1.17E-02	2.86E+00(b)	2.42E-01	1.84E-07	8.23E-06	1.10E-10	1.52E-12	2.19E-14	1.54E-12
Nd-147*	1.48E+06	4.69E-02	9.49E+05	7.31E-07	7.38E-07	4.29E-07	1.10E-09	3.16E-13	8.77E-13	1.19E-12
Ni-63	3.70E+06	1.17E-01	3.19E+09	2.17E-10	1.84E-06	0.00E+00	1.50E-10	0.00E+00	2.99E-13	2.99E-13

Isotope	Liquid Source Term (Bq/a)	Liquid Source Term (Bq/s)	Half-life (s)	Decay constant (s^{-1})	Water Concentration (Bq/L)	DCF Immersion (Sv/a per Bq/L)	DCF Ingestion (Sv/Bq)	Dose from Immersion (Sv/a)	Dose from Ingestion (Sv/a)	Total Dose (Sv/a)
Ni-65*	1.48E+06	4.69E-02	9.06E+03[b]	7.65E-05	7.38E-07	1.90E-06	1.80E-10	1.41E-12	1.43E-13	1.55E-12
Np-239	7.77E+07	2.46E+00	2.04E+05	3.41E-06	3.87E-05	4.83E-07	8.00E-10	1.87E-11	3.35E-11	5.22E-11
P-32	1.74E+07	5.52E-01	1.23E+06	5.63E-07	8.67E-06	2.04E-08	2.40E-09	1.77E-13	2.25E-11	2.27E-11
Pr-143	2.18E+07	6.91E-01	1.17E+06	5.91E-07	1.09E-05	6.97E-09	1.20E-09	7.57E-14	1.41E-11	1.42E-11
Ru-103	9.99E+06	3.17E-01	3.39E+06	2.04E-07	4.98E-06	1.43E-06	7.30E-10	7.12E-12	3.93E-12	1.10E-11
Ru-105*	2.92E+07	9.26E-01	1.60E+04[b]	4.34E-05	1.46E-05	2.61E-06	2.60E-10	3.80E-11	4.09E-12	4.21E-11
Ru-106	1.78E+07	5.64E-01	3.21E+07	2.16E-08	8.87E-06	0.00E+00	7.00E-09	0.00E+00	6.71E-11	6.71E-11
Sr-89	1.85E+06	5.87E-02	4.37E+06	1.59E-07	9.22E-07	1.66E-08	2.60E-09	1.53E-14	2.59E-12	2.61E-12
Sr-91*	7.40E+07	2.35E+00	3.42E+04	2.03E-05	3.69E-05	2.36E-06	6.50E-10	8.70E-11	2.59E-11	1.13E-10
Sr-92*	1.78E+07	5.64E-01	9.76E+03[b]	7.10E-05	8.87E-06	4.64E-06	4.30E-10	4.11E-11	4.12E-12	4.53E-11
Tc-99m	1.04E+08	3.30E+00	2.16E+04	3.20E-05	5.18E-05	3.66E-07	2.20E-11	1.90E-11	1.23E-12	2.02E-11
Te-129m*	1.85E+07	5.87E-01	2.90E+06	2.39E-07	9.22E-06	1.07E-07	3.00E-09	9.86E-13	2.99E-11	3.09E-11
Te-131m*	7.77E+06	2.46E-01	1.08E+05	6.42E-06	3.87E-06	4.79E-06	1.90E-09	1.86E-11	7.95E-12	2.65E-11
Te-132	2.59E+06	8.21E-02	2.77E+05	2.50E-06	1.29E-06	6.47E-07	3.80E-09	8.35E-13	5.30E-12	6.14E-12
W-187*	2.74E+07	8.69E-01	8.60E+04	8.06E-06	1.37E-05	1.57E-06	6.30E-10	2.14E-11	9.30E-12	3.07E-11
Y-91	2.48E+07	7.86E-01	5.06E+06	1.37E-07	1.24E-05	2.87E-08	2.40E-09	3.55E-13	3.21E-11	3.24E-11
Y-92*	5.55E+07	1.76E+00	1.27E+04[b]	5.44E-05	2.77E-05	8.86E-07	4.90E-10	2.45E-11	1.46E-11	3.92E-11
Y-93*	5.92E+06	1.88E-01	3.66E+04	1.89E-05	2.95E-06	3.25E-07	1.20E-09	9.59E-13	3.83E-12	4.78E-12
Zn-65	9.99E+07	3.17E+00	2.11E+07	3.29E-08	4.98E-05	1.86E-06	3.90E-09	9.26E-11	2.10E-10	3.02E-10
Zn-69m*	1.55E+08	4.92E+00	4.97E+04	1.40E-05	7.73E-05	1.37E-06	3.30E-10	1.06E-10	2.75E-11	1.33E-10
Zr-95	4.07E+07	1.29E+00	5.53E+06	1.25E-07	2.03E-05	2.30E-06	9.50E-10	4.67E-11	2.08E-11	6.75E-11
Zr-97*	7.40E+05	2.35E-02	6.08E+04	1.14E-05	3.69E-07	6.18E-07	2.10E-09	2.28E-13	8.37E-13	1.06E-12

Notes:

[a] The liquid source terms used in the screening dose calculation assume one SMR unit.

[b] Half-life is less than 288 minutes; therefore, assumed to disappear quickly.

Radionuclides shown with an asterisk (*) indicate those that are not addressed under CSA N288.1:20, DCFs for these were obtained from ICRP 72 (1995) for ingestion or Eckerman and Ryman from U.S. EPA (1993b) for immersion.

Green shading indicates dose greater than the cutoff of 1E-10 Sv/a for inclusion as a COPC in the sensitivity analysis.

Table 7-3: Summary of Radionuclides and Liquid Release Rates for Sensitivity Analysis

Isotope	Liquid Source Term – One SMR (Bq/s)	Liquid Source Term – Four SMRs (Bq/s)
Ba-140	5.74E+00	2.30E+01
Co-58	4.00E+00	1.60E+01
Co-60	7.74E+00	3.09E+01
Cs-134	2.70E+00	1.08E+01
Cs-136	1.53E+00	6.10E+00
Cs-137	4.12E+00	1.65E+01
Cu-64	8.69E+00	3.48E+01
Fe-59	4.12E+00	1.65E+01
H-3	1.54E+04	6.15E+04
I-131	1.29E+00	5.16E+00
I-133	2.23E+00	8.92E+00
Mn-54	7.64E+00	3.06E+01
Na-24	2.23E+00	8.92E+00
Sr-91	2.35E+00	9.39E+00
Zn-65	3.17E+00	1.27E+01
Zn-69m	4.92E+00	1.97E+01

7.2 Dispersion Model

The aquatic dispersion model in IMPACT™ version 5.5.2 was used to model waterborne releases to Lake Ontario. The aquatic dispersion model is consistent with equations for the transfer parameter (P_{02}) from source to water in Clause 7.1.3 in CSA N288.1:20 (CSA, 2020), and the coastal water plume characteristics are shown in **Table 7-4** below. The equation for P_{02} is shown in **Section 7.1**. The dilution factor (D_F) which represents the ratio of the annual average effluent concentration at the source to the annual average concentration at the point of interest is calculated according to Equation 7-3 in CSA N288.1:20 (CSA, 2020).

The dilution factor is conservative in that it assumes:

- longitudinal dispersion is negligible compared to lateral dispersion;
- radioactivity is uniformly mixed over the depth of the plume; and
- the point of interest is located along the centreline of the plume.

Table 7-4: Coastal Water Plume Characteristics

Parameter	Description	Value	Source
β	Effluent recirculation factor	1.15	(CSA, 2020)
Q_v	Volumetric discharge rate	41,800 L/s (4 SMRs)	(Baird, 2023)
κ	Proportionality coefficient	7.1E-06	(CSA, 2020)
D_0	Initial dilution factor	7.0	Target Dilution (Baird, 2023)
U_C	Current speed to the right	0.1108 m/s	Processed Acoustic Doppler current profiler data from 2017-2021
U_C	Current speed to the left	0.108 m/s	Processed Acoustic Doppler current profiler data from 2017-2021
α	Fraction of year current flows toward receptor	1.0	(CSA, 2020)
d	Average plume depth	11.3 m	(Baird, 2023)

7.2.1 Partitioning to Sediment

From the modelled COPC concentrations in water at any location, the IMPACT™ model also calculates COPC partitioning to sediment and aquatic organisms, such as fish, and the transfer from water to soil by irrigation. The equations are all provided in CSA N288.1:20 (CSA, 2020).

For transfer from surface water to sediment, the surface water concentration of a COPC was multiplied by its sediment water partition coefficient as defined in CSA N288.1:20 (CSA, 2020). This approach assumes sediments and water are in equilibrium, and that sediments are depositional and will accumulate COPCs. As the sediment in the nearshore of Lake Ontario near DNNP is considered transient, it is likely that this model overestimates concentrations in sediment.

7.3 Human Dose

The dose to the same human receptors assessed in the predictive HHRA in **Section 3.0** were assessed in the sensitivity analysis. All assumptions for receptor characteristics and model parameters identified in **Section 3.0** were consistent in the sensitivity analysis. The only difference is that a liquid radiological source was added; therefore, waterborne pathways that were previously considered negligible were now considered complete pathways.

The predicted total dose to human receptors due to liquid radiological release from four SMRs as well as due to liquid release in addition to atmospheric release from four SMRs are summarized in **Table 7-5** and **Table 7-6**, respectively, along with a comparison to the regulatory public dose limit of 1 mSv/a.

The highest total dose due to only liquid radiological release from four SMRs is 6.45E-05 mSv/a for child-10y WEB Resident, which accounts to a maximum of 0.006% of the regulatory public dose limit of 1 mSv/a. The highest total dose due to liquid and atmospheric radiological release from four SMRs is 6.96E-04 mSv/a for infant-1y Dairy Farm. The dose estimates for the human receptors range from approximately 0.003% of the regulatory public dose limit of 1 mSv/a to a maximum of 0.07% of the regulatory public dose limit. Demonstrating that these human receptor groups are protected implies that other receptor groups near the DN site with anticipated lower exposure are also protected.

Since the dose estimates are a small fraction of the public dose limit and of natural background dose of 1.4 mSv/a, no discernable health effects are anticipated due to exposure of potential critical groups to radiological releases from the DNNP.

Table 7-5: Total Radiological Dose to Human Receptors due to Liquid Release from Four SMRs – Sensitivity Analysis

Human Receptor	Adult		Child-10y		Infant-1y	
	Total Dose (mSv/a)	% of Dose Limit	Total Dose (mSv/a)	% of Dose Limit	Total Dose (mSv/a)	% of Dose Limit
Oshawa Resident+	3.15E-05	0.003%	3.18E-05	0.003%	4.14E-05	0.004%
Bowmanville Resident+	3.12E-05	0.003%	3.19E-05	0.003%	4.15E-05	0.004%
WEB Resident+	5.52E-05	0.006%	**6.45E-05**	0.006%	6.04E-05	0.006%
Farm	3.09E-05	0.003%	3.10E-05	0.003%	4.03E-05	0.004%
Dairy Farm	3.09E-05	0.003%	3.10E-05	0.003%	4.03E-05	0.004%
Rural Resident+	3.12E-05	0.003%	3.18E-05	0.003%	4.14E-05	0.004%
Sport Fisher	4.94E-05	0.005%	3.28E-05	0.003%	1.90E-05	0.002%
Camper	3.34E-05	0.003%	3.26E-05	0.003%	4.13E-05	0.004%
Harvester+	5.76E-05	0.006%	4.90E-05	0.005%	5.08E-05	0.005%
Industrial Commercial+	8.43E-06	0.001%	NA	NA	NA	NA

Note:
"+" indicates that a portion of the adults work near DN site and for modelling purposes are attributed the Industrial Commercial receptor dose.
The bold value indicates the highest total dose for human receptor due to liquid radiological release from 4 SMRs.
NA: not applicable.
There are no exceedances of the public dose limit of 1 mSv/a.

Table 7-6: Total Radiological Dose to Human Receptors due to Liquid and Atmospheric Release from Four SMRs – Sensitivity Analysis

Human Receptor	Adult		Child-10y		Infant-1y	
	Total Dose (mSv/a)	% of Dose Limit	Total Dose (mSv/a)	% of Dose Limit	Total Dose (mSv/a)	% of Dose Limit
Oshawa Resident+	2.51E-04	0.03%	2.29E-04	0.02%	2.25E-04	0.02%
Bowmanville Resident+	2.10E-04	0.02%	1.98E-04	0.02%	2.04E-04	0.02%
WEB Resident+	3.81E-04	0.04%	3.86E-04	0.04%	4.10E-04	0.04%
Farm	6.84E-04	0.07%	6.32E-04	0.06%	5.26E-04	0.05%
Dairy Farm	3.37E-04	0.03%	4.12E-04	0.04%	**6.96E-04**	0.07%
Rural Resident+	2.68E-04	0.03%	2.62E-04	0.03%	2.85E-04	0.03%
Sport Fisher	5.47E-05	0.005%	3.84E-05	0.004%	2.62E-05	0.003%
Camper	1.51E-04	0.02%	1.43E-04	0.01%	1.48E-04	0.01%
Harvester+	3.02E-04	0.03%	2.83E-04	0.03%	3.16E-04	0.03%
Industrial Commercial+	8.57E-05	0.01%	NA	NA	NA	NA

Notes:
"+" indicates that a portion of the adults work near DN site and for modelling purposes are attributed to the Industrial Commercial receptor dose while at work.
The bold value indicates the highest total dose for human receptor due to liquid and atmospheric radiological release from 4 SMRs.
NA: not applicable.
There are no exceedances of the public dose limit of 1 mSv/a.

7.4 Ecological Dose

The dose to the same ecological receptors assessed in the predictive EcoRA in **Section 4.0** were assessed in the sensitivity analysis. All assumptions for receptor characteristics and model parameters identified in **Section 4.0** were consistent in the sensitivity analysis. The only difference is that a liquid radiological source was added; therefore, waterborne pathways that were previously considered negligible were now considered complete pathways.

The predicted dose to ecological receptors due to liquid radiological release from four SMRs as well as due to liquid release in addition to atmospheric release from four SMRs are summarized in **Table 7-7** and **Table 7-8**, respectively, along with a comparison to their respective dose benchmarks.

There were no predicted exceedances of the 2.4 mGy/d radiation dose benchmark for the terrestrial biota assessed. Additionally, there were no predicted exceedances of the 9.6 mGy/d radiation dose benchmark for aquatic biota. The maximum predicted radiation dose due to liquid release is 8.76E-05 mGy/d for the Benthic Invertebrates in nearshore Lake Ontario, which is 0.00091% of the 9.6 mGy/d radiation dose benchmark for aquatic biota. The maximum predicted radiation dose due to liquid and atmospheric release remains the same with that only due to atmospheric release at 1.78E-04 mGy/d for the Song Sparrow in location F. All predicted doses were a small fraction of their respective dose benchmarks (ranging from <0.0001% to 0.0074% of the benchmark). Therefore, it is unlikely that there would be adverse effects on terrestrial populations or communities as a result of liquid and atmospheric radionuclide releases from the DNNP.

Table 7-7: Total Radiological Dose to Ecological Receptors due to Liquid Release from Four SMRs – Sensitivity Analysis

Ecological Receptors	Lake Ontario		AB		C		D		E		F		Maximum	
	Total Dose (mGy/d)	% of Benchmark	Total Dose (mGy/d)	% of Benchmark	Total Dose (mGy/d)	% of Benchmark	Total Dose (mGy/d)	% of Benchmark	Total Dose (mGy/d)	% of Benchmark	Total Dose (mGy/d)	% of Benchmark	Total Dose (mGy/d)	% of Benchmark
Aquatic Plants	NA	NA	0	0%	NA	NA	0	0%	NA	NA	NA	NA	0	0%
Benthic Invertebrates	8.76E-05	0.00091%	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	**8.76E-05**	0.00091%
Alewife	4.84E-06	0.00005%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4.84E-06	0.00005%
Lake Trout	4.84E-06	0.00005%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4.84E-06	0.00005%
American Eel	2.40E-05	0.00025%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.40E-05	0.00025%
Dace	NA	NA	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	0	0%
Round Whitefish	2.40E-05	0.00025%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.40E-05	0.00025%
White Sucker	2.40E-05	0.00025%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.40E-05	0.00025%
Frogs	NA	NA	0	0%	NA	NA	0	0%	NA	NA	NA	NA	0	0%
Turtles	NA	NA	0	0%	NA	NA	0	0%	NA	NA	NA	NA	0	0%
Grass	NA	NA	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
Sugar Maple	NA	NA	NA	NA	NA	NA	0	0%	0	0%	0	0%	0	0%
Earthworm	NA	NA	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
American Robin	NA	NA	0	0%	0	0%	0	0%	3.07E-09	0.0000001%	3.07E-09	0.0000001%	3.07E-09	0.0000001%
Bank Swallow	NA	NA	0	0%	NA	NA	NA	NA	3.12E-09	0.0000001%	3.12E-09	0.0000001%	3.12E-09	0.0000001%
Bufflehead	1.18E-05	0.00049%	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	1.18E-05	0.00049%
Common Shrew	NA	NA	0	0%	0	0%	0	0%	1.14E-08	0.0000005%	1.14E-08	0.0000005%	1.14E-08	0.0000005%
Eastern Cottontail	NA	NA	0	0%	0	0%	0	0%	1.21E-08	0.0000005%	1.21E-08	0.0000005%	1.21E-08	0.0000005%
Green Heron	NA	NA	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	0	0%
Mallard	1.18E-05	0.00049%	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	1.18E-05	0.00049%
Meadow Vole	NA	NA	0	0%	0	0%	0	0%	1.16E-08	0.0000005%	1.16E-08	0.0000005%	1.16E-08	0.0000005%
Muskrat	NA	NA	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	0	0%
Raccoon	NA	NA	0	0%	0	0%	0	0%	1.78E-08	0.0000007%	1.78E-08	0.0000007%	1.78E-08	0.0000007%
Red Fox	NA	NA	0	0%	0	0%	0	0%	1.85E-08	0.0000008%	1.85E-08	0.0000008%	1.85E-08	0.0000008%
Short-tailed Weasel	NA	NA	0	0%	0	0%	0	0%	1.90E-08	0.0000008%	1.90E-08	0.0000008%	1.90E-08	0.0000008%

Ecological Receptors	Lake Ontario		AB		C		D		E		F		Maximum	
	Total Dose (mGy/d)	% of Benchmark	Total Dose (mGy/d)	% of Benchmark	Total Dose (mGy/d)	% of Benchmark	Total Dose (mGy/d)	% of Benchmark	Total Dose (mGy/d)	% of Benchmark	Total Dose (mGy/d)	% of Benchmark	Total Dose (mGy/d)	% of Benchmark
Song Sparrow	NA	NA	0	0%	0	0%	0	0%	4.94E-09	0.0000002%	4.94E-09	0.0000002%	4.94E-09	0.0000002%
White-tailed Deer	NA	NA	0	0%	0	0%	0	0%	1.26E-08	0.0000005%	1.26E-08	0.0000005%	1.26E-08	0.0000005%
Yellow Warbler	NA	NA	0	0%	0	0%	0	0%	3.10E-09	0.0000001%	3.10E-09	0.0000001%	3.10E-09	0.0000001%

Note:
NA = Not applicable, the ecological receptor was not assessed at this location.
The bold value indicates the highest total dose for ecological receptors due to liquid radiological release from 4 SMRs.
There are no exceedances of the aquatic benchmark of 9.6 mGy/d or the terrestrial benchmark of 2.4 mGy/d.

Table 7-8: Total Radiological Dose to Ecological Receptors due to Liquid and Atmospheric Release from Four SMRs – Sensitivity Analysis

Ecological Receptors	Lake Ontario		AB		C		D		E		F		Maximum	
	Total Dose (mGy/d)	% of Benchmark	Total Dose (mGy/d)	% of Benchmark	Total Dose (mGy/d)	% of Benchmark	Total Dose (mGy/d)	% of Benchmark	Total Dose (mGy/d)	% of Benchmark	Total Dose (mGy/d)	% of Benchmark	Total Dose (mGy/d)	% of Benchmark
Aquatic Plants	NA	NA	6.19E-06	0.0001%	NA	NA	7.69E-06	0.0001%	NA	NA	NA	NA	7.69E-06	0.0001%
Benthic Invertebrates	8.76E-05	0.0009%	7.12E-06	0.0001%	NA	NA	NA	NA	NA	NA	NA	NA	8.76E-05	0.0009%
Alewife	4.84E-06	0.0001%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4.84E-06	0.0001%
Lake Trout	4.84E-06	0.0001%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4.84E-06	0.0001%
American Eel	2.40E-05	0.0002%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.40E-05	0.0002%
Dace	NA	NA	5.94E-06	0.0001%	NA	NA	NA	NA	NA	NA	NA	NA	5.94E-06	0.0001%
Round Whitefish	2.40E-05	0.0002%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.40E-05	0.0002%
White Sucker	2.40E-05	0.0002%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.40E-05	0.0002%
Frogs	NA	NA	5.98E-06	0.0001%	NA	NA	7.42E-06	0.0001%	NA	NA	NA	NA	7.42E-06	0.0001%
Turtles	NA	NA	5.97E-06	0.0001%	NA	NA	7.41E-06	0.0001%	NA	NA	NA	NA	7.41E-06	0.0001%
Grass	NA	NA	8.37E-06	0.0003%	8.71E-06	0.0004%	1.11E-05	0.0005%	2.76E-05	0.0012%	1.22E-04	0.0051%	1.22E-04	0.0051%
Sugar Maple	NA	NA	NA	NA	NA	NA	7.02E-06	0.0003%	1.69E-05	0.0007%	7.47E-05	0.0031%	7.47E-05	0.0031%
Earthworm	NA	NA	4.19E-06	0.0002%	4.25E-06	0.0002%	5.13E-06	0.0002%	1.21E-05	0.0005%	5.22E-05	0.0022%	5.22E-05	0.0022%
American Robin	NA	NA	6.29E-06	0.0003%	6.68E-06	0.0003%	9.03E-06	0.0004%	2.28E-05	0.0009%	1.04E-04	0.0043%	1.04E-04	0.0043%
Bank Swallow	NA	NA	5.50E-06	0.0002%	NA	NA	NA	NA	2.05E-05	0.0009%	9.44E-05	0.0039%	9.44E-05	0.0039%
Bufflehead	1.36E-05	0.0006%	6.40E-06	0.0003%	NA	NA	NA	NA	NA	NA	NA	NA	1.36E-05	0.0006%

Ecological Receptors	Lake Ontario		AB		C		D		E		F		Maximum	
	Total Dose (mGy/d)	% of Benchmark	Total Dose (mGy/d)	% of Benchmark	Total Dose (mGy/d)	% of Benchmark	Total Dose (mGy/d)	% of Benchmark	Total Dose (mGy/d)	% of Benchmark	Total Dose (mGy/d)	% of Benchmark	Total Dose (mGy/d)	% of Benchmark
Common Shrew	NA	NA	7.37E-06	0.0003%	7.57E-06	0.0003%	9.73E-06	0.0004%	2.34E-05	0.0010%	1.04E-04	0.0043%	1.04E-04	0.0043%
Eastern Cottontail	NA	NA	1.02E-05	0.0004%	1.05E-05	0.0004%	1.33E-05	0.0006%	3.17E-05	0.0013%	1.40E-04	0.0058%	1.40E-04	0.0058%
Green Heron	NA	NA	6.36E-06	0.0003%	NA	NA	NA	NA	NA	NA	NA	NA	6.36E-06	0.0003%
Mallard	1.37E-05	0.0006%	6.40E-06	0.0003%	NA	NA	NA	NA	NA	NA	NA	NA	1.37E-05	0.0006%
Meadow Vole	NA	NA	1.00E-05	0.0004%	1.03E-05	0.0004%	1.30E-05	0.0005%	3.11E-05	0.0013%	1.38E-04	0.0058%	1.38E-04	0.0058%
Muskrat	NA	NA	1.04E-05	0.0004%	NA	NA	NA	NA	NA	NA	NA	NA	1.04E-05	0.0004%
Raccoon	NA	NA	1.01E-05	0.0004%	1.03E-05	0.0004%	1.30E-05	0.0005%	3.10E-05	0.0013%	1.37E-04	0.0057%	1.37E-04	0.0057%
Red Fox	NA	NA	9.87E-06	0.0004%	1.01E-05	0.0004%	1.29E-05	0.0005%	3.08E-05	0.0013%	1.36E-04	0.0057%	1.36E-04	0.0057%
Short-tailed Weasel	NA	NA	9.93E-06	0.0004%	1.01E-05	0.0004%	1.29E-05	0.0005%	3.07E-05	0.0013%	1.36E-04	0.0057%	1.36E-04	0.0057%
Song Sparrow	NA	NA	1.10E-05	0.0005%	1.16E-05	0.0005%	1.56E-05	0.0007%	3.92E-05	0.0016%	1.78E-04	0.0074%	**1.78E-04**	0.0074%
White-tailed Deer	NA	NA	1.01E-05	0.0004%	1.03E-05	0.0004%	1.24E-05	0.0005%	2.93E-05	0.0012%	1.29E-04	0.0054%	1.29E-04	0.0054%
Yellow Warbler	NA	NA	3.91E-06	0.0002%	3.96E-06	0.0002%	4.84E-06	0.0002%	1.13E-05	0.0005%	4.92E-05	0.0020%	4.92E-05	0.0020%

Note:

NA = Not applicable, the ecological receptor was not assessed at this location.

The bold value indicates the highest total dose for ecological receptors due to liquid and atmospheric radiological release from 4 SMRs.

There are no exceedances of the aquatic benchmark of 9.6 mGy/d or the terrestrial benchmark of 2.4 mGy/d.

8.0 Conclusions and Recommendations

8.1 Conclusions

8.1.1 Radiological Conclusions

There are no radiological releases expected to air and water during site preparation and construction of the DNNP. During operation radiological emissions to air are anticipated to occur through the active ventilation system. The BWRX-300 LWM implements a zero liquid release philosophy, meaning that processed water from the LWM will not need to be routinely released to Lake Ontario since water will be reused in the plant. The conclusions in this section are based on radiological emissions to air during operation.

The incremental radiation dose from the DNNP to all human receptors during the operation phase is predicted to be well below the regulatory public dose limit of 1 mSv/a. The highest total dose due to atmospheric radiological release from 4 SMRs is 6.55E-04 mSv/a for the dairy farm infant. Overall, since the predicted radiation dose estimates are below the dose limit, no discernable health effects are anticipated due to exposure of these receptors to radioactive releases from the DNNP.

There were no predicted exceedances of the 9.6 mGy/d radiation dose benchmark for aquatic biota or the 2.4 mGy/d radiation dose benchmark for terrestrial and riparian biota; therefore, aquatic and terrestrial receptors at the DNNP are considered protected. The maximum predicted radiation dose from the DNNP (4 SMRs) during the operation phase is 1.78E-04 mGy/d to the Song Sparrow in location F, the location closest to the SMR release. Since there were no predicted exceedances of the respective dose benchmarks for any of the aquatic or terrestrial receptors, individual species at risk are also considered protected. Overall, it is unlikely that there would be adverse effects on terrestrial or aquatic populations or communities as a result of radionuclide releases from the DNNP.

The combined effects from the DN site and the DNNP were considered as well. The maximum predicted cumulative dose is 1.24E-03 mSv/a for the Farm (adult). This predicted dose is still well below the regulatory public dose limit. The maximum predicted cumulative dose is 5.67E-04 mGy/d to grass in location F. The grass dose is a small fraction (0.02%) of the terrestrial dose benchmark. The cumulative dose is considered conservative as the dose from the DNNP is modelled from emissions, whereas in the future, environmental monitoring data will be used to calculate dose.

Based on the results of the DNNP PERA, the DNNP is not predicted to cause any adverse effects to human and ecological receptors evaluated.

8.1.2 Non-Radiological Conclusions

Site preparation and construction activities are managed through the Contractor's Site-Specific Environmental Management Plan. Best management practices will be employed to minimize and avoid potential adverse impacts, and all MECP requirements will be followed.

During operation non-radiological liquid effluent will be released through the Condenser Cooling Water (CCW). It is anticipated that the only water stream that may use chlorination is the service water system. The de-chlorination system will be operated in a manner that ensures the concentration of total residual chlorine at the CCW duct does not exceed 0.01 mg/L. Chlorine concentrations in the lake are predicted to be below both human and ecological screening values. This will allow the PWQO for residual chlorine to be met within the mechanical mixing zone of the diffuser. Therefore, no additional quantitative assessment of total residual chlorine was required for the PERA.

During the site preparation and construction phases of the DNNP, chemical air pollutants are expected to be released into the local atmosphere from typical construction activities (e.g., excavation, land clearing), heavy construction vehicles, on-site personnel vehicles, and other motorized pieces of equipment. During operation, additional emissions are expected from the standby generators. Predicted air concentrations during all Project phases were compared against ambient air quality criteria at human and ecological receptor locations. Only benzo(a)pyrene was considered further quantitatively, for human health; however, the results of that assessment indicated that both cancer and non-cancer risk were below levels that would cause adverse impacts for human health.

Overall, it is unlikely that there would be adverse effects on human and ecological health as a result of non-radiological releases from the DNNP.

8.2 Recommendations and Future Monitoring

8.2.1 Effluent and Emissions Monitoring

OPG will develop an effluent and emissions monitoring program for the DNNP that meets the requirements of CSA N288.5:22, *Effluent and emissions monitoring programs at nuclear facilities* (CSA, 2022b). There is no separate recommendation on this monitoring resulting from this PERA.

Effluent and emissions monitoring should be risk-based, focusing on both radiological and non-radiological constituents released from the DNNP. The program should provide a characterization of released COPCs sufficient to support the ongoing PERAs and ERAs, and to demonstrate adequate control of releases for environmental protection. The objectives of the program, consistent with CSA N288.5 will be:

- To provide information to demonstrate compliance with all regulatory requirements regarding effluents and emissions;
- To provide information on effluents and emissions to support assessment of potential risks to people and the environment as identified in the ERA;
- To provide information on effluents and emissions to support assessment of radiation dose to people and the environment; and

- To provide early warning of any unusual or unforeseen releases of nuclear or hazardous substances to the environment.

A broad initial characterization of emissions, and effluents if any, should be conducted to allow for evaluation and selection of COPCs for routine monitoring, based on their estimated contribution to dose or risk, in accordance with CSA N288.5. Radionuclides that are expected to be important based on design information and modelling are discussed in **Section 8.2.2** below.

8.2.2 Environmental Monitoring

OPG has a robust environmental monitoring program where environmental media are sampled and analyzed at locations within and outside the DN site. While this program was specifically designed based on existing facilities on the DN site, much of the program would also be applicable to DNNP. Any monitoring at DNNP would be consistent with requirements and guidance in CSA N288.4-19: *Environmental monitoring programs at nuclear facilities and uranium mines and mills* (CSA, 2019). The existing program for the DN site is focused on analysis of radionuclides in environmental media specifically tritium, C-14, Co-60, Cs-134, and Cs-137 as applicable based on environmental medium. Consistent with CSA N288.4-19 (CSA, 2019), contaminants and media that contribute significantly to the dose should be monitored. Considering the SMRs at the DNNP will release a different proportion of radionuclides, the following recommendations or comments relating to the monitoring program are made:

- OPG's existing EMP includes atmospheric monitoring (active and passive samplers), terrestrial sampling (fruits and vegetables, animal feed, eggs, poultry, milk, soil), and aquatic sampling (fish, lake water, well water, municipal water, beach sand, sediment). Considering the addition of a Harvester that consumes local traditional foods, the pathways for this receptor should be reviewed as part of the next EMP design review to determine whether there should be any changes or additions to the EMP. The results would be applicable for both DNGS and DNNP.

- CSA N288.4:19 (CSA, 2019) recommends that environmental monitoring focus on those radionuclides that contribute significantly to dose. Specially, radionuclides that make up at least 70% of the dose should be considered significant, and for a given radionuclide a medium that contributes 10% or more to dose is considered significant. As identified in **Section 3.2.6** and **Section 4.2.6**, depending on the receptor C-14, I-131, and Xe-138 are the major contributors to human dose, and C-14 and Xe-138 are the major contributors to ecological dose. C-14 is already part of OPG's existing EMP at the DN Site, and I-131 is modelled due to monitoring limitations. OPG currently uses noble gas detectors to measure noble gases released from DNGS including Ar-41, Xe-133, Xe-135. Considering that Xe-138 is a major contributor to total dose at DNNP for human and ecological receptors, Xe-138 should be considered for inclusion as part of a EMP design review .

- Based on the modelling conducted in this PERA, C-14 (in milk and plants) and I-131 (in milk) are significant contributors to total human dose. C-14 is already included in OPG's

EMP and I-131 is currently modelled from emissions; therefore, no changes are recommended to account for these radionuclides.

Supplementary environmental monitoring is also ongoing as part of the Environmental Monitoring and Environmental Assessment Follow-Up (EMEAF) Plan (OPG, 2023h) to meet OPG's follow-up monitoring commitments made during the DNNP EA process. Additional monitoring data collected through the EMEAF Program, will be used to update the PERA during routine updates, as per CSA N288.6:22. At this time, based on the outcome of the PERA there are no recommended changes to the EMEAF Program. The EMEAF Program identifies potential updates to the PERA during each Project phase, and on a five-year review cycle. This is appropriate and consistent with CSA N288.6:22. EMEAF monitoring data from other environmental disciplines will be used to support future PERA updates and any changes identified to those programs will be identified through the adaptive management process for those disciplines.

8.2.3 Human Receptors to Support Dose Assessment

A new human receptor, the Harvester, was added to the DNNP PERA. The Harvester aims to better represent the lifestyle characteristics of an Indigenous person who may work and/or live near the DN site and also harvests traditional foods in the local area. This new receptor is assumed to hunt, fish and consume traditional foods in a greater proportion compared to the other receptors characterized in OPG's existing EMPs and ERAs. The characteristics of the Harvester were developed using publicly available information; however, it is expected that this receptor will be further refined as more site-specific information is gathered through surveys/studies and ongoing engagement activities with local Indigenous Nations and communities. Any updates to the characteristics of the Harvester will be reflected in future PERAs and ERAs, as appropriate.

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Appendix A Tables of Exposure Factors Used for Human Health Risk Assessment

Table A-1: Bioaccumulation Factors for Human Food Items

COPC	BAF [a, b] (L/kg fw)		Soil-to-Plant BAFs [a,b] kg(dw soil)/kg(dw plant)		
	Aquatic Animals		Terrestrial Plants		
	Freshwater Fish	Walleye	Fruits	Garden Vegetables	Potatoes
Ba-137md [c, d]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ba-140	9.30E-01	9.30E-01	2.80E-02	2.80E-02	2.80E-02
C-14	5.70E+03	5.70E+03	0.00E+00	0.00E+00	0.00E+00
Co-58	5.40E+01	5.40E+01	4.70E-02	4.70E-02	4.70E-02
Co-60	5.40E+01	5.40E+01	4.70E-02	4.70E-02	4.70E-02
Cs-134	3.50E+03	3.50E+03	5.30E-02	5.30E-02	5.30E-02
Cs-136	3.50E+03	3.50E+03	5.30E-02	5.30E-02	5.30E-02
Cs-137	3.50E+03	3.50E+03	5.30E-02	5.30E-02	5.30E-02
Cs-138d [d]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cu-64	2.70E+02	2.70E+02	8.00E-02	8.00E-02	8.00E-02
Fe-59	2.40E+02	2.40E+02	5.00E-03	5.00E-03	5.00E-03
HTO [e]	7.50E-01	7.50E-01	0.00E+00	0.00E+00	0.00E+00
I-131	6.00E+00	6.00E+00	5.00E-02	5.00E-02	5.00E-02
I-132	0.00E+00	0.00E+00	5.00E-02	5.00E-02	5.00E-02
I-133	6.00E+00	6.00E+00	5.00E-02	5.00E-02	5.00E-02
I-134	0.00E+00	0.00E+00	5.00E-02	5.00E-02	5.00E-02
I-135	6.00E+00	6.00E+00	5.00E-02	5.00E-02	5.00E-02
La-140d [d]	1.50E+01	1.50E+01	1.00E-02	1.00E-02	1.00E-02
Mn-54	2.40E+02	2.40E+02	3.50E-01	3.50E-01	3.50E-01
Na-24	8.40E+01	8.40E+01	1.20E-01	1.20E-01	1.20E-01
OBT [f]	1.40E-01	1.40E-01	0.00E+00	0.00E+00	0.00E+00
Rb-88d [d]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sr-91	2.00E+00	2.00E+00	8.70E-01	8.70E-01	8.70E-01
Y-91	2.00E+01	2.00E+01	2.20E-02	2.20E-02	2.20E-02
Zn-65	5.00E+03	5.00E+03	1.30E+00	1.30E+00	1.30E+00
Zn-69m [c]	5.00E+03	5.00E+03	1.30E+00	1.30E+00	1.30E+00

Notes:
[a] BAFs are taken from CSA N288.1-20, Table A.25a, except for Cu-64 BAFs for aquatic animals and terrestrial plants are from IAEA TRS 472 (2010).
[b] BAFs presented as zero in this table indicates those radionuclides do not bioaccumulate (e.g., due to short half-lives).
[c] The "m" after the radionuclide (e.g., Ba-137md and Zn-69m) means the radionuclide is metastable.
[d] The "d" after the radionuclide indicates the radionuclide is a daughter product. For instance, Ba-137md is the daughter product of Cs-137; Cs-138d is the daughter product of Xe-138; La-140d is the daughter product of Ba-140; Rb-88d is the daughter product of Kr-88.
[e] HTO = tritium oxide; OBT = organically bound tritium.
fw = fresh weight; dw = dry weight; COPC = constituent of potential concern, which includes radionuclides which are selected for the sensitivity analysis scenario.

Table A-2: Ingestion Transfer Factors (d/kg fw) for Human Food Items – Mammals

COPC	Beef(meat) [a]	Cow(milk) [a]	Deer [a]	Deer Organ [b]	Lamb [a]	Pig [a]	Rabbit [a]
Ba-137md	0.00E+00 [d]	0.00E+00	0.00E+00	2.27E-03	0.00E+00	0.00E+00	0.00E+00
Ba-140	1.40E-04	1.60E-04	3.70E-04	2.27E-03	2.50E-04	1.00E-04	5.30E-03
C-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-58	4.30E-04	1.10E-04	1.20E-02	4.53E-01	1.20E-02	4.10E-02	1.80E-01
Co-60	4.30E-04	1.10E-04	1.20E-02	4.53E-01	1.20E-02	4.10E-02	1.80E-01
Cs-134	2.20E-02	4.60E-03	1.50E-01	1.36E-01	1.90E-01	2.00E-01	1.10E+02
Cs-136	2.20E-02	4.60E-03	1.50E-01	1.36E-01	1.90E-01	2.00E-01	1.10E+02
Cs-137	2.20E-02	4.60E-03	1.50E-01	1.36E-01	1.90E-01	2.00E-01	1.10E+02
Cs-138d	0.00E+00	0.00E+00	0.00E+00	1.36E-01	0.00E+00	0.00E+00	0.00E+00
Cu-64	1.00E-02	2.00E-03	4.53E-02	1.81E+00	6.45E-02	3.57E-02	7.80E-01
Fe-59	1.40E-02	3.50E-05	2.70E-02	1.81E+01	2.70E-02	3.00E-03	3.90E-01
HTO	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I-131	6.70E-03	5.40E-03	3.20E-02	9.06E-03	3.00E-02	4.10E-02	4.60E-01
I-132	0.00E+00	0.00E+00	0.00E+00	9.06E-03	0.00E+00	0.00E+00	0.00E+00
I-133	6.70E-03	5.40E-03	3.20E-02	9.06E-03	3.00E-02	4.10E-02	4.60E-01
I-134	0.00E+00	0.00E+00	0.00E+00	9.06E-03	0.00E+00	0.00E+00	0.00E+00
I-135	6.70E-03	5.40E-03	3.20E-02	9.06E-03	3.00E-02	4.10E-02	4.60E-01
La-140d	1.30E-04	3.50E-05	2.00E-02	9.06E-01	5.00E-02	1.00E-03	2.90E-01
Mn-54	6.00E-04	4.10E-05	6.90E-03	9.06E-01	9.00E-03	5.30E-03	9.80E-02
Na-24	1.50E-02	1.30E-02	2.90E-01	3.04E+00	1.10E-01	1.90E-01	4.20E+00
OBT	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Rb-88d	0.00E+00	0.00E+00	0.00E+00	4.53E-02	0.00E+00	0.00E+00	0.00E+00
Sr-91	1.30E-03	1.30E-03	4.00E-02	1.36E-03	1.50E-03	2.50E-03	1.90E-01
Y-91	1.20E-03	2.90E-05	5.60E-03	4.53E-02	1.00E-02	2.00E-04	7.90E-02
Zn-65	1.60E-01	2.70E-03	1.70E-01	9.06E-03	4.50E-02	1.70E-01	2.40E+00
Zn-69m	1.60E-01	2.70E-03	1.70E-01	9.06E-03	4.50E-02	1.70E-01	2.40E+00

Notes:

[a] Ingestion TFs from forage to tissue for agricultural livestock as well as deer and rabbit are taken in CSA N288.1:20, Table G.3.
[b] An allometric equation (transfer proportional to a -3/4 power of body weight) was applied to transfer factors available for beef liver to estimate the transfer factor for the deer organ.
[c] For Cu-64 which is not listed in CSA N288.1 Table G.3, the ingestion TF was taken from the National Council on Radiation Protection and Measurements (NCRP) Report No. 123, Table 5.2 (1996).
[d] BAFs presented as zero in this table indicates those radionuclides do not bioaccumulate (e.g., due to short half-lives).
fw = fresh weight; COPC = constituent of potential concern, which includes radionuclides which are selected for the sensitivity analysis scenario.

Table A-3: Ingestion Transfer Factors (d/kg fw) for Human Food Items – Birds and Honeybee

COPC	Canada Goose [a]	Poultry(egg) [b]	Poultry(meat) [c]	Honeybee [d]
Ba-137md	1.20E-02	0.00E+00	0.00E+00	0.00E+00
Ba-140	1.20E-02	8.70E-01	1.90E-02	1.00E-01
C-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-58	6.12E-01	3.30E-02	9.70E-01	1.00E-01
Co-60	6.12E-01	3.30E-02	9.70E-01	1.00E-01
Cs-134	1.70E+00	4.00E-01	2.70E+00	5.70E-02
Cs-136	1.70E+00	4.00E-01	2.70E+00	5.70E-02
Cs-137	1.70E+00	4.00E-01	2.70E+00	5.70E-02
Cs-138d	1.70E+00	0.00E+00	0.00E+00	0.00E+00
Cu-64	3.91E-01	7.44E-01	6.20E-01	1.00E-01
Fe-59	8.83E-01	1.80E+00	1.40E+00	1.00E-01
HTO	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I-131	5.49E-03	2.40E+00	8.70E-03	1.60E+00
I-132	5.49E-03	0.00E+00	0.00E+00	0.00E+00
I-133	5.49E-03	2.40E+00	8.70E-03	1.60E+00
I-134	5.49E-03	0.00E+00	0.00E+00	0.00E+00
I-135	5.49E-03	2.40E+00	8.70E-03	1.60E+00
La-140d	6.30E-02	9.00E-03	1.00E-01	1.00E-01
Mn-54	1.20E-03	4.20E-02	1.90E-03	1.00E-01
Na-24	4.41E+00	4.00E+00	7.00E+00	1.00E+00
OBT	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Rb-88d	6.93E-01	0.00E+00	0.00E+00	0.00E+00
Sr-91	1.26E-02	3.50E-01	2.00E-02	1.00E-01
Y-91	8.20E-03	3.90E-03	1.30E-02	1.00E-01
Zn-65	2.96E-01	1.40E+00	4.70E-01	1.00E-01
Zn-69m	2.96E-01	1.40E+00	4.70E-01	1.00E-01

Notes:
[a] An allometric equation (transfer proportional to a -3/4 power of body weight) was applied to transfer factors available for poultry to estimate the transfer factor for Canada goose.
[b] Ingestion TFs for poultry (egg) and poultry (meet) are taken from CSA N288.1:20, Table G.3.
[c] For Cu-64 which is not listed in CSA N288.1-20, the ingestion TF for poultry (meat) was calculate from TF_{beef} using poultry/beef ratio of 62, as suggested in Table G14 of COG DRL Guidance (COG, 2013). TF_{beef} was taken from NCRP No. 123, Table 5.2 (1996). The ingestion TF for poultry (egg) was calculate from $TF_{poultry}$ using egg/poultry ratio of 1.2, as suggested in Table G14 of COG DRL Guidance (COG, 2013).
[d] Ingestion TFs for honeybee are taken from CSA N288.1:20, cl.6.10.5.2.
BAFs presented as zero in this table indicates those radionuclides do not bioaccumulate (e.g., due to short half-lives).
fw = fresh weight; COPC = constituent of potential concern, which includes radionuclides which are selected for the sensitivity analysis scenario.

Table A-4: Inhalation Transfer Factors (d/kg fw) for Human Food Items – Mammals and Birds

COPC	Canada Goose	Poultry(egg)	Poultry(meat)	Beef(meat)	Cow(milk)	Deer	Deer Organ	Lamb	Pig	Rabbit
Ba-137md	1.33E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.52E-03	0.00E+00	0.00E+00	0.00E+00
Ba-140	1.33E-02	9.66E-01	2.11E-02	1.55E-04	1.78E-04	4.11E-04	2.52E-03	2.78E-04	1.11E-04	5.88E-03
C-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-58	1.05E+00	5.64E-02	1.66E+00	7.35E-04	1.88E-04	2.05E-02	7.75E-01	2.05E-02	7.01E-02	3.08E-01
Co-60	1.05E+00	5.64E-02	1.66E+00	7.35E-04	1.88E-04	2.05E-02	7.75E-01	2.05E-02	7.01E-02	3.08E-01
Cs-134	1.07E+00	2.52E-01	1.70E+00	1.39E-02	2.90E-03	9.45E-02	8.57E-02	1.20E-01	1.26E-01	6.93E+01
Cs-136	1.07E+00	2.52E-01	1.70E+00	1.39E-02	2.90E-03	9.45E-02	8.57E-02	1.20E-01	1.26E-01	6.93E+01
Cs-137	1.07E+00	2.52E-01	1.70E+00	1.39E-02	2.90E-03	9.45E-02	8.57E-02	1.20E-01	1.26E-01	6.93E+01
Cs-138d	1.07E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.57E-02	0.00E+00	0.00E+00	0.00E+00
Cu-64 [a]	4.34E-01	8.26E-01	6.88E-01	1.11E-02	2.22E-03	5.03E-02	5.28E+00	7.16E-02	3.96E-02	8.66E-01
Fe-59	1.51E+00	3.08E+00	2.39E+00	2.39E-02	5.99E-05	4.62E-02	3.10E+01	4.62E-02	5.13E-03	6.67E-01
HTO	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I-131	3.46E-03	1.51E+00	5.48E-03	4.22E-03	3.40E-03	2.02E-02	5.71E-03	1.89E-02	2.58E-02	2.90E-01
I-132	3.46E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.71E-03	0.00E+00	0.00E+00	0.00E+00
I-133	3.46E-03	1.51E+00	5.48E-03	4.22E-03	3.40E-03	2.02E-02	5.71E-03	1.89E-02	2.58E-02	2.90E-01
I-134	3.46E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.71E-03	0.00E+00	0.00E+00	0.00E+00
I-135	3.46E-03	1.51E+00	5.48E-03	4.22E-03	3.40E-03	2.02E-02	5.71E-03	1.89E-02	2.58E-02	2.90E-01
La-140d	6.05E+01	8.64E+00	9.60E+01	1.25E-01	3.36E-02	1.92E+01	8.70E+02	4.80E+01	9.60E-01	2.78E+02
Mn-54	5.93E-03	2.08E-01	9.41E-03	2.97E-03	2.03E-04	3.42E-02	4.49E+00	4.46E-02	2.62E-02	4.85E-01
Na-24	2.78E+00	2.52E+00	4.41E+00	9.45E-03	8.19E-03	1.83E-01	1.91E+00	6.93E-02	1.20E-01	2.65E+00
OBT	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Rb-88d	4.37E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.86E-02	0.00E+00	0.00E+00	0.00E+00
Sr-91	1.15E-02	3.19E-01	1.82E-02	1.18E-03	1.18E-03	3.64E-02	1.24E-03	1.37E-03	2.28E-03	1.73E-01
Y-91	9.84E+00	4.68E+00	1.56E+01	1.44E+00	3.48E-02	6.73E+00	5.44E+01	1.20E+01	2.40E-01	9.49E+01
Zn-65	2.22E-01	1.05E+00	3.53E-01	1.20E-01	2.03E-03	1.28E-01	6.80E-03	3.38E-02	1.28E-01	1.80E+00
Zn-69m	2.22E-01	1.05E+00	3.53E-01	1.20E-01	2.03E-03	1.28E-01	6.80E-03	3.38E-02	1.28E-01	1.80E+00

Notes: (see next page)

Table A-4 Notes: Inhalation TFs were calculated from the ingestion TF, by adjusting the ingestion TF by a COPC-specific inhalation/ingestion ratio (II) from CSA N288.1:20, Table G.8.
[a] For Cu-64 which is not listed in CSA N288.1 Table G.8, the inhalation/ingestion ratio (II) was calculated from II = fa / f1, where f1 was taken from ICRP 72 Table A.1 (1995); fa was calculated as per the CANDU Owners Group DRL Guidance (COG, 2013), section G7.
BAFs presented as zero in this table indicates those radionuclides do not bioaccumulate (e.g., due to short half-lives).
fw = fresh weight; COPC = constituent of potential concern, which includes radionuclides which are selected for the sensitivity analysis scenario.

Table A-5: Dose Coefficients for Human Receptors

COPC	Ingestion	Inhalation	External Air	External Soil	External Water	External Sediment
	DCFf	DCFi	DCFa	DCFg	DCFw	DCFs
	(Sv/Bq)	(Sv/Bq)	(Sv/yr)/ (Bq/m^3)	(Sv/yr)/ (Bq/m^2)	(Sv/yr)/ (Bq/L)	(Sv/yr)/ (Bq/kg) (dw)
	Adult					
Ba-137md	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ba-140	2.60E-09	5.10E-09	2.55E-07	8.44E-08	5.49E-07	2.44E-06
C-14	5.80E-10	1.20E-11	8.21E-11	4.01E-13	9.09E-11	2.78E-12
Co-58	7.40E-10	1.60E-09	1.40E-06	2.92E-08	3.04E-06	8.48E-07
Co-60	3.40E-09	1.00E-08	3.76E-06	7.26E-08	8.11E-06	2.16E-06
Cs-134	1.90E-08	6.60E-09	2.23E-06	4.67E-08	4.83E-06	1.36E-06
Cs-136	3.00E-09	1.20E-09	3.14E-06	6.41E-08	6.82E-06	1.87E-06
Cs-137	1.30E-08	4.60E-09	8.09E-07	1.75E-08	1.75E-06	4.94E-07
Cs-138d	9.20E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cu-64 [a,b]	1.20E-10	1.20E-10	2.87E-07	5.90E-09	6.24E-07	1.76E-07
Fe-59	1.80E-09	3.70E-09	1.77E-06	3.47E-08	3.85E-06	1.03E-06
HTO	2.00E-11	3.00E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I-131	2.20E-08	2.00E-08	5.33E-07	1.15E-08	1.16E-06	3.31E-07
I-132	2.90E-10	3.10E-10	3.31E-06	6.94E-08	7.16E-06	1.99E-06
I-133	4.30E-09	4.00E-09	8.71E-07	1.95E-08	1.88E-06	5.30E-07
I-134	1.10E-10	1.50E-10	3.85E-06	7.98E-08	8.33E-06	2.28E-06
I-135	9.30E-10	9.20E-10	2.38E-06	4.64E-08	5.14E-06	1.35E-06
Kr-85	0.00E+00	0.00E+00	8.05E-09	0.00E+00	0.00E+00	0.00E+00
Kr-85m	0.00E+00	0.00E+00	2.16E-07	0.00E+00	0.00E+00	0.00E+00
Kr-87	0.00E+00	0.00E+00	1.24E-06	0.00E+00	0.00E+00	0.00E+00
Kr-88	0.00E+00	1.60E-11	4.24E-06	0.00E+00	0.00E+00	0.00E+00
La-140d	2.00E-09	1.10E-09	3.50E-06	0.00E+00	0.00E+00	0.00E+00
Mn-54	7.10E-10	1.50E-09	1.21E-06	2.50E-08	2.62E-06	7.27E-07
Na-24	4.30E-10	2.70E-10	6.56E-06	1.13E-07	1.42E-05	3.43E-06
OBT	4.60E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

COPC	Ingestion DCFf (Sv/Bq)	Inhalation DCFi (Sv/Bq)	External Air DCFa (Sv/yr)/ (Bq/m^3)	External Soil DCFg (Sv/yr)/ (Bq/m^2)	External Water DCFw (Sv/yr)/ (Bq/L)	External Sediment DCFs (Sv/yr)/ (Bq/kg) (dw)
Rb-88d	9.00E-11	0.00E+00	0.00E+00	2.34E-08	0.00E+00	0.00E+00
Sr-91 [a,b]	6.50E-10	3.70E-10	1.09E-06	2.14E-08	2.36E-06	6.36E-07
Xe-131md	0.00E+00	0.00E+00	1.17E-08	0.00E+00	0.00E+00	0.00E+00
Xe-133	0.00E+00	0.00E+00	4.39E-08	0.00E+00	0.00E+00	0.00E+00
Xe-133dd	0.00E+00	0.00E+00	4.39E-08	0.00E+00	0.00E+00	0.00E+00
Xe-133md	0.00E+00	0.00E+00	4.01E-08	0.00E+00	0.00E+00	0.00E+00
Xe-135	0.00E+00	0.00E+00	3.50E-07	0.00E+00	0.00E+00	0.00E+00
Xe-135d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Xe-135dd	0.00E+00	0.00E+00	3.50E-07	0.00E+00	0.00E+00	0.00E+00
Xe-135m	0.00E+00	0.00E+00	6.12E-07	0.00E+00	0.00E+00	0.00E+00
Xe-135md	0.00E+00	0.00E+00	5.84E-07	0.00E+00	0.00E+00	0.00E+00
Xe-138	0.00E+00	2.40E-11	5.38E-06	0.00E+00	0.00E+00	0.00E+00
Y-91	2.40E-09	8.90E-09	1.96E-08	2.35E-09	2.87E-08	6.67E-09
Zn-65	3.90E-09	1.60E-09	8.58E-07	1.71E-08	1.86E-06	5.03E-07
Zn-69m [a,b]	3.30E-10	2.40E-10	6.28E-07	1.30E-08	1.37E-06	3.87E-07
COPC	**10-year old**					
Ba-137md	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ba-140	5.80E-09	7.60E-09	2.55E-07	8.44E-08	5.49E-07	2.44E-06
C-14	8.00E-10	1.80E-11	8.21E-11	4.01E-13	9.09E-11	2.78E-12
Co-58	1.70E-09	2.40E-09	1.40E-06	2.92E-08	3.04E-06	8.48E-07
Co-60	1.10E-08	1.50E-08	3.76E-06	7.26E-08	8.11E-06	2.16E-06
Cs-134	1.40E-08	5.30E-09	2.23E-06	4.67E-08	4.83E-06	1.36E-06
Cs-136	4.40E-09	2.00E-09	3.14E-06	6.41E-08	6.82E-06	1.87E-06
Cs-137	1.00E-08	3.70E-09	8.09E-07	1.75E-08	1.75E-06	4.94E-07
Cs-138d	1.70E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cu-64 [a,b]	2.50E-10	2.00E-10	2.87E-07	5.90E-09	6.24E-07	1.76E-07
Fe-59	4.70E-09	5.50E-09	1.77E-06	3.47E-08	3.85E-06	1.03E-06
HTO	2.50E-11	3.75E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00

COPC	Ingestion DCFf (Sv/Bq)	Inhalation DCFi (Sv/Bq)	External Air DCFa (Sv/yr)/ (Bq/m³)	External Soil DCFg (Sv/yr)/ (Bq/m²)	External Water DCFw (Sv/yr)/ (Bq/L)	External Sediment DCFs (Sv/yr)/ (Bq/kg) (dw)
I-131	5.20E-08	4.80E-08	5.33E-07	1.15E-08	1.16E-06	3.31E-07
I-132	6.20E-10	6.40E-10	3.31E-06	6.94E-08	7.16E-06	1.99E-06
I-133	1.00E-08	9.70E-09	8.71E-07	1.95E-08	1.88E-06	5.30E-07
I-134	2.10E-10	2.20E-10	3.85E-06	7.98E-08	8.33E-06	2.28E-06
I-135	2.20E-09	2.10E-09	2.38E-06	4.64E-08	5.14E-06	1.35E-06
Kr-85	0.00E+00	0.00E+00	8.05E-09	0.00E+00	0.00E+00	0.00E+00
Kr-85m	0.00E+00	0.00E+00	2.16E-07	0.00E+00	0.00E+00	0.00E+00
Kr-87	0.00E+00	0.00E+00	1.24E-06	0.00E+00	0.00E+00	0.00E+00
Kr-88	0.00E+00	3.20E-11	4.24E-06	0.00E+00	0.00E+00	0.00E+00
La-140d	4.20E-09	2.00E-09	3.50E-06	0.00E+00	0.00E+00	0.00E+00
Mn-54	1.30E-09	2.40E-09	1.21E-06	2.50E-08	2.62E-06	7.27E-07
Na-24	7.70E-10	5.70E-10	6.56E-06	1.13E-07	1.42E-05	3.43E-06
OBT	6.30E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Rb-88d	1.70E-10	0.00E+00	0.00E+00	2.34E-08	0.00E+00	0.00E+00
Sr-91 [a,b]	1.20E-09	6.90E-10	1.09E-06	2.14E-08	2.36E-06	6.36E-07
Xe-131md	0.00E+00	0.00E+00	1.17E-08	0.00E+00	0.00E+00	0.00E+00
Xe-133	0.00E+00	0.00E+00	4.39E-08	0.00E+00	0.00E+00	0.00E+00
Xe-133dd	0.00E+00	0.00E+00	4.39E-08	0.00E+00	0.00E+00	0.00E+00
Xe-133md	0.00E+00	0.00E+00	4.01E-08	0.00E+00	0.00E+00	0.00E+00
Xe-135	0.00E+00	0.00E+00	3.50E-07	0.00E+00	0.00E+00	0.00E+00
Xe-135d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Xe-135dd	0.00E+00	0.00E+00	3.50E-07	0.00E+00	0.00E+00	0.00E+00
Xe-135m	0.00E+00	0.00E+00	6.12E-07	0.00E+00	0.00E+00	0.00E+00
Xe-135md	0.00E+00	0.00E+00	5.84E-07	0.00E+00	0.00E+00	0.00E+00
Xe-138	0.00E+00	5.00E-11	5.38E-06	0.00E+00	0.00E+00	0.00E+00
Y-91	5.20E-09	1.30E-08	1.96E-08	2.35E-09	2.87E-08	6.67E-09
Zn-65	6.40E-09	2.40E-09	8.58E-07	1.71E-08	1.86E-06	5.03E-07
Zn-69m [a,b]	7.00E-10	5.00E-10	6.28E-07	1.30E-08	1.37E-06	3.87E-07

COPC	Ingestion DCFf (Sv/Bq)	Inhalation DCFi (Sv/Bq)	External Air DCFa (Sv/yr)/ (Bq/m^3)	External Soil DCFg (Sv/yr)/ (Bq/m^2)	External Water DCFw (Sv/yr)/ (Bq/L)	External Sediment DCFs (Sv/yr)/ (Bq/kg) (dw)
COPC	**1-year old**					
Ba-137md	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ba-140	1.80E-08	2.00E-08	3.32E-07	1.10E-07	7.14E-07	3.17E-06
C-14	1.60E-09	3.80E-11	8.21E-11	4.01E-13	9.09E-11	2.78E-12
Co-58	4.40E-09	6.50E-09	1.82E-06	3.80E-08	3.95E-06	1.10E-06
Co-60	2.70E-08	3.40E-08	4.89E-06	9.44E-08	1.05E-05	2.81E-06
Cs-134	1.60E-08	7.30E-09	2.90E-06	6.07E-08	6.28E-06	1.77E-06
Cs-136	9.50E-09	5.20E-09	4.08E-06	8.33E-08	8.87E-06	2.43E-06
Cs-137	1.20E-08	5.40E-09	1.05E-06	2.28E-08	2.28E-06	6.42E-07
Cs-138d	5.90E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cu-64 [a,b]	8.30E-10	5.70E-10	3.73E-07	7.67E-09	8.12E-07	2.28E-07
Fe-59	1.30E-08	1.30E-08	2.30E-06	4.51E-08	5.01E-06	1.34E-06
HTO	5.30E-11	8.00E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I-131	1.80E-07	1.60E-07	6.93E-07	1.50E-08	1.51E-06	4.30E-07
I-132	2.40E-09	2.30E-09	4.30E-06	9.02E-08	9.31E-06	2.59E-06
I-133	4.40E-08	4.10E-08	1.13E-06	2.54E-08	2.44E-06	6.89E-07
I-134	7.50E-10	6.90E-10	5.01E-06	1.04E-07	1.08E-05	2.96E-06
I-135	8.90E-09	8.50E-09	3.09E-06	6.03E-08	6.68E-06	1.76E-06
Kr-85	0.00E+00	0.00E+00	1.05E-08	0.00E+00	0.00E+00	0.00E+00
Kr-85m	0.00E+00	0.00E+00	2.81E-07	0.00E+00	0.00E+00	0.00E+00
Kr-87	0.00E+00	0.00E+00	1.61E-06	0.00E+00	0.00E+00	0.00E+00
Kr-88	0.00E+00	1.20E-10	5.51E-06	0.00E+00	0.00E+00	0.00E+00
La-140d	1.30E-08	6.30E-09	4.55E-06	0.00E+00	0.00E+00	0.00E+00
Mn-54	3.10E-09	6.20E-09	1.57E-06	3.25E-08	3.41E-06	9.45E-07
Na-24	2.30E-09	1.80E-09	8.53E-06	1.47E-07	1.85E-05	4.46E-06
OBT	1.30E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Rb-88d	6.20E-10	0.00E+00	0.00E+00	3.04E-08	0.00E+00	0.00E+00
Sr-91 [a,b]	4.00E-09	2.20E-09	1.41E-06	2.78E-08	3.07E-06	8.26E-07

COPC	Ingestion	Inhalation	External Air	External Soil	External Water	External Sediment
	DCFf	DCFi	DCFa	DCFg	DCFw	DCFs
	(Sv/Bq)	(Sv/Bq)	(Sv/yr)/ (Bq/m^3)	(Sv/yr)/ (Bq/m^2)	(Sv/yr)/ (Bq/L)	(Sv/yr)/ (Bq/kg) (dw)
Xe-131md	0.00E+00	0.00E+00	1.52E-08	0.00E+00	0.00E+00	0.00E+00
Xe-133	0.00E+00	0.00E+00	5.71E-08	0.00E+00	0.00E+00	0.00E+00
Xe-133dd	0.00E+00	0.00E+00	5.71E-08	0.00E+00	0.00E+00	0.00E+00
Xe-133md	0.00E+00	0.00E+00	5.21E-08	0.00E+00	0.00E+00	0.00E+00
Xe-135	0.00E+00	0.00E+00	4.55E-07	0.00E+00	0.00E+00	0.00E+00
Xe-135d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Xe-135dd	0.00E+00	0.00E+00	4.55E-07	0.00E+00	0.00E+00	0.00E+00
Xe-135m	0.00E+00	0.00E+00	7.96E-07	0.00E+00	0.00E+00	0.00E+00
Xe-135md	0.00E+00	0.00E+00	7.59E-07	0.00E+00	0.00E+00	0.00E+00
Xe-138	0.00E+00	1.80E-10	6.99E-06	0.00E+00	0.00E+00	0.00E+00
Y-91	1.80E-08	3.40E-08	2.55E-08	3.06E-09	2.87E-08	8.67E-09
Zn-65	1.60E-08	6.50E-09	1.12E-06	2.22E-08	2.42E-06	6.54E-07
Zn-69m [a,b]	2.30E-09	1.50E-09	8.16E-07	1.69E-08	1.78E-06	5.02E-07

Notes:
All human DCF are taken from CSA N288.1:20, Table C1 to Table C6, except:
[a] DCFf and DCFi of Cu-64, Sr-91 and Zn-69m are from ICRP 72 (1995).
[b] External DCF including DCFa, DCFg, DCFw and DCFs of Cu-64, Sr-91 and Zn-69m are from U.S. EPA FGR No. 12 (1993b).
COPC = constituent of potential concern, which includes radionuclides which are selected for the sensitivity analysis scenario; DCF = dose coefficient; Sv/yr = sieverts per year; Bq = becquerel.

Appendix B Tables of Estimated Concentrations and Doses at Human Health Assessment Locations

Table B-1: Estimated Concentrations of Radionuclides in Environmental Media at Human Health Assessment Locations under an Air Release Scenario

Environmental Media	Location	Estimated Concentrations of Radionuclides													
		Ba-137md	C-14	Co-60	Cs-134	Cs-137	Cs-138d	HTO	I-131	I-132	I-133	I-134	I-135	Kr-85	Kr-85m
Outdoor Air (Bq/m^3)	Oshawa Resident	5.79E-09	2.44E-03	6.70E-08	4.02E-09	6.09E-09	1.97E-03	5.91E-03	3.15E-06	1.30E-05	1.40E-05	2.09E-05	2.46E-05	1.34E-02	1.71E-04
	Bowmanville Resident	8.44E-09	3.58E-03	9.83E-08	5.90E-09	8.94E-09	4.33E-03	8.67E-03	4.64E-06	2.35E-05	2.11E-05	5.08E-05	3.88E-05	1.97E-02	2.79E-04
	WEB Resident	3.42E-08	1.46E-02	4.02E-07	2.41E-08	3.66E-08	1.74E-02	3.55E-02	1.90E-05	9.94E-05	8.65E-05	2.27E-04	1.61E-04	8.05E-02	1.16E-03
	Farm	3.31E-08	1.43E-02	3.93E-07	2.36E-08	3.57E-08	1.69E-02	3.46E-02	1.85E-05	9.83E-05	8.46E-05	2.29E-04	1.58E-04	7.86E-02	1.14E-03
	Dairy Farm	4.67E-09	1.97E-03	5.41E-08	3.24E-09	4.92E-09	1.53E-03	4.77E-03	2.54E-06	1.04E-05	1.13E-05	1.62E-05	1.97E-05	1.08E-02	1.37E-04
	Rural Resident	1.65E-08	7.18E-03	1.97E-07	1.18E-08	1.80E-08	8.21E-03	1.74E-02	9.32E-06	5.05E-05	4.26E-05	1.22E-04	7.98E-05	3.95E-02	5.81E-04
	Sport Fisher	7.65E-08	3.53E-02	9.70E-07	5.82E-08	8.82E-08	3.30E-02	8.56E-02	4.58E-05	2.58E-04	2.10E-04	6.57E-04	3.97E-04	1.94E-01	2.91E-03
	Camper	1.44E-08	6.08E-03	1.67E-07	1.00E-08	1.52E-08	6.41E-03	1.47E-02	7.88E-06	3.66E-05	3.54E-05	7.02E-05	6.39E-05	3.34E-02	4.53E-04
	Industrial Commercial	2.85E-08	1.22E-02	3.35E-07	2.01E-08	3.05E-08	1.46E-02	2.96E-02	1.58E-05	8.19E-05	7.20E-05	1.84E-04	1.33E-04	6.71E-02	9.63E-04
Soil (Bq/kg(dw))	Oshawa Resident	2.56E-04	0.00E+00	8.11E-04	1.97E-05	2.69E-04	3.05E-04	0.00E+00	9.51E-05	4.70E-06	4.58E-05	2.88E-06	2.54E-05	0.00E+00	0.00E+00
	Bowmanville Resident	2.27E-04	0.00E+00	7.20E-04	1.75E-05	2.39E-04	4.06E-04	0.00E+00	1.37E-04	8.29E-06	6.74E-05	6.85E-06	3.93E-05	0.00E+00	0.00E+00
	WEB Resident	6.56E-04	0.00E+00	2.08E-03	5.06E-05	6.90E-04	1.15E-03	0.00E+00	5.56E-04	3.48E-05	2.74E-04	3.03E-05	1.61E-04	0.00E+00	0.00E+00
	Farm	1.48E-03	0.00E+00	4.68E-03	1.14E-04	1.55E-03	2.57E-03	0.00E+00	5.59E-04	3.54E-05	2.76E-04	3.14E-05	1.63E-04	0.00E+00	0.00E+00
	Dairy Farm	1.95E-04	0.00E+00	6.19E-04	1.51E-05	2.05E-04	2.24E-04	0.00E+00	7.65E-05	3.73E-06	3.68E-05	2.22E-06	2.04E-05	0.00E+00	0.00E+00
	Rural Resident	3.96E-04	0.00E+00	1.26E-03	3.06E-05	4.17E-04	6.70E-04	0.00E+00	2.74E-04	1.78E-05	1.36E-04	1.63E-05	8.06E-05	0.00E+00	0.00E+00
	Camper	6.30E-04	0.00E+00	2.00E-03	4.86E-05	6.63E-04	9.82E-04	0.00E+00	2.37E-04	1.32E-05	1.16E-04	9.64E-06	6.61E-05	0.00E+00	0.00E+00
	Industrial Commercial	1.21E-03	0.00E+00	3.84E-03	9.34E-05	1.27E-03	2.13E-03	0.00E+00	4.76E-04	2.94E-05	2.35E-04	2.52E-05	1.38E-04	0.00E+00	0.00E+00
Lake Water (Bq/L)	Outfall	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Beach	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	WSP(Osh)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	WSP(Bow)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Deep Well (Bq/L)	WEB Resident	1.04E-122	7.77E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.72E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Farm	3.44E-197	7.24E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.73E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Dairy Farm	1.94E-122	1.04E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Rural Resident	8.04E-104	3.86E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.81E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Shallow Well (Bq/L)	WEB Resident	1.91E-06	8.36E-05	3.25E-06	1.37E-07	1.87E-06	3.12E-06	1.61E+00	3.06E-05	1.92E-06	1.51E-05	1.67E-06	8.88E-06	0.00E+00	0.00E+00
	Farm	4.29E-06	8.16E-05	7.31E-06	3.08E-07	4.19E-06	6.95E-06	1.57E+00	3.08E-05	1.95E-06	1.52E-05	1.73E-06	8.97E-06	0.00E+00	0.00E+00
	Dairy Farm	5.67E-07	1.12E-05	9.66E-07	4.07E-08	5.55E-07	6.06E-07	2.17E-01	4.21E-06	2.05E-07	2.03E-06	1.22E-07	1.12E-06	0.00E+00	0.00E+00
	Rural Resident	1.15E-06	4.10E-05	1.96E-06	8.26E-08	1.13E-06	1.81E-06	7.92E-01	1.51E-05	9.79E-07	7.49E-06	8.99E-07	4.44E-06	0.00E+00	0.00E+00
Sediment (Bq/kg(dw))	Beach	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Environmental Media	Location	Estimated Point Concentrations of Radionuclides													
		Kr-87	Kr-88	OBT	Rb-88d	Xe-131md	Xe-133	Xe-133dd	Xe-133md	Xe-135	Xe-135d	Xe-135dd	Xe-135m	Xe-135md	Xe-138
Outdoor Air (Bq/m^3)	Oshawa Resident	3.80E-04	5.41E-04	0.00E+00	5.24E-04	9.69E-09	9.68E-03	9.18E-10	2.35E-07	7.20E-03	1.75E-04	2.25E-06	5.44E-04	3.74E-06	9.33E-04
	Bowmanville Resident	7.98E-04	9.37E-04	0.00E+00	6.69E-04	6.34E-09	1.43E-02	2.83E-10	1.56E-07	1.11E-02	2.12E-04	1.52E-06	2.88E-03	4.62E-06	5.24E-03
	WEB Resident	3.47E-03	3.94E-03	0.00E+00	2.45E-03	2.06E-08	5.84E-02	7.57E-10	5.08E-07	4.60E-02	7.78E-04	4.93E-06	1.53E-02	1.70E-05	2.84E-02
	Farm	3.46E-03	3.89E-03	0.00E+00	2.29E-03	1.81E-08	5.70E-02	5.90E-10	4.47E-07	4.50E-02	7.25E-04	4.33E-06	1.63E-02	1.58E-05	3.04E-02
	Dairy Farm	2.98E-04	4.31E-04	0.00E+00	4.26E-04	8.11E-09	7.81E-03	7.82E-10	1.96E-07	5.79E-03	1.43E-04	1.88E-06	3.70E-04	3.05E-06	6.25E-04
	Rural Resident	1.81E-03	1.99E-03	0.00E+00	1.03E-03	7.34E-09	2.87E-02	1.89E-10	1.81E-07	2.28E-02	3.28E-04	1.75E-06	9.60E-03	7.17E-06	1.80E-02
	Sport Fisher	9.51E-03	1.01E-02	0.00E+00	3.71E-03	2.22E-08	1.41E-01	3.43E-10	5.51E-07	1.13E-01	1.18E-03	5.26E-06	6.31E-02	2.59E-05	1.21E-01
	Camper	1.17E-03	1.49E-03	0.00E+00	1.26E-03	1.64E-08	2.42E-02	1.11E-09	4.00E-07	1.85E-02	4.06E-04	3.89E-06	2.93E-03	8.77E-06	5.22E-03
	Industrial Commercial	2.83E-03	3.26E-03	0.00E+00	2.13E-03	1.87E-08	4.87E-02	7.40E-10	4.61E-07	3.82E-02	6.74E-04	4.48E-06	1.18E-02	1.47E-05	2.17E-02
Soil (Bq/kg(dw))	Oshawa Resident	0.00E+00	0.00E+00	0.00E+00	4.34E-05	6.59E-05	0.00E+00	3.54E-05	4.23E-05	0.00E+00	0.00E+00	2.51E-05	0.00E+00	4.07E-06	0.00E+00
	Bowmanville Resident	0.00E+00	0.00E+00	0.00E+00	3.35E-05	9.49E-05	0.00E+00	5.20E-05	6.23E-05	0.00E+00	0.00E+00	3.87E-05	0.00E+00	6.28E-06	0.00E+00
	WEB Resident	0.00E+00	0.00E+00	0.00E+00	8.68E-05	3.85E-04	0.00E+00	2.12E-04	2.54E-04	0.00E+00	0.00E+00	1.59E-04	0.00E+00	2.58E-05	0.00E+00
	Farm	0.00E+00	0.00E+00	0.00E+00	1.86E-04	3.87E-04	0.00E+00	2.13E-04	2.55E-04	0.00E+00	0.00E+00	1.61E-04	0.00E+00	2.60E-05	0.00E+00
	Dairy Farm	0.00E+00	0.00E+00	0.00E+00	3.33E-05	5.30E-05	0.00E+00	2.84E-05	3.40E-05	0.00E+00	0.00E+00	2.01E-05	0.00E+00	3.25E-06	0.00E+00
	Rural Resident	0.00E+00	0.00E+00	0.00E+00	4.50E-05	1.90E-04	0.00E+00	1.05E-04	1.26E-04	0.00E+00	0.00E+00	7.94E-05	0.00E+00	1.29E-05	0.00E+00
	Camper	0.00E+00	0.00E+00	0.00E+00	1.03E-04	1.64E-04	0.00E+00	8.94E-05	1.07E-04	0.00E+00	0.00E+00	6.52E-05	0.00E+00	1.06E-05	0.00E+00
	Industrial Commercial	0.00E+00	0.00E+00	0.00E+00	1.67E-04	3.30E-04	0.00E+00	1.81E-04	2.17E-04	0.00E+00	0.00E+00	1.36E-04	0.00E+00	2.20E-05	0.00E+00
Lake Water (Bq/L)	Outfall	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Beach	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	WSP(Osh)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	WSP(Bow)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Deep Well (Bq/L)	WEB Resident	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.86E-148	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Farm	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.68E-242	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Dairy Farm	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.52E-148	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Rural Resident	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.62E-125	0.00E+00	1.04E-276	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Shallow Well (Bq/L)	WEB Resident	0.00E+00	0.00E+00	0.00E+00	4.82E-07	2.50E-03	0.00E+00	1.38E-03	1.65E-03	0.00E+00	0.00E+00	1.03E-03	0.00E+00	1.68E-04	0.00E+00
	Farm	0.00E+00	0.00E+00	0.00E+00	1.03E-06	2.52E-03	0.00E+00	1.39E-03	1.66E-03	0.00E+00	0.00E+00	1.04E-03	0.00E+00	1.69E-04	0.00E+00
	Dairy Farm	0.00E+00	0.00E+00	0.00E+00	1.85E-07	3.44E-04	0.00E+00	1.85E-04	2.21E-04	0.00E+00	0.00E+00	1.30E-04	0.00E+00	2.12E-05	0.00E+00
	Rural Resident	0.00E+00	0.00E+00	0.00E+00	2.50E-07	1.23E-03	0.00E+00	6.82E-04	8.16E-04	0.00E+00	0.00E+00	5.16E-04	0.00E+00	8.37E-05	0.00E+00
Sediment (Bq/kg(dw))	Beach	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table B-2: Estimated Concentrations of Radionuclides in Food Items for Human Receptors under an Air Release Scenario

Food Item	Location	Estimated Concentrations of Radionuclides in Food Items for Human Receptors (Bq/kg(fw))													
		Ba-137md	C-14	Co-60	Cs-134	Cs-137	Cs-138d	HTO	I-131	I-132	I-133	I-134	I-135	OBT	Rb-88d
Freshwater Fish	Outfall	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Walleye	Outfall	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Freshwater Fish	Beach	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Honey Bee	Apiary	0.00E+00	9.66E+00	5.51E-04	1.86E-05	2.95E-05	0.00E+00	2.43E+00	4.75E-01	0.00E+00	1.47E-01	0.00E+00	1.54E-02	2.38E-01	0.00E+00
Fruits	Oshawa Resident	1.45E-10	5.80E-01	2.42E-05	1.22E-05	2.01E-05	6.44E-03	3.33E-01	7.80E-04	4.93E-05	4.68E-04	3.03E-05	2.65E-04	1.45E-02	9.17E-04
Garden Vegetables	Oshawa Resident	1.45E-10	5.80E-01	2.42E-05	1.22E-05	2.01E-05	6.44E-03	3.33E-01	7.80E-04	4.93E-05	4.68E-04	3.03E-05	2.65E-04	1.45E-02	9.17E-04
Potatoes	Oshawa Resident	6.91E-11	1.22E+00	1.77E-05	5.97E-06	1.19E-05	3.07E-03	2.92E-01	3.72E-04	2.35E-05	2.23E-04	1.44E-05	1.26E-04	3.05E-02	4.37E-04
Fruits	Bowmanville Resident	1.64E-10	8.51E-01	2.66E-05	1.39E-05	2.26E-05	1.10E-02	4.82E-01	1.12E-03	8.65E-05	6.85E-04	7.16E-05	4.08E-04	2.10E-02	9.09E-04
Garden Vegetables	Bowmanville Resident	1.64E-10	8.51E-01	2.66E-05	1.39E-05	2.26E-05	1.10E-02	4.82E-01	1.12E-03	8.65E-05	6.85E-04	7.16E-05	4.08E-04	2.10E-02	9.09E-04
Potatoes	Bowmanville Resident	7.83E-11	1.79E+00	1.82E-05	6.76E-06	1.28E-05	5.25E-03	4.23E-01	5.33E-04	4.13E-05	3.27E-04	3.42E-05	1.94E-04	4.41E-02	4.33E-04
Fruits	WEB Resident	6.06E-10	3.48E+00	9.32E-05	4.96E-05	8.25E-05	3.87E-02	3.04E+00	4.52E-03	3.62E-04	2.78E-03	3.16E-04	1.67E-03	1.32E-01	2.91E-03
Garden Vegetables	WEB Resident	6.06E-10	3.48E+00	9.32E-05	4.96E-05	8.25E-05	3.87E-02	3.04E+00	4.52E-03	3.62E-04	2.78E-03	3.16E-04	1.67E-03	1.32E-01	2.91E-03
Potatoes	WEB Resident	2.89E-10	7.32E+00	6.03E-05	2.41E-05	4.52E-05	1.84E-02	2.66E+00	2.16E-03	1.73E-04	1.33E-03	1.51E-04	7.96E-04	2.78E-01	1.38E-03
Fruits	Farm	8.41E-10	3.40E+00	1.41E-04	7.11E-05	1.19E-04	5.47E-02	3.39E+00	4.58E-03	3.71E-04	2.82E-03	3.30E-04	1.70E-03	1.47E-01	3.97E-03
Garden Vegetables	Farm	8.41E-10	3.40E+00	1.41E-04	7.11E-05	1.19E-04	5.47E-02	3.39E+00	4.58E-03	3.71E-04	2.82E-03	3.30E-04	1.70E-03	1.47E-01	3.97E-03
Potatoes	Farm	4.01E-10	7.14E+00	1.03E-04	3.48E-05	7.00E-05	2.60E-02	2.97E+00	2.19E-03	1.77E-04	1.35E-03	1.58E-04	8.09E-04	3.10E-01	1.89E-03
Beef(meat)	Farm	0.00E+00	1.37E+01	7.39E-06	1.03E-04	2.24E-04	0.00E+00	9.10E-01	1.80E-03	0.00E+00	5.74E-04	0.00E+00	1.20E-04	5.42E-02	0.00E+00
Lamb	Farm	0.00E+00	1.87E+01	1.52E-04	2.03E-04	3.86E-04	0.00E+00	1.01E+00	1.69E-02	0.00E+00	5.29E-03	0.00E+00	6.03E-04	4.42E-02	0.00E+00
Pig	Farm	0.00E+00	1.96E+01	1.09E-04	2.15E-04	3.90E-04	0.00E+00	3.61E-01	2.60E-03	0.00E+00	8.33E-04	0.00E+00	1.78E-04	9.11E-02	0.00E+00
Poultry(egg)	Farm	0.00E+00	1.07E-01	8.46E-07	3.82E-07	3.53E-06	0.00E+00	3.55E-01	7.99E-05	0.00E+00	1.10E-04	0.00E+00	1.72E-04	3.10E-02	0.00E+00
Poultry(meat)	Farm	0.00E+00	1.66E-01	2.49E-05	2.58E-06	2.38E-05	0.00E+00	3.55E-01	2.90E-07	0.00E+00	3.99E-07	0.00E+00	6.23E-07	3.91E-02	0.00E+00
Fruits	Dairy Farm	1.13E-10	4.68E-01	1.88E-05	9.52E-06	1.57E-05	4.86E-03	3.57E-01	6.27E-04	3.91E-05	3.76E-04	2.33E-05	2.12E-04	1.56E-02	7.22E-04
Garden Vegetables	Dairy Farm	1.13E-10	4.68E-01	1.88E-05	9.52E-06	1.57E-05	4.86E-03	3.57E-01	6.27E-04	3.91E-05	3.76E-04	2.33E-05	2.12E-04	1.56E-02	7.22E-04
Potatoes	Dairy Farm	5.40E-11	9.83E-01	1.37E-05	4.67E-06	9.23E-06	2.31E-03	3.14E-01	2.99E-04	1.86E-05	1.79E-04	1.11E-05	1.01E-04	3.27E-02	3.44E-04
Beef(meat)	Dairy Farm	0.00E+00	1.67E+00	6.52E-06	2.52E-05	4.69E-05	0.00E+00	1.19E-01	4.73E-03	0.00E+00	1.44E-03	0.00E+00	1.52E-04	7.53E-03	0.00E+00
Cow(milk)	Dairy Farm	0.00E+00	5.42E-01	2.51E-06	7.91E-06	1.48E-05	0.00E+00	1.49E-01	5.72E-03	0.00E+00	1.74E-03	0.00E+00	1.81E-04	2.37E-03	0.00E+00
Poultry(egg)	Dairy Farm	0.00E+00	0.00E+00	1.06E-07	3.14E-08	4.20E-07	0.00E+00	5.74E-02	3.79E-06	0.00E+00	1.25E-05	0.00E+00	2.12E-05	4.99E-03	0.00E+00
Poultry(meat)	Dairy Farm	0.00E+00	0.00E+00	3.12E-06	2.12E-07	2.83E-06	0.00E+00	5.74E-02	1.38E-08	0.00E+00	4.53E-08	0.00E+00	7.68E-08	6.31E-03	0.00E+00

Fruits	Rural Resident	3.08E-10	1.71E+00	5.00E-05	2.63E-05	4.30E-05	1.97E-02	1.41E+00	2.24E-03	1.85E-04	1.38E-03	1.71E-04	8.35E-04	6.15E-02	1.32E-03
Garden Vegetables	Rural Resident	3.08E-10	1.71E+00	5.00E-05	2.63E-05	4.30E-05	1.97E-02	1.41E+00	2.24E-03	1.85E-04	1.38E-03	1.71E-04	8.35E-04	6.15E-02	1.32E-03
Potatoes	Rural Resident	1.47E-10	3.59E+00	3.34E-05	1.28E-05	2.41E-05	9.39E-03	1.24E+00	1.07E-03	8.84E-05	6.58E-04	8.14E-05	3.98E-04	1.29E-01	6.31E-04
Poultry(egg)	Rural Resident	0.00E+00	0.00E+00	2.35E-07	7.27E-08	9.67E-07	0.00E+00	4.57E-01	2.23E-05	0.00E+00	5.13E-05	0.00E+00	8.81E-05	3.98E-02	0.00E+00
Canada Goose	Harvester	1.10E-09	1.66E+01	1.81E-03	2.99E-04	4.76E-04	1.99E-02	1.51E+00	8.11E-04	4.27E-07	2.54E-04	8.70E-07	2.77E-05	1.05E-01	1.10E-03
Deer	Harvester	0.00E+00	1.37E+01	6.38E-04	4.71E-04	7.57E-04	0.00E+00	1.62E+00	8.45E-02	0.00E+00	2.64E-02	0.00E+00	2.88E-03	1.32E-01	0.00E+00
Deer Organ	Harvester	1.23E-07	1.37E+01	2.41E-02	4.27E-04	6.86E-04	2.61E-02	1.62E+00	2.39E-02	1.17E-05	7.49E-03	2.36E-05	8.16E-04	1.32E-01	1.18E-03
Mallard	Harvester	0.00E+00	3.98E+01	2.34E-04	5.44E-05	8.65E-05	0.00E+00	2.03E+00	4.48E-06	0.00E+00	2.68E-06	0.00E+00	2.01E-06	5.93E-02	0.00E+00
Rabbit	Harvester	0.00E+00	1.37E+01	4.34E-04	1.54E-02	2.71E-02	0.00E+00	1.71E+00	5.34E-02	0.00E+00	1.67E-02	0.00E+00	1.83E-03	1.50E-01	0.00E+00

Note:
The estimated concentrations of noble gases in the tissue of ecological receptors are zero, which are not shown in this table.

Table B-3: Estimated Radiation Doses by Pathways for Human Receptors under an Air Release Scenario

Human Receptor	COPC	Radiological Dose by Pathway (mSv/a)												
		Air (internal)	Air (external)	Water (internal)	Water (external)	Soil (internal)	Soil (external)	Sediment (internal)	Sediment (external)	Aquatic plants	Aquatic animals	Terrestrial plants	Terrestrial animals	Total by COPC
Oshawa Resident Adult +worker	C-14	1.80E-07	2.07E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.69E-04	2.49E-05	1.94E-04
	Co-60	4.13E-09	1.57E-10	0.00E+00	0.00E+00	1.54E-12	3.88E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.64E-08	4.15E-10	3.91E-06
	Cs-134	1.64E-10	5.58E-12	0.00E+00	0.00E+00	2.09E-13	6.07E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.73E-08	7.26E-09	1.35E-07
	Cs-137	1.73E-10	3.07E-12	0.00E+00	0.00E+00	1.95E-12	3.10E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.04E-08	1.01E-08	4.01E-07
	Cs-138d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.60E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.49E-07	0.00E+00	2.49E-07
	HTO	1.09E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.95E-06	4.52E-08	5.09E-06
	I-131	3.89E-07	1.05E-09	0.00E+00	0.00E+00	1.17E-12	7.21E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.99E-06	1.32E-07	5.59E-06
	I-132	2.52E-08	2.72E-08	0.00E+00	0.00E+00	7.72E-16	2.18E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.33E-09	0.00E+00	7.95E-08
	I-133	3.46E-07	7.61E-09	0.00E+00	0.00E+00	1.10E-13	5.90E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.01E-07	8.26E-09	1.02E-06
	I-134	2.00E-08	5.18E-08	0.00E+00	0.00E+00	1.83E-16	1.57E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-09	0.00E+00	8.93E-08
	I-135	1.40E-07	3.65E-08	0.00E+00	0.00E+00	1.33E-14	7.81E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.81E-08	3.66E-10	3.33E-07
	Kr-85	0.00E+00	6.71E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.71E-08
	Kr-85m	0.00E+00	2.31E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.31E-08
	Kr-87	0.00E+00	3.00E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.00E-07
	Kr-88	5.39E-08	1.44E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.49E-06
	OBT	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.81E-07	9.29E-09	5.90E-07
	Rb-88d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.16E-15	6.63E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.77E-08	0.00E+00	8.40E-08
	Xe-131md	0.00E+00	6.86E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.86E-14
	Xe-133	0.00E+00	2.64E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.64E-07
	Xe-133dd	0.00E+00	2.41E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.41E-14
	Xe-133md	0.00E+00	5.70E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.70E-12
	Xe-135	0.00E+00	1.57E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.57E-06
	Xe-135dd	0.00E+00	4.78E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.78E-10
	Xe-135m	0.00E+00	2.38E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.38E-07
	Xe-135md	0.00E+00	1.35E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.35E-09
	Xe-138	1.60E-07	3.63E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.79E-06
	Total by pathway	2.41E-06	7.66E-06	0.00E+00	0.00E+00	5.02E-12	4.56E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-04	2.52E-05	2.20E-04

Human Receptor	COPC	Radiological Dose by Pathway (mSv/a)											
		Air (internal)	Air (external)	Water (internal)	Water (external)	Soil (internal)	Soil (external)	Sediment (internal)	Sediment (external)	Aquatic plants	Aquatic animals	Terrestrial plants	Terrestrial animals	Total by COPC
Oshawa Resident Child-10y	C-14	2.48E-07	2.00E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.51E-04	1.85E-05	1.70E-04
	Co-60	5.69E-09	1.51E-10	0.00E+00	0.00E+00	6.62E-11	3.75E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.58E-08	7.48E-10	3.81E-06
	Cs-134	1.21E-10	5.38E-12	0.00E+00	0.00E+00	2.05E-12	5.87E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.25E-08	2.87E-09	9.42E-08
	Cs-137	1.28E-10	2.96E-12	0.00E+00	0.00E+00	2.00E-11	3.00E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.05E-08	4.18E-09	3.45E-07
	Cs-138d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.85E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.01E-07	0.00E+00	3.01E-07
	HTO	1.25E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.22E-06	3.14E-08	4.51E-06
	I-131	8.57E-07	1.01E-09	0.00E+00	0.00E+00	3.67E-11	6.96E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.73E-06	1.79E-07	8.84E-06
	I-132	4.72E-08	2.59E-08	0.00E+00	0.00E+00	2.16E-14	2.08E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.47E-09	0.00E+00	1.01E-07
	I-133	7.70E-07	7.33E-09	0.00E+00	0.00E+00	3.40E-12	5.69E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.15E-07	1.10E-08	1.76E-06
	I-134	2.61E-08	4.84E-08	0.00E+00	0.00E+00	4.49E-15	1.46E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.25E-09	0.00E+00	9.13E-08
	I-135	2.92E-07	3.51E-08	0.00E+00	0.00E+00	4.15E-13	7.51E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.21E-07	4.80E-10	5.24E-07
	Kr-85	0.00E+00	6.47E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.47E-08
	Kr-85m	0.00E+00	2.21E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.21E-08
	Kr-87	0.00E+00	2.83E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.83E-07
	Kr-88	9.80E-08	1.38E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.47E-06
	OBT	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.14E-07	6.98E-09	5.21E-07
	Rb-88d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.48E-14	6.46E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.19E-08	0.00E+00	8.66E-08
	Xe-131md	0.00E+00	6.80E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.80E-14
	Xe-133	0.00E+00	2.55E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.55E-07
	Xe-133dd	0.00E+00	2.42E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.42E-14
	Xe-133md	0.00E+00	5.64E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.64E-12
	Xe-135	0.00E+00	1.51E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.51E-06
	Xe-135dd	0.00E+00	4.73E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.73E-10
	Xe-135m	0.00E+00	2.00E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.00E-07
	Xe-135md	0.00E+00	1.31E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.31E-09
	Xe-138	2.64E-07	3.01E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.27E-06
	Total by pathway	3.86E-06	6.84E-06	0.00E+00	0.00E+00	1.29E-10	4.41E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.64E-04	1.87E-05	1.98E-04

Human Receptor	COPC	Radiological Dose by Pathway (mSv/a)												
		Air (internal)	Air (external)	Water (internal)	Water (external)	Soil (internal)	Soil (external)	Sediment (internal)	Sediment (external)	Aquatic plants	Aquatic animals	Terrestrial plants	Terrestrial animals	Total by COPC
Oshawa Resident Infant-1y	C-14	1.69E-07	2.00E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.34E-04	1.08E-05	1.45E-04
	Co-60	4.17E-09	1.97E-10	0.00E+00	0.00E+00	1.80E-10	4.87E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.58E-08	4.65E-10	4.94E-06
	Cs-134	5.37E-11	6.99E-12	0.00E+00	0.00E+00	2.60E-12	7.63E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.82E-08	9.28E-10	9.55E-08
	Cs-137	6.02E-11	3.84E-12	0.00E+00	0.00E+00	2.66E-11	3.91E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.36E-08	1.45E-09	4.16E-07
	Cs-138d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.48E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.14E-07	0.00E+00	5.14E-07
	HTO	8.65E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.24E-06	2.09E-08	4.13E-06
	I-131	9.23E-07	1.31E-09	0.00E+00	0.00E+00	1.41E-10	9.04E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.32E-05	1.59E-07	1.43E-05
	I-132	5.49E-08	3.37E-08	0.00E+00	0.00E+00	9.29E-14	2.70E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.42E-08	0.00E+00	1.30E-07
	I-133	1.05E-06	9.52E-09	0.00E+00	0.00E+00	1.66E-11	7.39E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.98E-06	1.25E-08	3.13E-06
	I-134	2.65E-08	6.29E-08	0.00E+00	0.00E+00	1.78E-14	1.90E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.95E-09	0.00E+00	1.12E-07
	I-135	3.82E-07	4.56E-08	0.00E+00	0.00E+00	1.86E-12	9.76E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.41E-07	5.32E-10	7.67E-07
	Kr-85	0.00E+00	8.44E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.44E-08
	Kr-85m	0.00E+00	2.88E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.88E-08
	Kr-87	0.00E+00	3.68E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.68E-07
	Kr-88	1.19E-07	1.79E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.91E-06
	OBT	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.71E-07	4.31E-09	4.76E-07
	Rb-88d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.22E-13	8.40E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.93E-08	0.00E+00	1.23E-07
	Xe-131md	0.00E+00	8.84E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.84E-14
	Xe-133	0.00E+00	3.31E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.31E-07
	Xe-133dd	0.00E+00	3.14E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.14E-14
	Xe-133md	0.00E+00	7.34E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.34E-12
	Xe-135	0.00E+00	1.97E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.97E-06
	Xe-135dd	0.00E+00	6.15E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.15E-10
	Xe-135m	0.00E+00	2.60E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.60E-07
	Xe-135md	0.00E+00	1.71E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.71E-09
	Xe-138	3.07E-07	3.91E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.22E-06
	Total by pathway	3.90E-06	8.89E-06	0.00E+00	0.00E+00	3.71E-10	5.73E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.54E-04	1.10E-05	1.83E-04

Human Receptor	COPC	Radiological Dose by Pathway (mSv/a)												
		Air (internal)	Air (external)	Water (internal)	Water (external)	Soil (internal)	Soil (external)	Sediment (internal)	Sediment (external)	Aquatic plants	Aquatic animals	Terrestrial plants	Terrestrial animals	Total by COPC
Bowmanville Resident Adult +worker	C-14	2.71E-07	3.11E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.25E-04	1.16E-05	1.37E-04
	Co-60	6.21E-09	2.35E-10	0.00E+00	0.00E+00	1.47E-12	3.69E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.88E-08	1.94E-10	3.72E-06
	Cs-134	2.46E-10	8.37E-12	0.00E+00	0.00E+00	1.99E-13	5.78E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.80E-08	3.38E-09	1.09E-07
	Cs-137	2.60E-10	4.60E-12	0.00E+00	0.00E+00	1.86E-12	2.95E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.73E-08	4.72E-09	3.58E-07
	Cs-138d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.24E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.78E-07	0.00E+00	1.78E-07
	HTO	1.64E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.77E-06	2.56E-08	4.44E-06
	I-131	5.86E-07	1.57E-09	0.00E+00	0.00E+00	1.73E-12	1.07E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.64E-06	5.90E-08	4.39E-06
	I-132	4.60E-08	4.95E-08	0.00E+00	0.00E+00	1.38E-15	3.90E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.87E-09	0.00E+00	1.38E-07
	I-133	5.32E-07	1.17E-08	0.00E+00	0.00E+00	1.66E-13	8.89E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.37E-07	3.92E-09	1.07E-06
	I-134	4.84E-08	1.25E-07	0.00E+00	0.00E+00	4.34E-16	3.71E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.30E-09	0.00E+00	2.12E-07
	I-135	2.25E-07	5.88E-08	0.00E+00	0.00E+00	2.10E-14	1.23E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.68E-08	2.68E-10	4.65E-07
	Kr-85	0.00E+00	1.01E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.01E-07
	Kr-85m	0.00E+00	3.84E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.84E-08
	Kr-87	0.00E+00	6.32E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.32E-07
	Kr-88	9.48E-08	2.53E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.63E-06
	OBT	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.09E-07	5.29E-09	4.14E-07
	Rb-88d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.79E-15	5.49E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.28E-08	0.00E+00	6.77E-08
	Xe-131md	0.00E+00	4.67E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.67E-14
	Xe-133	0.00E+00	3.98E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.98E-07
	Xe-133dd	0.00E+00	7.75E-15	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.75E-15
	Xe-133md	0.00E+00	3.94E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.94E-12
	Xe-135	0.00E+00	2.48E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.48E-06
	Xe-135dd	0.00E+00	3.34E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.34E-10
	Xe-135m	0.00E+00	1.14E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.14E-06
	Xe-135md	0.00E+00	1.71E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.71E-09
	Xe-138	8.08E-07	1.83E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.91E-05
	Total by pathway	4.26E-06	2.58E-05	0.00E+00	0.00E+00	5.47E-12	4.49E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.33E-04	1.17E-05	1.79E-04

Human Receptor	COPC	Radiological Dose by Pathway (mSv/a)												
		Air (internal)	Air (external)	Water (internal)	Water (external)	Soil (internal)	Soil (external)	Sediment (internal)	Sediment (external)	Aquatic plants	Aquatic animals	Terrestrial plants	Terrestrial animals	Total by COPC
Bowmanville Resident Child-10y	C-14	3.64E-07	2.94E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.13E-04	8.52E-06	1.22E-04
	Co-60	8.35E-09	2.22E-10	0.00E+00	0.00E+00	5.88E-11	3.33E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.03E-08	3.30E-10	3.38E-06
	Cs-134	1.77E-10	7.89E-12	0.00E+00	0.00E+00	1.82E-12	5.21E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.35E-08	1.31E-09	7.71E-08
	Cs-137	1.87E-10	4.34E-12	0.00E+00	0.00E+00	1.77E-11	2.66E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.92E-08	1.92E-09	2.98E-07
	Cs-138d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.13E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.19E-07	0.00E+00	2.19E-07
	HTO	1.84E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.29E-06	1.72E-08	4.15E-06
	I-131	1.26E-06	1.48E-09	0.00E+00	0.00E+00	5.29E-11	1.00E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.71E-06	7.39E-08	7.14E-06
	I-132	8.50E-08	4.66E-08	0.00E+00	0.00E+00	3.81E-14	3.66E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.49E-09	0.00E+00	1.74E-07
	I-133	1.16E-06	1.10E-08	0.00E+00	0.00E+00	5.00E-12	8.37E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.76E-07	4.81E-09	1.93E-06
	I-134	6.33E-08	1.17E-07	0.00E+00	0.00E+00	1.07E-14	3.48E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.64E-09	0.00E+00	2.17E-07
	I-135	4.61E-07	5.54E-08	0.00E+00	0.00E+00	6.42E-13	1.16E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.93E-08	3.27E-10	7.22E-07
	Kr-85	0.00E+00	9.50E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.50E-08
	Kr-85m	0.00E+00	3.61E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.61E-08
	Kr-87	0.00E+00	5.93E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.93E-07
	Kr-88	1.70E-07	2.38E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.55E-06
	OBT	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.67E-07	3.85E-09	3.71E-07
	Rb-88d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.23E-14	4.99E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.61E-08	0.00E+00	6.60E-08
	Xe-131md	0.00E+00	4.45E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.45E-14
	Xe-133	0.00E+00	3.76E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.76E-07
	Xe-133dd	0.00E+00	7.44E-15	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.44E-15
	Xe-133md	0.00E+00	3.75E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.75E-12
	Xe-135	0.00E+00	2.34E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.34E-06
	Xe-135dd	0.00E+00	3.19E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.19E-10
	Xe-135m	0.00E+00	1.06E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.06E-06
	Xe-135md	0.00E+00	1.62E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.62E-09
	Xe-138	1.48E-06	1.69E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.84E-05
	Total by pathway	6.89E-06	2.40E-05	0.00E+00	0.00E+00	1.37E-10	4.07E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.23E-04	8.63E-06	1.66E-04

Human Receptor	COPC	Radiological Dose by Pathway (mSv/a)												
		Air (internal)	Air (external)	Water (internal)	Water (external)	Soil (internal)	Soil (external)	Sediment (internal)	Sediment (external)	Aquatic plants	Aquatic animals	Terrestrial plants	Terrestrial animals	Total by COPC
Bowmanville Resident Infant-1y	C-14	2.49E-07	2.94E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.95E-05	5.15E-06	1.05E-04
	Co-60	6.12E-09	2.88E-10	0.00E+00	0.00E+00	1.60E-10	4.32E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.71E-08	2.43E-10	4.38E-06
	Cs-134	7.88E-11	1.03E-11	0.00E+00	0.00E+00	2.31E-12	6.77E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.31E-08	4.44E-10	8.13E-08
	Cs-137	8.83E-11	5.63E-12	0.00E+00	0.00E+00	2.36E-11	3.47E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.69E-08	7.00E-10	3.64E-07
	Cs-138d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.97E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.70E-07	0.00E+00	3.70E-07
	HTO	1.27E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.29E-06	1.40E-08	3.58E-06
	I-131	1.36E-06	1.93E-09	0.00E+00	0.00E+00	2.03E-10	1.30E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.59E-06	7.85E-08	1.12E-05
	I-132	9.88E-08	6.06E-08	0.00E+00	0.00E+00	1.64E-13	4.76E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.03E-08	0.00E+00	2.17E-07
	I-133	1.58E-06	1.43E-08	0.00E+00	0.00E+00	2.44E-11	1.09E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.44E-06	6.91E-09	3.15E-06
	I-134	6.42E-08	1.53E-07	0.00E+00	0.00E+00	4.23E-14	4.52E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.85E-09	0.00E+00	2.65E-07
	I-135	6.03E-07	7.20E-08	0.00E+00	0.00E+00	2.88E-12	1.51E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-07	5.73E-10	1.00E-06
	Kr-85	0.00E+00	1.24E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.24E-07
	Kr-85m	0.00E+00	4.70E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.70E-08
	Kr-87	0.00E+00	7.71E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.71E-07
	Kr-88	2.06E-07	3.10E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.30E-06
	OBT	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.35E-07	2.98E-09	3.38E-07
	Rb-88d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.71E-13	6.48E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.85E-08	0.00E+00	9.33E-08
	Xe-131md	0.00E+00	5.79E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.79E-14
	Xe-133	0.00E+00	4.88E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.88E-07
	Xe-133dd	0.00E+00	9.68E-15	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.68E-15
	Xe-133md	0.00E+00	4.87E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.87E-12
	Xe-135	0.00E+00	3.04E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.04E-06
	Xe-135dd	0.00E+00	4.14E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.14E-10
	Xe-135m	0.00E+00	1.38E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.38E-06
	Xe-135md	0.00E+00	2.10E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.10E-09
	Xe-138	1.73E-06	2.20E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.37E-05
	Total by pathway	7.16E-06	3.12E-05	0.00E+00	0.00E+00	4.19E-10	5.29E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.14E-04	5.25E-06	1.63E-04

Human Receptor	COPC	Radiological Dose by Pathway (mSv/a)												
		Air (internal)	Air (external)	Water (internal)	Water (external)	Soil (internal)	Soil (external)	Sediment (internal)	Sediment (external)	Aquatic plants	Aquatic animals	Terrestrial plants	Terrestrial animals	Total by COPC
WEB Resident Adult +worker	C-14	1.04E-06	1.20E-09	1.36E-08	1.70E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.57E-04	2.00E-06	1.60E-04
	Co-60	2.39E-08	9.06E-10	1.02E-09	2.76E-10	3.86E-12	9.72E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.16E-08	6.72E-12	9.77E-06
	Cs-134	9.46E-10	3.22E-11	2.40E-10	6.93E-12	5.26E-13	1.52E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.56E-08	4.91E-10	2.10E-07
	Cs-137	9.99E-10	1.77E-11	2.24E-09	3.42E-11	4.90E-12	7.78E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.63E-08	7.37E-10	8.48E-07
	Cs-138d	0.00E+00	0.00E+00	2.65E-11	0.00E+00	5.80E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.06E-07	0.00E+00	2.06E-07
	HTO	6.32E-06	0.00E+00	5.69E-06	1.38E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.48E-06	5.63E-09	1.56E-05
	I-131	2.26E-06	6.06E-09	6.23E-08	3.72E-10	6.59E-12	4.06E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.43E-06	1.02E-08	7.17E-06
	I-132	1.83E-07	1.97E-07	5.14E-11	1.44E-10	5.43E-15	1.53E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.72E-09	0.00E+00	5.38E-07
	I-133	2.05E-06	4.51E-08	6.01E-09	2.98E-10	6.36E-13	3.40E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.33E-07	6.89E-10	2.98E-06
	I-134	2.02E-07	5.23E-07	1.70E-11	1.46E-10	1.80E-15	1.54E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E-09	0.00E+00	8.81E-07
	I-135	8.77E-07	2.29E-07	7.64E-10	4.79E-10	8.08E-14	4.75E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.93E-08	5.20E-11	1.65E-06
	Kr-85	0.00E+00	3.88E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.88E-07
	Kr-85m	0.00E+00	1.50E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.50E-07
	Kr-87	0.00E+00	2.58E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.58E-06
	Kr-88	3.75E-07	1.00E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.04E-05
	OBT	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.21E-07	8.38E-10	5.22E-07
	Rb-88d	0.00E+00	0.00E+00	4.01E-12	0.00E+00	4.27E-15	1.31E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.47E-08	0.00E+00	1.46E-07
	Xe-131md	0.00E+00	1.44E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.44E-13
	Xe-133	0.00E+00	1.53E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.53E-06
	Xe-133dd	0.00E+00	1.99E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.99E-14
	Xe-133md	0.00E+00	1.22E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.22E-11
	Xe-135	0.00E+00	9.64E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.64E-06
	Xe-135dd	0.00E+00	1.03E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.03E-09
	Xe-135m	0.00E+00	5.61E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.61E-06
	Xe-135md	0.00E+00	5.93E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.93E-09
	Xe-138	4.04E-06	9.13E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.54E-05
	Total by pathway	1.74E-05	1.22E-04	5.77E-06	1.40E-07	1.67E-11	1.23E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.66E-04	2.01E-06	3.26E-04

Human Receptor	COPC	Radiological Dose by Pathway (mSv/a)												
		Air (internal)	Air (external)	Water (internal)	Water (external)	Soil (internal)	Soil (external)	Sediment (internal)	Sediment (external)	Aquatic plants	Aquatic animals	Terrestrial plants	Terrestrial animals	Total by COPC
WEB Resident Child-10y	C-14	1.49E-06	1.20E-09	7.55E-09	1.72E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.40E-04	1.57E-06	1.43E-04
	Co-60	3.42E-08	9.08E-10	1.33E-09	2.80E-10	1.70E-10	9.61E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.58E-08	1.24E-11	9.69E-06
	Cs-134	7.24E-10	3.23E-11	7.15E-11	7.03E-12	5.26E-12	1.50E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.69E-08	2.07E-10	1.78E-07
	Cs-137	7.66E-10	1.78E-11	6.96E-10	3.47E-11	5.13E-11	7.69E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.35E-08	3.24E-10	8.04E-07
	Cs-138d	0.00E+00	0.00E+00	1.98E-11	0.00E+00	1.46E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.50E-07	0.00E+00	2.50E-07
	HTO	7.53E-06	0.00E+00	2.87E-06	1.17E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.84E-06	4.02E-09	1.34E-05
	I-131	5.16E-06	6.07E-09	5.94E-08	3.78E-10	2.15E-10	4.07E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.87E-06	1.37E-08	1.25E-05
	I-132	3.60E-07	1.97E-07	4.43E-11	1.46E-10	1.60E-13	1.54E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.62E-09	0.00E+00	7.18E-07
	I-133	4.75E-06	4.52E-08	5.64E-09	3.02E-10	2.04E-11	3.41E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.13E-07	9.16E-10	5.96E-06
	I-134	2.83E-07	5.25E-07	1.31E-11	1.48E-10	4.72E-14	1.54E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.99E-09	0.00E+00	9.63E-07
	I-135	1.91E-06	2.29E-07	7.29E-10	4.86E-10	2.63E-12	4.76E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.08E-07	7.03E-11	2.72E-06
	Kr-85	0.00E+00	3.89E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.89E-07
	Kr-85m	0.00E+00	1.51E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.51E-07
	Kr-87	0.00E+00	2.58E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.58E-06
	Kr-88	7.14E-07	1.00E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.07E-05
	OBT	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.63E-07	6.56E-10	4.63E-07
	Rb-88d	0.00E+00	0.00E+00	3.06E-12	0.00E+00	1.10E-13	1.29E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.83E-08	0.00E+00	1.48E-07
	Xe-131md	0.00E+00	1.45E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.45E-13
	Xe-133	0.00E+00	1.54E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.54E-06
	Xe-133dd	0.00E+00	1.99E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.99E-14
	Xe-133md	0.00E+00	1.22E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.22E-11
	Xe-135	0.00E+00	9.66E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.66E-06
	Xe-135dd	0.00E+00	1.03E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.03E-09
	Xe-135m	0.00E+00	5.63E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.63E-06
	Xe-135md	0.00E+00	5.94E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.94E-09
	Xe-138	8.03E-06	9.16E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.96E-05
	Total by pathway	3.03E-05	1.23E-04	2.95E-06	1.18E-07	4.66E-10	1.22E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.52E-04	1.59E-06	3.21E-04

Human Receptor	COPC	Radiological Dose by Pathway (mSv/a)												
		Air (internal)	Air (external)	Water (internal)	Water (external)	Soil (internal)	Soil (external)	Sediment (internal)	Sediment (external)	Aquatic plants	Aquatic animals	Terrestrial plants	Terrestrial animals	Total by COPC
WEB Resident Infant-1y	C-14	1.02E-06	1.20E-09	9.89E-09	7.08E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.21E-04	1.16E-06	1.23E-04
	Co-60	2.50E-08	1.18E-09	2.14E-09	1.50E-10	4.63E-10	1.25E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.24E-08	1.17E-11	1.26E-05
	Cs-134	3.23E-10	4.20E-11	5.35E-11	3.76E-12	6.67E-12	1.96E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.46E-08	8.67E-11	2.11E-07
	Cs-137	3.62E-10	2.30E-11	5.47E-10	1.86E-11	6.82E-11	1.00E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.89E-08	1.43E-10	1.02E-06
	Cs-138d	0.00E+00	0.00E+00	4.50E-11	0.00E+00	5.61E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.14E-07	0.00E+00	4.14E-07
	HTO	5.20E-06	0.00E+00	3.98E-06	6.09E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.76E-06	3.52E-09	1.20E-05
	I-131	5.56E-06	7.90E-09	1.35E-07	2.02E-10	8.24E-10	5.29E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.12E-05	1.77E-08	1.75E-05
	I-132	4.18E-07	2.57E-07	1.12E-10	7.81E-11	6.87E-13	2.00E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.21E-08	0.00E+00	8.87E-07
	I-133	6.49E-06	5.88E-08	1.62E-08	1.62E-10	9.94E-11	4.43E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.69E-06	1.58E-09	8.70E-06
	I-134	2.87E-07	6.82E-07	3.06E-11	7.92E-11	1.87E-13	2.00E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.36E-09	0.00E+00	1.17E-06
	I-135	2.50E-06	2.98E-07	1.93E-09	2.60E-10	1.18E-11	6.19E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.06E-07	1.36E-10	3.62E-06
	Kr-85	0.00E+00	5.07E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.07E-07
	Kr-85m	0.00E+00	1.96E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.96E-07
	Kr-87	0.00E+00	3.36E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.36E-06
	Kr-88	8.66E-07	1.30E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.39E-05
	OBT	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.12E-07	5.81E-10	4.13E-07
	Rb-88d	0.00E+00	0.00E+00	7.30E-12	0.00E+00	4.43E-13	1.68E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.17E-08	0.00E+00	2.00E-07
	Xe-131md	0.00E+00	1.88E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.88E-13
	Xe-133	0.00E+00	2.00E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.00E-06
	Xe-133dd	0.00E+00	2.59E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.59E-14
	Xe-133md	0.00E+00	1.59E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E-11
	Xe-135	0.00E+00	1.26E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.26E-05
	Xe-135dd	0.00E+00	1.35E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.35E-09
	Xe-135m	0.00E+00	7.32E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.32E-06
	Xe-135md	0.00E+00	7.73E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.73E-09
	Xe-138	9.35E-06	1.19E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.28E-04
	Total by pathway	3.17E-05	1.59E-04	4.15E-06	6.19E-08	1.48E-09	1.59E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.38E-04	1.18E-06	3.50E-04

Human Receptor	COPC	Radiological Dose by Pathway (mSv/a)												
		Air (internal)	Air (external)	Water (internal)	Water (external)	Soil (internal)	Soil (external)	Sediment (internal)	Sediment (external)	Aquatic plants	Aquatic animals	Terrestrial plants	Terrestrial animals	Total by COPC
Farm Adult	C-14	1.02E-06	1.17E-09	1.37E-08	1.63E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.46E-04	1.09E-04	4.56E-04
	Co-60	2.34E-08	8.86E-10	1.89E-09	4.30E-10	8.59E-12	2.16E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.34E-08	2.37E-09	2.17E-05
	Cs-134	9.26E-10	3.15E-11	4.44E-10	1.08E-11	1.17E-12	3.38E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.36E-07	3.35E-08	5.09E-07
	Cs-137	9.77E-10	1.73E-11	4.14E-09	5.33E-11	1.09E-11	1.73E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.62E-07	4.56E-08	1.94E-06
	Cs-138d	0.00E+00	0.00E+00	4.85E-11	0.00E+00	1.28E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.02E-07	0.00E+00	5.02E-07
	HTO	6.18E-06	0.00E+00	4.18E-06	9.60E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.02E-06	2.10E-07	1.87E-05
	I-131	2.21E-06	5.93E-09	5.14E-08	2.59E-10	6.64E-12	4.09E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.01E-05	5.50E-07	1.33E-05
	I-132	1.81E-07	1.95E-07	4.29E-11	1.01E-10	5.54E-15	1.56E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.07E-08	0.00E+00	5.44E-07
	I-133	2.01E-06	4.42E-08	4.97E-09	2.08E-10	6.41E-13	3.43E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.21E-06	3.61E-08	3.65E-06
	I-134	2.04E-07	5.28E-07	1.45E-11	1.05E-10	1.87E-15	1.60E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.63E-09	0.00E+00	8.96E-07
	I-135	8.62E-07	2.25E-07	6.33E-10	3.35E-10	8.18E-14	4.81E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.58E-07	2.31E-09	1.73E-06
	Kr-85	0.00E+00	3.79E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.79E-07
	Kr-85m	0.00E+00	1.48E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.48E-07
	Kr-87	0.00E+00	2.58E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.58E-06
	Kr-88	3.70E-07	9.90E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.03E-05
	OBT	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.19E-06	5.03E-08	1.24E-06
	Rb-88d	0.00E+00	0.00E+00	7.07E-12	0.00E+00	9.06E-15	2.78E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.56E-08	0.00E+00	3.13E-07
	Xe-131md	0.00E+00	1.27E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.27E-13
	Xe-133	0.00E+00	1.50E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.50E-06
	Xe-133dd	0.00E+00	1.55E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.55E-14
	Xe-133md	0.00E+00	1.08E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.08E-11
	Xe-135	0.00E+00	9.46E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.46E-06
	Xe-135dd	0.00E+00	9.10E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.10E-10
	Xe-135m	0.00E+00	5.99E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.99E-06
	Xe-135md	0.00E+00	5.54E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.54E-09
	Xe-138	4.34E-06	9.80E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.02E-04
	Total by pathway	1.74E-05	1.29E-04	4.26E-06	9.75E-08	2.82E-11	2.55E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.68E-04	1.10E-04	6.54E-04

Human Receptor	COPC	Radiological Dose by Pathway (mSv/a)												
		Air (internal)	Air (external)	Water (internal)	Water (external)	Soil (internal)	Soil (external)	Sediment (internal)	Sediment (external)	Aquatic plants	Aquatic animals	Terrestrial plants	Terrestrial animals	Total by COPC
Farm Child-10y	C-14	1.46E-06	1.17E-09	7.51E-09	1.63E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.08E-04	7.96E-05	3.89E-04
	Co-60	3.34E-08	8.86E-10	2.43E-09	4.30E-10	3.82E-10	2.16E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.13E-07	4.10E-09	2.18E-05
	Cs-134	7.07E-10	3.15E-11	1.30E-10	1.08E-11	1.18E-11	3.38E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.56E-08	1.30E-08	4.18E-07
	Cs-137	7.48E-10	1.73E-11	1.27E-09	5.33E-11	1.15E-10	1.73E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.18E-08	1.86E-08	1.83E-06
	Cs-138d	0.00E+00	0.00E+00	3.57E-11	0.00E+00	3.25E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.09E-07	0.00E+00	6.09E-07
	HTO	7.35E-06	0.00E+00	2.08E-06	8.00E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.54E-06	1.41E-07	1.62E-05
	I-131	5.04E-06	5.93E-09	4.83E-08	2.59E-10	2.16E-10	4.09E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.56E-05	6.88E-07	2.18E-05
	I-132	3.56E-07	1.95E-07	3.65E-11	1.01E-10	1.63E-13	1.56E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.51E-08	0.00E+00	7.23E-07
	I-133	4.64E-06	4.42E-08	4.60E-09	2.08E-10	2.05E-11	3.43E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.85E-06	4.42E-08	6.93E-06
	I-134	2.85E-07	5.28E-07	1.10E-11	1.05E-10	4.90E-14	1.60E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.54E-09	0.00E+00	9.77E-07
	I-135	1.87E-06	2.25E-07	5.96E-10	3.35E-10	2.66E-12	4.81E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.45E-07	2.80E-09	2.83E-06
	Kr-85	0.00E+00	3.79E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.79E-07
	Kr-85m	0.00E+00	1.48E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.48E-07
	Kr-87	0.00E+00	2.58E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.58E-06
	Kr-88	7.05E-07	9.90E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.06E-05
	OBT	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.05E-06	3.68E-08	1.09E-06
	Rb-88d	0.00E+00	0.00E+00	5.32E-12	0.00E+00	2.35E-13	2.78E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.42E-08	0.00E+00	3.22E-07
	Xe-131md	0.00E+00	1.27E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.27E-13
	Xe-133	0.00E+00	1.50E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.50E-06
	Xe-133dd	0.00E+00	1.55E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.55E-14
	Xe-133md	0.00E+00	1.08E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.08E-11
	Xe-135	0.00E+00	9.46E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.46E-06
	Xe-135dd	0.00E+00	9.10E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.10E-10
	Xe-135m	0.00E+00	5.99E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.99E-06
	Xe-135md	0.00E+00	5.54E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.54E-09
	Xe-138	8.59E-06	9.80E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.07E-04
	Total by pathway	3.03E-05	1.29E-04	2.14E-06	8.15E-08	7.52E-10	2.55E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.34E-04	8.06E-05	6.01E-04

Human Receptor	COPC	Radiological Dose by Pathway (mSv/a)												
		Air (internal)	Air (external)	Water (internal)	Water (external)	Soil (internal)	Soil (external)	Sediment (internal)	Sediment (external)	Aquatic plants	Aquatic animals	Terrestrial plants	Terrestrial animals	Total by COPC
Farm Infant-1y	C-14	9.93E-07	1.17E-09	9.83E-09	6.71E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.73E-04	4.30E-05	2.17E-04
	Co-60	2.44E-08	1.15E-09	3.90E-09	2.30E-10	1.04E-09	2.81E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.06E-07	2.62E-09	2.82E-05
	Cs-134	3.15E-10	4.10E-11	9.73E-11	5.77E-12	1.50E-11	4.40E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.08E-08	3.89E-09	4.75E-07
	Cs-137	3.53E-10	2.25E-11	9.96E-10	2.85E-11	1.53E-10	2.25E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.91E-08	6.03E-09	2.30E-06
	Cs-138d	0.00E+00	0.00E+00	8.11E-11	0.00E+00	1.25E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.73E-07	0.00E+00	8.73E-07
	HTO	5.07E-06	0.00E+00	2.89E-06	4.18E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.06E-06	1.07E-07	1.32E-05
	I-131	5.43E-06	7.71E-09	1.10E-07	1.39E-10	8.28E-10	5.31E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.23E-05	6.51E-07	2.90E-05
	I-132	4.14E-07	2.54E-07	9.26E-11	5.42E-11	7.00E-13	2.03E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.41E-08	0.00E+00	8.95E-07
	I-133	6.35E-06	5.74E-08	1.32E-08	1.11E-10	1.00E-10	4.46E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.36E-06	5.61E-08	1.03E-05
	I-134	2.89E-07	6.87E-07	2.57E-11	5.60E-11	1.94E-13	2.07E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.70E-09	0.00E+00	1.19E-06
	I-135	2.45E-06	2.92E-07	1.58E-09	1.79E-10	1.19E-11	6.25E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.09E-07	4.28E-09	3.78E-06
	Kr-85	0.00E+00	4.95E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.95E-07
	Kr-85m	0.00E+00	1.92E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.92E-07
	Kr-87	0.00E+00	3.35E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.35E-06
	Kr-88	8.54E-07	1.29E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.37E-05
	OBT	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.09E-07	2.50E-08	6.34E-07
	Rb-88d	0.00E+00	0.00E+00	1.27E-11	0.00E+00	9.52E-13	3.61E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.65E-08	0.00E+00	4.27E-07
	Xe-131md	0.00E+00	1.65E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.65E-13
	Xe-133	0.00E+00	1.95E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.95E-06
	Xe-133dd	0.00E+00	2.02E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.02E-14
	Xe-133md	0.00E+00	1.40E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.40E-11
	Xe-135	0.00E+00	1.23E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.23E-05
	Xe-135dd	0.00E+00	1.18E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.18E-09
	Xe-135m	0.00E+00	7.79E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.79E-06
	Xe-135md	0.00E+00	7.21E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.21E-09
	Xe-138	1.00E-05	1.27E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.37E-04
	Total by pathway	3.19E-05	1.68E-04	3.03E-06	4.26E-08	2.16E-09	3.32E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.06E-04	4.38E-05	4.85E-04

Human Receptor	COPC	Radiological Dose by Pathway (mSv/a)												
		Air (internal)	Air (external)	Water (internal)	Water (external)	Soil (internal)	Soil (external)	Sediment (internal)	Sediment (external)	Aquatic plants	Aquatic animals	Terrestrial plants	Terrestrial animals	Total by COPC
Dairy Farm Adult	C-14	1.40E-07	1.61E-10	2.27E-09	2.27E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.58E-04	1.01E-04	2.59E-04
	Co-60	3.22E-09	1.22E-10	5.61E-11	1.14E-11	1.14E-12	2.86E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.46E-08	2.52E-09	2.89E-06
	Cs-134	1.27E-10	4.34E-12	1.32E-11	2.85E-13	1.54E-13	4.47E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.27E-08	4.36E-08	1.51E-07
	Cs-137	1.35E-10	2.39E-12	1.23E-10	1.41E-12	1.44E-12	2.29E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.48E-08	5.67E-08	3.61E-07
	Cs-138d	0.00E+00	0.00E+00	9.53E-13	0.00E+00	1.12E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.24E-07	0.00E+00	2.24E-07
	HTO	8.51E-07	0.00E+00	7.21E-07	1.27E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.60E-06	6.00E-07	5.78E-06
	I-131	3.03E-07	8.14E-10	1.58E-09	7.09E-12	9.08E-13	5.60E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.66E-06	2.48E-05	2.99E-05
	I-132	1.91E-08	2.06E-08	1.02E-12	2.13E-12	5.84E-16	1.65E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.86E-09	0.00E+00	6.10E-08
	I-133	2.69E-07	5.90E-09	1.49E-10	5.53E-12	8.55E-14	4.57E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.60E-07	1.48E-06	2.36E-06
	I-134	1.45E-08	3.74E-08	2.30E-13	1.48E-12	1.32E-16	1.13E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E-09	0.00E+00	6.47E-08
	I-135	1.08E-07	2.82E-08	1.78E-11	8.37E-12	1.02E-14	6.01E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.24E-08	3.36E-08	3.02E-07
	Kr-85	0.00E+00	5.22E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.22E-08
	Kr-85m	0.00E+00	1.77E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.77E-08
	Kr-87	0.00E+00	2.22E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.22E-07
	Kr-88	4.11E-08	1.10E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.14E-06
	OBT	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.26E-07	3.87E-08	5.64E-07
	Rb-88d	0.00E+00	0.00E+00	2.85E-13	0.00E+00	1.62E-15	4.97E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.71E-08	0.00E+00	6.68E-08
	Xe-131md	0.00E+00	5.69E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.69E-14
	Xe-133	0.00E+00	2.06E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.06E-07
	Xe-133dd	0.00E+00	2.06E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.06E-14
	Xe-133md	0.00E+00	4.72E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.72E-12
	Xe-135	0.00E+00	1.22E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.22E-06
	Xe-135dd	0.00E+00	3.96E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.96E-10
	Xe-135m	0.00E+00	1.36E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.36E-07
	Xe-135md	0.00E+00	1.07E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.07E-09
	Xe-138	8.93E-08	2.02E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.11E-06
	Total by pathway	1.84E-06	5.06E-06	7.25E-07	1.27E-08	3.75E-12	3.37E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.67E-04	1.28E-04	3.06E-04

Human Receptor	COPC	Radiological Dose by Pathway (mSv/a)												
		Air (internal)	Air (external)	Water (internal)	Water (external)	Soil (internal)	Soil (external)	Sediment (internal)	Sediment (external)	Aquatic plants	Aquatic animals	Terrestrial plants	Terrestrial animals	Total by COPC
Dairy Farm Child-10y	C-14	2.00E-07	1.61E-10	1.25E-09	2.27E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.39E-04	1.37E-04	2.76E-04
	Co-60	4.59E-09	1.22E-10	7.23E-11	1.14E-11	5.05E-11	2.86E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.15E-08	8.85E-09	2.92E-06
	Cs-134	9.73E-11	4.34E-12	3.87E-12	2.85E-13	1.56E-12	4.47E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.00E-08	3.29E-08	1.08E-07
	Cs-137	1.03E-10	2.39E-12	3.77E-11	1.41E-12	1.52E-11	2.29E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.73E-08	4.44E-08	3.11E-07
	Cs-138d	0.00E+00	0.00E+00	7.01E-13	0.00E+00	2.83E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.69E-07	0.00E+00	2.69E-07
	HTO	1.01E-06	0.00E+00	3.59E-07	1.06E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.91E-06	9.34E-07	5.22E-06
	I-131	6.91E-07	8.14E-10	1.49E-09	7.09E-12	2.95E-11	5.60E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.16E-06	7.58E-05	8.37E-05
	I-132	3.76E-08	2.06E-08	8.65E-13	2.13E-12	1.72E-14	1.65E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.75E-09	0.00E+00	8.14E-08
	I-133	6.20E-07	5.90E-09	1.38E-10	5.53E-12	2.73E-12	4.57E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.45E-07	4.44E-06	5.96E-06
	I-134	2.02E-08	3.74E-08	1.75E-13	1.48E-12	3.46E-15	1.13E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.98E-09	0.00E+00	7.08E-08
	I-135	2.35E-07	2.82E-08	1.68E-11	8.37E-12	3.32E-13	6.01E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.11E-07	1.02E-07	5.36E-07
	Kr-85	0.00E+00	5.22E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.22E-08
	Kr-85m	0.00E+00	1.77E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.77E-08
	Kr-87	0.00E+00	2.22E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.22E-07
	Kr-88	7.81E-08	1.10E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.18E-06
	OBT	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.61E-07	5.10E-08	5.12E-07
	Rb-88d	0.00E+00	0.00E+00	2.14E-13	0.00E+00	4.21E-14	4.97E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.10E-08	0.00E+00	7.06E-08
	Xe-131md	0.00E+00	5.69E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.69E-14
	Xe-133	0.00E+00	2.06E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.06E-07
	Xe-133dd	0.00E+00	2.06E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.06E-14
	Xe-133md	0.00E+00	4.72E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.72E-12
	Xe-135	0.00E+00	1.22E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.22E-06
	Xe-135dd	0.00E+00	3.96E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.96E-10
	Xe-135m	0.00E+00	1.36E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.36E-07
	Xe-135md	0.00E+00	1.07E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.07E-09
	Xe-138	1.77E-07	2.02E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.19E-06
	Total by pathway	3.08E-06	5.06E-06	3.62E-07	1.06E-08	1.00E-10	3.37E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.51E-04	2.18E-04	3.81E-04

Human Receptor	COPC	Radiological Dose by Pathway (mSv/a)												
		Air (internal)	Air (external)	Water (internal)	Water (external)	Soil (internal)	Soil (external)	Sediment (internal)	Sediment (external)	Aquatic plants	Aquatic animals	Terrestrial plants	Terrestrial animals	Total by COPC
Dairy Farm Infant-1y	C-14	1.37E-07	1.61E-10	1.63E-09	9.35E-15	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.24E-04	2.25E-04	3.49E-04
	Co-60	3.36E-09	1.59E-10	1.16E-10	6.09E-12	1.38E-10	3.72E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.10E-08	1.86E-08	3.80E-06
	Cs-134	4.33E-11	5.64E-12	2.90E-12	1.53E-13	1.98E-12	5.82E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.69E-08	3.20E-08	1.07E-07
	Cs-137	4.86E-11	3.10E-12	2.96E-11	7.54E-13	2.03E-11	2.98E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.19E-08	4.50E-08	3.65E-07
	Cs-138d	0.00E+00	0.00E+00	1.59E-12	0.00E+00	1.09E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.64E-07	0.00E+00	4.64E-07
	HTO	6.98E-07	0.00E+00	4.98E-07	5.52E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.95E-06	1.90E-06	6.05E-06
	I-131	7.45E-07	1.06E-09	3.37E-09	3.80E-12	1.13E-10	7.28E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.22E-05	2.52E-04	2.65E-04
	I-132	4.36E-08	2.68E-08	2.19E-12	1.14E-12	7.37E-14	2.14E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.30E-08	0.00E+00	1.05E-07
	I-133	8.48E-07	7.67E-09	3.97E-10	2.96E-12	1.33E-11	5.94E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.84E-06	1.88E-05	2.16E-05
	I-134	2.04E-08	4.86E-08	4.08E-13	7.92E-13	1.37E-14	1.47E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.52E-09	0.00E+00	8.73E-08
	I-135	3.07E-07	3.66E-08	4.44E-11	4.48E-12	1.49E-12	7.81E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.22E-07	3.96E-07	1.04E-06
	Kr-85	0.00E+00	6.81E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.81E-08
	Kr-85m	0.00E+00	2.31E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.31E-08
	Kr-87	0.00E+00	2.89E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.89E-07
	Kr-88	9.47E-08	1.43E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.52E-06
	OBT	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.26E-07	8.48E-08	5.11E-07
	Rb-88d	0.00E+00	0.00E+00	5.11E-13	0.00E+00	1.70E-13	6.45E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.75E-08	0.00E+00	1.02E-07
	Xe-131md	0.00E+00	7.40E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.40E-14
	Xe-133	0.00E+00	2.67E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.67E-07
	Xe-133dd	0.00E+00	2.68E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.68E-14
	Xe-133md	0.00E+00	6.14E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.14E-12
	Xe-135	0.00E+00	1.58E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.58E-06
	Xe-135dd	0.00E+00	5.14E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.14E-10
	Xe-135m	0.00E+00	1.77E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.77E-07
	Xe-135md	0.00E+00	1.39E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.39E-09
	Xe-138	2.06E-07	2.62E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.83E-06
	Total by pathway	3.10E-06	6.58E-06	5.03E-07	5.54E-09	2.89E-10	4.38E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.42E-04	4.99E-04	6.55E-04

Human Receptor	COPC	Radiological Dose by Pathway (mSv/a)												
		Air (internal)	Air (external)	Water (internal)	Water (external)	Soil (internal)	Soil (external)	Sediment (internal)	Sediment (external)	Aquatic plants	Aquatic animals	Terrestrial plants	Terrestrial animals	Total by COPC
Rural Resident Adult +worker	C-14	5.19E-07	5.97E-10	5.63E-09	7.64E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.34E-04	6.09E-07	1.35E-04
	Co-60	1.19E-08	4.51E-10	1.57E-10	5.65E-11	2.39E-12	6.03E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.87E-08	6.91E-11	6.06E-06
	Cs-134	4.71E-10	1.61E-11	3.69E-11	1.42E-12	3.26E-13	9.43E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.80E-08	6.47E-11	1.43E-07
	Cs-137	4.98E-10	8.83E-12	3.44E-10	7.00E-12	3.04E-12	4.82E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.71E-08	3.66E-10	5.40E-07
	Cs-138d	0.00E+00	0.00E+00	3.91E-12	0.00E+00	3.46E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.77E-07	0.00E+00	1.77E-07
	HTO	3.15E-06	0.00E+00	2.10E-06	5.17E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.93E-06	6.13E-08	8.29E-06
	I-131	1.12E-06	3.02E-09	7.80E-09	6.22E-11	3.30E-12	2.03E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.79E-06	2.74E-07	5.41E-06
	I-132	9.43E-08	1.02E-07	6.66E-12	2.49E-11	2.82E-15	7.95E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.08E-09	0.00E+00	2.79E-07
	I-133	1.03E-06	2.26E-08	7.56E-10	5.00E-11	3.20E-13	1.71E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.57E-07	1.95E-08	1.70E-06
	I-134	1.10E-07	2.84E-07	2.32E-12	2.66E-11	9.79E-16	8.38E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.39E-09	0.00E+00	4.79E-07
	I-135	4.42E-07	1.15E-07	9.69E-11	8.10E-11	4.10E-14	2.41E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.95E-08	1.62E-09	8.60E-07
	Kr-85	0.00E+00	1.93E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.93E-07
	Kr-85m	0.00E+00	7.62E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.62E-08
	Kr-87	0.00E+00	1.36E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.36E-06
	Kr-88	1.92E-07	5.13E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.32E-06
	OBT	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.39E-07	1.24E-08	4.51E-07
	Rb-88d	0.00E+00	0.00E+00	5.28E-13	0.00E+00	2.30E-15	7.03E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.23E-08	0.00E+00	8.27E-08
	Xe-131md	0.00E+00	5.30E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.30E-14
	Xe-133	0.00E+00	7.65E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.65E-07
	Xe-133dd	0.00E+00	5.24E-15	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.24E-15
	Xe-133md	0.00E+00	4.49E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.49E-12
	Xe-135	0.00E+00	4.84E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.84E-06
	Xe-135dd	0.00E+00	3.78E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.78E-10
	Xe-135m	0.00E+00	3.54E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.54E-06
	Xe-135md	0.00E+00	2.56E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.56E-09
	Xe-138	2.58E-06	5.84E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.10E-05
	Total by pathway	9.25E-06	7.48E-05	2.11E-06	5.20E-08	9.46E-12	7.45E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.42E-04	9.78E-07	2.37E-04

Human Receptor	COPC	Radiological Dose by Pathway (mSv/a)												
		Air (internal)	Air (external)	Water (internal)	Water (external)	Soil (internal)	Soil (external)	Sediment (internal)	Sediment (external)	Aquatic plants	Aquatic animals	Terrestrial plants	Terrestrial animals	Total by COPC
Rural Resident Child-10y	C-14	7.32E-07	5.90E-10	3.15E-09	7.79E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E-04	5.37E-07	1.21E-04
	Co-60	1.68E-08	4.46E-10	2.06E-10	5.76E-11	1.03E-10	5.81E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.96E-08	2.09E-10	5.86E-06
	Cs-134	3.55E-10	1.59E-11	1.10E-11	1.44E-12	3.18E-12	9.09E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.33E-08	2.75E-11	1.15E-07
	Cs-137	3.76E-10	8.71E-12	1.07E-10	7.13E-12	3.10E-11	4.65E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.88E-08	1.42E-10	4.94E-07
	Cs-138d	0.00E+00	0.00E+00	2.93E-12	0.00E+00	8.45E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.15E-07	0.00E+00	2.15E-07
	HTO	3.70E-06	0.00E+00	1.06E-06	4.39E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.40E-06	3.84E-08	7.24E-06
	I-131	2.53E-06	2.98E-09	7.48E-09	6.34E-11	1.06E-10	2.01E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.90E-06	7.23E-07	9.36E-06
	I-132	1.83E-07	1.00E-07	5.78E-12	2.54E-11	8.18E-14	7.85E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.73E-09	0.00E+00	3.68E-07
	I-133	2.34E-06	2.23E-08	7.13E-10	5.09E-11	1.01E-11	1.69E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.99E-07	4.63E-08	3.28E-06
	I-134	1.52E-07	2.81E-07	1.80E-12	2.71E-11	2.55E-14	8.29E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.74E-09	0.00E+00	5.18E-07
	I-135	9.49E-07	1.14E-07	9.29E-11	8.25E-11	1.32E-12	2.38E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.26E-08	2.43E-09	1.40E-06
	Kr-85	0.00E+00	1.91E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.91E-07
	Kr-85m	0.00E+00	7.53E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.53E-08
	Kr-87	0.00E+00	1.35E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.35E-06
	Kr-88	3.61E-07	5.07E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.43E-06
	OBT	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.90E-07	8.51E-09	3.99E-07
	Rb-88d	0.00E+00	0.00E+00	4.04E-13	0.00E+00	5.68E-14	6.70E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.53E-08	0.00E+00	8.24E-08
	Xe-131md	0.00E+00	5.15E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.15E-14
	Xe-133	0.00E+00	7.55E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.55E-07
	Xe-133dd	0.00E+00	4.97E-15	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.97E-15
	Xe-133md	0.00E+00	4.36E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.36E-12
	Xe-135	0.00E+00	4.78E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.78E-06
	Xe-135dd	0.00E+00	3.68E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.68E-10
	Xe-135m	0.00E+00	3.52E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.52E-06
	Xe-135md	0.00E+00	2.51E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.51E-09
	Xe-138	5.10E-06	5.82E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.33E-05
	Total by pathway	1.61E-05	7.45E-05	1.07E-06	4.42E-08	2.55E-10	7.20E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.30E-04	1.36E-06	2.30E-04

Human Receptor	COPC	Radiological Dose by Pathway (mSv/a)												
		Air (internal)	Air (external)	Water (internal)	Water (external)	Soil (internal)	Soil (external)	Sediment (internal)	Sediment (external)	Aquatic plants	Aquatic animals	Terrestrial plants	Terrestrial animals	Total by COPC
Rural Resident Infant-1y	C-14	4.99E-07	5.90E-10	4.12E-09	3.21E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.04E-04	3.94E-07	1.05E-04
	Co-60	1.23E-08	5.79E-10	3.30E-10	3.08E-11	2.79E-10	7.55E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.55E-08	5.40E-11	7.61E-06
	Cs-134	1.58E-10	2.06E-11	8.24E-12	7.73E-13	4.03E-12	1.18E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.27E-08	1.43E-11	1.31E-07
	Cs-137	1.77E-10	1.13E-11	8.42E-11	3.82E-12	4.12E-11	6.05E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.64E-08	1.00E-10	6.22E-07
	Cs-138d	0.00E+00	0.00E+00	6.65E-12	0.00E+00	3.25E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.56E-07	0.00E+00	3.56E-07
	HTO	2.55E-06	0.00E+00	1.47E-06	2.29E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.34E-06	4.85E-08	6.43E-06
	I-131	2.73E-06	3.88E-09	1.69E-08	3.39E-11	4.06E-10	2.61E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.67E-06	3.41E-08	1.27E-05
	I-132	2.13E-07	1.30E-07	1.46E-11	1.36E-11	3.51E-13	1.02E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.05E-08	0.00E+00	4.56E-07
	I-133	3.20E-06	2.90E-08	2.05E-09	2.73E-11	4.92E-11	2.19E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.46E-06	1.16E-08	4.92E-06
	I-134	1.54E-07	3.66E-07	4.20E-12	1.45E-11	1.01E-13	1.08E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.94E-09	0.00E+00	6.30E-07
	I-135	1.24E-06	1.48E-07	2.46E-10	4.42E-11	5.90E-12	3.09E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.77E-07	3.69E-09	1.88E-06
	Kr-85	0.00E+00	2.49E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.49E-07
	Kr-85m	0.00E+00	9.79E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.79E-08
	Kr-87	0.00E+00	1.75E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06
	Kr-88	4.38E-07	6.59E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.02E-06
	OBT	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.49E-07	1.04E-08	3.59E-07
	Rb-88d	0.00E+00	0.00E+00	9.65E-13	0.00E+00	2.30E-13	8.70E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.68E-08	0.00E+00	1.14E-07
	Xe-131md	0.00E+00	6.70E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.70E-14
	Xe-133	0.00E+00	9.82E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.82E-07
	Xe-133dd	0.00E+00	6.46E-15	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.46E-15
	Xe-133md	0.00E+00	5.67E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.67E-12
	Xe-135	0.00E+00	6.22E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.22E-06
	Xe-135dd	0.00E+00	4.78E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.78E-10
	Xe-135m	0.00E+00	4.58E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.58E-06
	Xe-135md	0.00E+00	3.26E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.26E-09
	Xe-138	5.94E-06	7.56E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.15E-05
	Total by pathway	1.70E-05	9.68E-05	1.50E-06	2.31E-08	7.90E-10	9.36E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.18E-04	5.03E-07	2.43E-04

Human Receptor	COPC	Radiological Dose by Pathway (mSv/a)												
		Air (internal)	Air (external)	Water (internal)	Water (external)	Soil (internal)	Soil (external)	Sediment (internal)	Sediment (external)	Aquatic plants	Aquatic animals	Terrestrial plants	Terrestrial animals	Total by COPC
Sport Fisher Adult	C-14	2.52E-08	2.90E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.52E-08
	Co-60	5.77E-10	2.19E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.99E-10
	Cs-134	2.29E-11	7.79E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.36E-11
	Cs-137	2.41E-11	4.28E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.46E-11
	Cs-138d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	HTO	1.53E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.53E-07
	I-131	5.46E-08	1.47E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.47E-08
	I-132	4.75E-09	5.12E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.87E-09
	I-133	5.01E-08	1.10E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.12E-08
	I-134	5.87E-09	1.52E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.10E-08
	I-135	2.18E-08	5.68E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.74E-08
	Kr-85	0.00E+00	9.37E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.37E-09
	Kr-85m	0.00E+00	3.77E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.77E-09
	Kr-87	0.00E+00	7.08E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.08E-08
	Kr-88	9.60E-09	2.57E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.66E-07
	OBT	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Rb-88d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Xe-131md	0.00E+00	1.56E-15	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.56E-15
	Xe-133	0.00E+00	3.71E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.71E-08
	Xe-133dd	0.00E+00	9.04E-17	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.04E-17
	Xe-133md	0.00E+00	1.33E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.33E-13
	Xe-135	0.00E+00	2.37E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.37E-07
	Xe-135dd	0.00E+00	1.11E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.11E-11
	Xe-135m	0.00E+00	2.32E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.32E-07
	Xe-135md	0.00E+00	9.08E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.08E-11
	Xe-138	1.73E-07	3.90E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.08E-06
	Total by pathway	4.98E-07	4.78E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.28E-06

Human Receptor	COPC	Radiological Dose by Pathway (mSv/a)												
		Air (internal)	Air (external)	Water (internal)	Water (external)	Soil (internal)	Soil (external)	Sediment (internal)	Sediment (external)	Aquatic plants	Aquatic animals	Terrestrial plants	Terrestrial animals	Total by COPC
Sport Fisher Child-10y	C-14	3.60E-08	2.90E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.60E-08
	Co-60	8.24E-10	2.19E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.46E-10
	Cs-134	1.75E-11	7.79E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.82E-11
	Cs-137	1.85E-11	4.28E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.89E-11
	Cs-138d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	HTO	1.82E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.82E-07
	I-131	1.25E-07	1.47E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.25E-07
	I-132	9.33E-09	5.12E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.45E-08
	I-133	1.15E-07	1.10E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.17E-07
	I-134	8.18E-09	1.52E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.34E-08
	I-135	4.72E-08	5.68E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.29E-08
	Kr-85	0.00E+00	9.37E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.37E-09
	Kr-85m	0.00E+00	3.77E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.77E-09
	Kr-87	0.00E+00	7.08E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.08E-08
	Kr-88	1.83E-08	2.57E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.75E-07
	OBT	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Rb-88d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Xe-131md	0.00E+00	1.56E-15	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.56E-15
	Xe-133	0.00E+00	3.71E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.71E-08
	Xe-133dd	0.00E+00	9.04E-17	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.04E-17
	Xe-133md	0.00E+00	1.33E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.33E-13
	Xe-135	0.00E+00	2.37E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.37E-07
	Xe-135dd	0.00E+00	1.11E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.11E-11
	Xe-135m	0.00E+00	2.32E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.32E-07
	Xe-135md	0.00E+00	9.08E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.08E-11
	Xe-138	3.42E-07	3.90E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.25E-06
	Total by pathway	8.84E-07	4.78E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.66E-06

Human Receptor	COPC	Radiological Dose by Pathway (mSv/a)												
		Air (internal)	Air (external)	Water (internal)	Water (external)	Soil (internal)	Soil (external)	Sediment (internal)	Sediment (external)	Aquatic plants	Aquatic animals	Terrestrial plants	Terrestrial animals	Total by COPC
Sport Fisher Infant-1y	C-14	2.45E-08	2.90E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.46E-08
	Co-60	6.04E-10	2.85E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.32E-10
	Cs-134	7.78E-12	1.01E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.79E-12
	Cs-137	8.72E-12	5.56E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.27E-12
	Cs-138d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	HTO	1.25E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.25E-07
	I-131	1.34E-07	1.91E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.34E-07
	I-132	1.08E-08	6.65E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-08
	I-133	1.58E-07	1.43E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E-07
	I-134	8.30E-09	1.97E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.80E-08
	I-135	6.18E-08	7.38E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.92E-08
	Kr-85	0.00E+00	1.22E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.22E-08
	Kr-85m	0.00E+00	4.90E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.90E-09
	Kr-87	0.00E+00	9.20E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.20E-08
	Kr-88	2.22E-08	3.33E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.56E-07
	OBT	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Rb-88d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Xe-131md	0.00E+00	2.03E-15	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.03E-15
	Xe-133	0.00E+00	4.83E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.83E-08
	Xe-133dd	0.00E+00	1.18E-16	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.18E-16
	Xe-133md	0.00E+00	1.72E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.72E-13
	Xe-135	0.00E+00	3.08E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.08E-07
	Xe-135dd	0.00E+00	1.44E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.44E-11
	Xe-135m	0.00E+00	3.01E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.01E-07
	Xe-135md	0.00E+00	1.18E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.18E-10
	Xe-138	3.98E-07	5.07E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.47E-06
	Total by pathway	9.44E-07	6.21E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.15E-06

Human Receptor	COPC	Radiological Dose by Pathway (mSv/a)												
		Air (internal)	Air (external)	Water (internal)	Water (external)	Soil (internal)	Soil (external)	Sediment (internal)	Sediment (external)	Aquatic plants	Aquatic animals	Terrestrial plants	Terrestrial animals	Total by COPC
Camper Adult	C-14	2.17E-07	2.49E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.18E-06	8.78E-05	2.61E-07	9.04E-05
	Co-60	4.97E-09	1.89E-10	0.00E+00	0.00E+00	1.83E-12	4.62E-06	0.00E+00	0.00E+00	0.00E+00	7.98E-11	1.32E-08	1.21E-11	4.63E-06
	Cs-134	1.97E-10	6.71E-12	0.00E+00	0.00E+00	2.49E-13	7.23E-08	0.00E+00	0.00E+00	0.00E+00	7.70E-09	3.31E-08	3.06E-11	1.13E-07
	Cs-137	2.08E-10	3.69E-12	0.00E+00	0.00E+00	2.33E-12	3.69E-07	0.00E+00	0.00E+00	0.00E+00	8.08E-09	3.98E-08	1.94E-10	4.18E-07
	Cs-138d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.44E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.22E-07	0.00E+00	1.22E-07
	HTO	1.32E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.35E-08	1.99E-06	2.99E-08	3.35E-06
	I-131	4.69E-07	1.26E-09	0.00E+00	0.00E+00	1.41E-12	8.68E-08	0.00E+00	0.00E+00	0.00E+00	4.19E-09	2.45E-06	7.41E-09	3.02E-06
	I-132	3.38E-08	3.64E-08	0.00E+00	0.00E+00	1.03E-15	2.91E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.62E-09	0.00E+00	1.02E-07
	I-133	4.22E-07	9.26E-09	0.00E+00	0.00E+00	1.34E-13	7.18E-08	0.00E+00	0.00E+00	0.00E+00	5.22E-10	2.95E-07	1.99E-09	8.01E-07
	I-134	3.13E-08	8.10E-08	0.00E+00	0.00E+00	2.86E-16	2.45E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.84E-10	0.00E+00	1.38E-07
	I-135	1.75E-07	4.56E-08	0.00E+00	0.00E+00	1.66E-14	9.76E-08	0.00E+00	0.00E+00	0.00E+00	6.47E-11	3.84E-08	6.73E-10	3.57E-07
	Kr-85	0.00E+00	8.07E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.07E-08
	Kr-85m	0.00E+00	2.94E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.94E-08
	Kr-87	0.00E+00	4.35E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.35E-07
	Kr-88	7.07E-08	1.89E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.96E-06
	OBT	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.01E-08	3.02E-07	6.02E-09	3.18E-07
	Rb-88d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.50E-15	7.67E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.69E-09	0.00E+00	8.54E-08
	Xe-131md	0.00E+00	5.76E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.76E-14
	Xe-133	0.00E+00	3.19E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.19E-07
	Xe-133dd	0.00E+00	1.46E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.46E-14
	Xe-133md	0.00E+00	4.82E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.82E-12
	Xe-135	0.00E+00	1.94E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.94E-06
	Xe-135dd	0.00E+00	4.09E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.09E-10
	Xe-135m	0.00E+00	5.38E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.38E-07
	Xe-135md	0.00E+00	1.54E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.54E-09
	Xe-138	3.73E-07	8.42E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.79E-06
	Total by pathway	3.11E-06	1.38E-05	0.00E+00	0.00E+00	6.00E-12	5.44E-06	0.00E+00	0.00E+00	0.00E+00	2.23E-06	9.30E-05	3.07E-07	1.18E-04

Human Receptor	COPC	Radiological Dose by Pathway (mSv/a)												
		Air (internal)	Air (external)	Water (internal)	Water (external)	Soil (internal)	Soil (external)	Sediment (internal)	Sediment (external)	Aquatic plants	Aquatic animals	Terrestrial plants	Terrestrial animals	Total by COPC
Camper Child-10y	C-14	3.10E-07	2.49E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.11E-06	7.73E-05	1.71E-07	7.99E-05
	Co-60	7.09E-09	1.89E-10	0.00E+00	0.00E+00	8.16E-11	4.62E-06	0.00E+00	0.00E+00	0.00E+00	1.81E-10	2.74E-08	1.86E-11	4.65E-06
	Cs-134	1.50E-10	6.71E-12	0.00E+00	0.00E+00	2.53E-12	7.23E-08	0.00E+00	0.00E+00	0.00E+00	3.99E-09	1.57E-08	1.07E-11	9.22E-08
	Cs-137	1.59E-10	3.69E-12	0.00E+00	0.00E+00	2.46E-11	3.69E-07	0.00E+00	0.00E+00	0.00E+00	4.37E-09	1.97E-08	7.08E-11	3.94E-07
	Cs-138d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.20E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.46E-07	0.00E+00	1.46E-07
	HTO	1.56E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.06E-08	1.60E-06	1.78E-08	3.20E-06
	I-131	1.07E-06	1.26E-09	0.00E+00	0.00E+00	4.58E-11	8.68E-08	0.00E+00	0.00E+00	0.00E+00	6.96E-09	3.74E-06	8.33E-09	4.92E-06
	I-132	6.63E-08	3.64E-08	0.00E+00	0.00E+00	3.04E-14	2.91E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.62E-09	0.00E+00	1.35E-07
	I-133	9.73E-07	9.26E-09	0.00E+00	0.00E+00	4.30E-12	7.18E-08	0.00E+00	0.00E+00	0.00E+00	8.53E-10	4.43E-07	2.21E-09	1.50E-06
	I-134	4.37E-08	8.10E-08	0.00E+00	0.00E+00	7.52E-15	2.45E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.09E-09	0.00E+00	1.50E-07
	I-135	3.80E-07	4.56E-08	0.00E+00	0.00E+00	5.40E-13	9.76E-08	0.00E+00	0.00E+00	0.00E+00	1.08E-10	5.87E-08	7.57E-10	5.83E-07
	Kr-85	0.00E+00	8.07E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.07E-08
	Kr-85m	0.00E+00	2.94E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.94E-08
	Kr-87	0.00E+00	4.35E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.35E-07
	Kr-88	1.35E-07	1.89E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.02E-06
	OBT	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.71E-09	2.64E-07	3.92E-09	2.77E-07
	Rb-88d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.50E-14	7.67E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.06E-08	0.00E+00	8.73E-08
	Xe-131md	0.00E+00	5.76E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.76E-14
	Xe-133	0.00E+00	3.19E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.19E-07
	Xe-133dd	0.00E+00	1.46E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.46E-14
	Xe-133md	0.00E+00	4.82E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.82E-12
	Xe-135	0.00E+00	1.94E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.94E-06
	Xe-135dd	0.00E+00	4.09E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.09E-10
	Xe-135m	0.00E+00	5.38E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.38E-07
	Xe-135md	0.00E+00	1.54E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.54E-09
	Xe-138	7.38E-07	8.42E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.16E-06
	Total by pathway	5.29E-06	1.38E-05	0.00E+00	0.00E+00	1.60E-10	5.44E-06	0.00E+00	0.00E+00	0.00E+00	2.16E-06	8.36E-05	2.04E-07	1.11E-04

Human Receptor	COPC	Radiological Dose by Pathway (mSv/a)												
		Air (internal)	Air (external)	Water (internal)	Water (external)	Soil (internal)	Soil (external)	Sediment (internal)	Sediment (external)	Aquatic plants	Aquatic animals	Terrestrial plants	Terrestrial animals	Total by COPC
Camper Infant-1y	C-14	2.11E-07	2.49E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.47E-06	6.55E-05	2.15E-07	6.74E-05
	Co-60	5.20E-09	2.45E-10	0.00E+00	0.00E+00	2.22E-10	6.00E-06	0.00E+00	0.00E+00	0.00E+00	1.55E-10	3.04E-08	2.87E-11	6.04E-06
	Cs-134	6.70E-11	8.72E-12	0.00E+00	0.00E+00	3.20E-12	9.40E-08	0.00E+00	0.00E+00	0.00E+00	1.59E-09	8.30E-09	7.69E-12	1.04E-07
	Cs-137	7.51E-11	4.79E-12	0.00E+00	0.00E+00	3.28E-11	4.81E-07	0.00E+00	0.00E+00	0.00E+00	1.83E-09	1.08E-08	5.34E-11	4.94E-07
	Cs-138d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.39E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.34E-07	0.00E+00	2.34E-07
	HTO	1.08E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.53E-08	1.51E-06	2.37E-08	2.63E-06
	I-131	1.15E-06	1.64E-09	0.00E+00	0.00E+00	1.76E-10	1.13E-07	0.00E+00	0.00E+00	0.00E+00	8.39E-09	5.98E-06	1.81E-08	7.28E-06
	I-132	7.71E-08	4.73E-08	0.00E+00	0.00E+00	1.30E-13	3.79E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.47E-09	0.00E+00	1.69E-07
	I-133	1.33E-06	1.20E-08	0.00E+00	0.00E+00	2.10E-11	9.34E-08	0.00E+00	0.00E+00	0.00E+00	1.31E-09	9.01E-07	6.10E-09	2.34E-06
	I-134	4.43E-08	1.05E-07	0.00E+00	0.00E+00	2.98E-14	3.18E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-09	0.00E+00	1.83E-07
	I-135	4.97E-07	5.93E-08	0.00E+00	0.00E+00	2.42E-12	1.27E-07	0.00E+00	0.00E+00	0.00E+00	1.52E-10	1.10E-07	1.93E-09	7.95E-07
	Kr-85	0.00E+00	1.05E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.05E-07
	Kr-85m	0.00E+00	3.82E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.82E-08
	Kr-87	0.00E+00	5.65E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.65E-07
	Kr-88	1.63E-07	2.46E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.62E-06
	OBT	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.98E-09	2.31E-07	5.08E-09	2.43E-07
	Rb-88d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.63E-13	9.97E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.78E-08	0.00E+00	1.18E-07
	Xe-131md	0.00E+00	7.49E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.49E-14
	Xe-133	0.00E+00	4.14E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.14E-07
	Xe-133dd	0.00E+00	1.89E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.89E-14
	Xe-133md	0.00E+00	6.26E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.26E-12
	Xe-135	0.00E+00	2.53E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.53E-06
	Xe-135dd	0.00E+00	5.31E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.31E-10
	Xe-135m	0.00E+00	6.99E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.99E-07
	Xe-135md	0.00E+00	2.00E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.00E-09
	Xe-138	8.59E-07	1.09E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.18E-05
	Total by pathway	5.42E-06	1.80E-05	0.00E+00	0.00E+00	4.60E-10	7.08E-06	0.00E+00	0.00E+00	0.00E+00	1.51E-06	7.46E-05	2.70E-07	1.07E-04

Human Receptor	COPC	Radiological Dose by Pathway (mSv/a)												
		Air (internal)	Air (external)	Water (internal)	Water (external)	Soil (internal)	Soil (external)	Sediment (internal)	Sediment (external)	Aquatic plants	Aquatic animals	Terrestrial plants	Terrestrial animals	Total by COPC
Harvester Adult +worker	C-14	1.02E-06	1.17E-09	1.35E-08	1.61E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.15E-05	4.89E-05	6.14E-05
	Co-60	2.33E-08	8.85E-10	1.87E-09	4.26E-10	8.57E-12	2.16E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.79E-09	1.54E-07	2.18E-05
	Cs-134	9.24E-10	3.15E-11	4.40E-10	1.07E-11	1.17E-12	3.38E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.86E-09	1.87E-07	5.34E-07
	Cs-137	9.76E-10	1.73E-11	4.10E-09	5.28E-11	1.09E-11	1.73E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.00E-09	2.21E-07	1.96E-06
	Cs-138d	0.00E+00	0.00E+00	4.81E-11	0.00E+00	1.28E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.93E-08	5.28E-09	3.46E-08
	HTO	6.18E-06	0.00E+00	4.14E-06	9.51E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.94E-07	1.82E-07	1.10E-05
	I-131	2.20E-06	5.92E-09	5.09E-08	2.57E-10	6.63E-12	4.08E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.87E-07	6.11E-06	9.37E-06
	I-132	1.81E-07	1.95E-07	4.25E-11	1.00E-10	5.53E-15	1.56E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.27E-10	6.07E-12	5.33E-07
	I-133	2.01E-06	4.41E-08	4.92E-09	2.06E-10	6.40E-13	3.42E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.06E-08	3.74E-07	2.85E-06
	I-134	2.04E-07	5.27E-07	1.43E-11	1.04E-10	1.86E-15	1.59E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.11E-10	4.62E-12	8.91E-07
	I-135	8.61E-07	2.25E-07	6.27E-10	3.32E-10	8.16E-14	4.80E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.19E-09	8.82E-09	1.58E-06
	Kr-85	0.00E+00	3.79E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.79E-07
	Kr-85m	0.00E+00	1.48E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.48E-07
	Kr-87	0.00E+00	2.57E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.57E-06
	Kr-88	3.70E-07	9.88E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.03E-05
	OBT	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.95E-08	3.26E-08	7.21E-08
	Rb-88d	0.00E+00	0.00E+00	7.00E-12	0.00E+00	9.05E-15	2.77E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.08E-09	2.44E-10	2.80E-07
	Xe-131md	0.00E+00	1.27E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.27E-13
	Xe-133	0.00E+00	1.50E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.50E-06
	Xe-133dd	0.00E+00	1.56E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.56E-14
	Xe-133md	0.00E+00	1.08E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.08E-11
	Xe-135	0.00E+00	9.45E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.45E-06
	Xe-135dd	0.00E+00	9.10E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.10E-10
	Xe-135m	0.00E+00	5.97E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.97E-06
	Xe-135md	0.00E+00	5.54E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.54E-09
	Xe-138	4.33E-06	9.78E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.02E-04
	Total by pathway	1.74E-05	1.29E-04	4.22E-06	9.66E-08	2.81E-11	2.55E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.26E-05	5.62E-05	2.45E-04

Human Receptor	COPC	Radiological Dose by Pathway (mSv/a)												
		Air (internal)	Air (external)	Water (internal)	Water (external)	Soil (internal)	Soil (external)	Sediment (internal)	Sediment (external)	Aquatic plants	Aquatic animals	Terrestrial plants	Terrestrial animals	Total by COPC
Harvester Child-10y	C-14	1.46E-06	1.17E-09	7.51E-09	1.63E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.65E-06	3.13E-05	4.14E-05
	Co-60	3.34E-08	8.86E-10	2.43E-09	4.30E-10	3.82E-10	2.16E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.92E-09	3.38E-07	2.20E-05
	Cs-134	7.07E-10	3.15E-11	1.30E-10	1.08E-11	1.18E-11	3.38E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.16E-09	4.42E-08	3.87E-07
	Cs-137	7.48E-10	1.73E-11	1.27E-09	5.33E-11	1.15E-10	1.73E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.78E-09	5.40E-08	1.79E-06
	Cs-138d	0.00E+00	0.00E+00	3.57E-11	0.00E+00	3.25E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.96E-08	6.52E-09	3.61E-08
	HTO	7.35E-06	0.00E+00	2.08E-06	8.00E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.69E-07	1.03E-07	9.88E-06
	I-131	5.04E-06	5.93E-09	4.83E-08	2.59E-10	2.16E-10	4.09E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.57E-07	4.96E-06	1.12E-05
	I-132	3.56E-07	1.95E-07	3.65E-11	1.01E-10	1.63E-13	1.56E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.32E-10	9.04E-12	7.08E-07
	I-133	4.64E-06	4.42E-08	4.60E-09	2.08E-10	2.05E-11	3.43E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.96E-08	2.99E-07	5.42E-06
	I-134	2.85E-07	5.28E-07	1.10E-11	1.05E-10	4.90E-14	1.60E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.20E-10	6.16E-12	9.73E-07
	I-135	1.87E-06	2.25E-07	5.96E-10	3.35E-10	2.66E-12	4.81E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.19E-08	7.16E-09	2.60E-06
	Kr-85	0.00E+00	3.79E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.79E-07
	Kr-85m	0.00E+00	1.48E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.48E-07
	Kr-87	0.00E+00	2.58E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.58E-06
	Kr-88	7.05E-07	9.90E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.06E-05
	OBT	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.95E-08	1.99E-08	4.94E-08
	Rb-88d	0.00E+00	0.00E+00	5.32E-12	0.00E+00	2.35E-13	2.78E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.14E-09	3.05E-10	2.80E-07
	Xe-131md	0.00E+00	1.27E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.27E-13
	Xe-133	0.00E+00	1.50E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.50E-06
	Xe-133dd	0.00E+00	1.55E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.55E-14
	Xe-133md	0.00E+00	1.08E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.08E-11
	Xe-135	0.00E+00	9.46E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.46E-06
	Xe-135dd	0.00E+00	9.10E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.10E-10
	Xe-135m	0.00E+00	5.99E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.99E-06
	Xe-135md	0.00E+00	5.54E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.54E-09
	Xe-138	8.59E-06	9.80E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.07E-04
	Total by pathway	3.03E-05	1.29E-04	2.14E-06	8.15E-08	7.52E-10	2.55E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.85E-06	3.71E-05	2.34E-04

Human Receptor	COPC	Radiological Dose by Pathway (mSv/a)												
		Air (internal)	Air (external)	Water (internal)	Water (external)	Soil (internal)	Soil (external)	Sediment (internal)	Sediment (external)	Aquatic plants	Aquatic animals	Terrestrial plants	Terrestrial animals	Total by COPC
Harvester Infant-1y	C-14	9.93E-07	1.17E-09	9.83E-09	6.71E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.29E-07	2.23E-05	2.40E-05
	Co-60	2.44E-08	1.15E-09	3.90E-09	2.30E-10	1.04E-09	2.81E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.40E-10	3.01E-07	2.84E-05
	Cs-134	3.15E-10	4.10E-11	9.73E-11	5.77E-12	1.50E-11	4.40E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.32E-10	1.82E-08	4.59E-07
	Cs-137	3.53E-10	2.25E-11	9.96E-10	2.85E-11	1.53E-10	2.25E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.65E-10	2.34E-08	2.28E-06
	Cs-138d	0.00E+00	0.00E+00	8.11E-11	0.00E+00	1.25E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.73E-09	8.40E-09	1.22E-08
	HTO	5.07E-06	0.00E+00	2.89E-06	4.18E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.07E-08	7.73E-08	8.10E-06
	I-131	5.43E-06	7.71E-09	1.10E-07	1.39E-10	8.28E-10	5.31E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.53E-08	5.63E-06	1.18E-05
	I-132	4.14E-07	2.54E-07	9.26E-11	5.42E-11	7.00E-13	2.03E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.03E-10	1.27E-11	8.71E-07
	I-133	6.35E-06	5.74E-08	1.32E-08	1.11E-10	1.00E-10	4.46E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.43E-08	4.31E-07	7.31E-06
	I-134	2.89E-07	6.87E-07	2.57E-11	5.60E-11	1.94E-13	2.07E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.86E-11	7.97E-12	1.18E-06
	I-135	2.45E-06	2.92E-07	1.58E-09	1.79E-10	1.19E-11	6.25E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-09	9.51E-09	3.38E-06
	Kr-85	0.00E+00	4.95E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.95E-07
	Kr-85m	0.00E+00	1.92E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.92E-07
	Kr-87	0.00E+00	3.35E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.35E-06
	Kr-88	8.54E-07	1.29E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.37E-05
	OBT	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.22E-09	1.45E-08	1.67E-08
	Rb-88d	0.00E+00	0.00E+00	1.27E-11	0.00E+00	9.52E-13	3.61E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.84E-10	4.15E-10	3.61E-07
	Xe-131md	0.00E+00	1.65E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.65E-13
	Xe-133	0.00E+00	1.95E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.95E-06
	Xe-133dd	0.00E+00	2.02E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.02E-14
	Xe-133md	0.00E+00	1.40E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.40E-11
	Xe-135	0.00E+00	1.23E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.23E-05
	Xe-135dd	0.00E+00	1.18E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.18E-09
	Xe-135m	0.00E+00	7.79E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.79E-06
	Xe-135md	0.00E+00	7.21E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.21E-09
	Xe-138	1.00E-05	1.27E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.37E-04
	Total by pathway	3.19E-05	1.68E-04	3.03E-06	4.26E-08	2.16E-09	3.32E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.68E-07	2.88E-05	2.65E-04

Human Receptor	COPC	Radiological Dose by Pathway (mSv/a)												
		Air (internal)	Air (external)	Water (internal)	Water (external)	Soil (internal)	Soil (external)	Sediment (internal)	Sediment (external)	Aquatic plants	Aquatic animals	Terrestrial plants	Terrestrial animals	Total by COPC
Industrial Commercial Adult +worker	C-14	2.67E-07	3.07E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.36E-05	3.13E-06	3.70E-05
	Co-60	6.12E-09	2.32E-10	0.00E+00	0.00E+00	1.97E-12	4.95E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.05E-09	5.21E-11	4.96E-06
	Cs-134	2.42E-10	8.26E-12	0.00E+00	0.00E+00	2.68E-13	7.75E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.29E-08	9.08E-10	9.16E-08
	Cs-137	2.56E-10	4.54E-12	0.00E+00	0.00E+00	2.50E-12	3.96E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.54E-08	1.27E-09	4.13E-07
	Cs-138d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.97E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.79E-08	0.00E+00	4.79E-08
	HTO	1.62E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.44E-07	6.87E-09	2.37E-06
	I-131	5.78E-07	1.55E-09	0.00E+00	0.00E+00	1.73E-12	1.06E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.77E-07	1.58E-08	1.68E-06
	I-132	4.61E-08	4.96E-08	0.00E+00	0.00E+00	1.40E-15	3.95E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.04E-09	0.00E+00	1.36E-07
	I-133	5.25E-07	1.15E-08	0.00E+00	0.00E+00	1.66E-13	8.89E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.17E-07	1.05E-09	7.44E-07
	I-134	4.96E-08	1.28E-07	0.00E+00	0.00E+00	4.50E-16	3.85E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.48E-10	0.00E+00	2.17E-07
	I-135	2.23E-07	5.83E-08	0.00E+00	0.00E+00	2.11E-14	1.24E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.53E-08	7.20E-11	4.21E-07
	Kr-85	0.00E+00	9.94E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.94E-08
	Kr-85m	0.00E+00	3.82E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.82E-08
	Kr-87	0.00E+00	6.40E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.40E-07
	Kr-88	9.46E-08	2.53E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.62E-06
	OBT	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-07	1.42E-09	1.11E-07
	Rb-88d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.29E-15	7.01E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.44E-09	0.00E+00	7.36E-08
	Xe-131md	0.00E+00	4.19E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.19E-14
	Xe-133	0.00E+00	3.93E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.93E-07
	Xe-133dd	0.00E+00	6.43E-15	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.43E-15
	Xe-133md	0.00E+00	3.53E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.53E-12
	Xe-135	0.00E+00	2.46E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.46E-06
	Xe-135dd	0.00E+00	3.00E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.00E-10
	Xe-135m	0.00E+00	1.27E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.27E-06
	Xe-135md	0.00E+00	1.61E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.61E-09
	Xe-138	9.09E-07	2.05E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.14E-05
	Total by pathway	4.32E-06	2.82E-05	0.00E+00	0.00E+00	6.68E-12	5.89E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.57E-05	3.15E-06	7.72E-05

Table B-4: Estimated Concentrations of Radionuclides in Environmental Media at Human Health Assessment Location under an Air and Water Release Scenario

Environmental Media	Location	Estimated Point Concentrations of Radionuclides													
		Ba-137md	Ba-140	C-14	Co-58	Co-60	Cs-134	Cs-136	Cs-137	Cs-138d	Cu-64	Fe-59	HTO	I-131	I-132
Outdoor Air (Bq/m^3)	Oshawa Resident	5.79E-09	0.00E+00	2.44E-03	0.00E+00	6.70E-08	4.02E-09	0.00E+00	6.09E-09	1.97E-03	0.00E+00	0.00E+00	5.91E-03	3.15E-06	1.30E-05
	Bowmanville Resident	8.44E-09	0.00E+00	3.58E-03	0.00E+00	9.83E-08	5.90E-09	0.00E+00	8.94E-09	4.33E-03	0.00E+00	0.00E+00	8.67E-03	4.64E-06	2.35E-05
	WEB Resident	3.42E-08	0.00E+00	1.46E-02	0.00E+00	4.02E-07	2.41E-08	0.00E+00	3.66E-08	1.74E-02	0.00E+00	0.00E+00	3.55E-02	1.90E-05	9.94E-05
	Farm	3.31E-08	0.00E+00	1.43E-02	0.00E+00	3.93E-07	2.36E-08	0.00E+00	3.57E-08	1.69E-02	0.00E+00	0.00E+00	3.46E-02	1.85E-05	9.83E-05
	Dairy Farm	4.67E-09	0.00E+00	1.97E-03	0.00E+00	5.41E-08	3.24E-09	0.00E+00	4.92E-09	1.53E-03	0.00E+00	0.00E+00	4.77E-03	2.54E-06	1.04E-05
	Rural Resident	1.65E-08	0.00E+00	7.18E-03	0.00E+00	1.97E-07	1.18E-08	0.00E+00	1.80E-08	8.21E-03	0.00E+00	0.00E+00	1.74E-02	9.32E-06	5.05E-05
	Sport Fisher	7.65E-08	0.00E+00	3.53E-02	0.00E+00	9.70E-07	5.82E-08	0.00E+00	8.82E-08	3.30E-02	0.00E+00	0.00E+00	8.56E-02	4.58E-05	2.58E-04
	Camper	1.44E-08	0.00E+00	6.08E-03	0.00E+00	1.67E-07	1.00E-08	0.00E+00	1.52E-08	6.41E-03	0.00E+00	0.00E+00	1.47E-02	7.88E-06	3.66E-05
	Industrial Commercial	2.85E-08	0.00E+00	1.22E-02	0.00E+00	3.35E-07	2.01E-08	0.00E+00	3.05E-08	1.46E-02	0.00E+00	0.00E+00	2.96E-02	1.58E-05	8.19E-05
Soil (Bq/kg(dw))	Oshawa Resident	4.26E-04	4.60E-07	0.00E+00	1.84E-06	9.03E-04	3.27E-05	1.27E-07	4.48E-04	3.05E-04	1.03E-08	1.19E-06	0.00E+00	9.51E-05	4.70E-06
	Bowmanville Resident	4.18E-04	5.19E-07	0.00E+00	2.07E-06	8.23E-04	3.21E-05	1.43E-07	4.40E-04	4.06E-04	1.31E-08	1.34E-06	0.00E+00	1.37E-04	8.29E-06
	WEB Resident	8.47E-04	5.19E-07	0.00E+00	2.07E-06	2.18E-03	6.52E-05	1.43E-07	8.91E-04	1.15E-03	1.31E-08	1.34E-06	0.00E+00	5.56E-04	3.48E-05
	Farm	1.48E-03	0.00E+00	0.00E+00	0.00E+00	4.68E-03	1.14E-04	0.00E+00	1.55E-03	2.57E-03	0.00E+00	0.00E+00	0.00E+00	5.59E-04	3.54E-05
	Dairy Farm	1.95E-04	0.00E+00	0.00E+00	0.00E+00	6.19E-04	1.51E-05	0.00E+00	2.05E-04	2.24E-04	0.00E+00	0.00E+00	0.00E+00	7.65E-05	3.73E-06
	Rural Resident	5.87E-04	5.19E-07	0.00E+00	2.07E-06	1.36E-03	4.52E-05	1.43E-07	6.18E-04	6.70E-04	1.31E-08	1.34E-06	0.00E+00	2.74E-04	1.78E-05
	Camper	6.30E-04	0.00E+00	0.00E+00	0.00E+00	2.00E-03	4.86E-05	0.00E+00	6.63E-04	9.82E-04	0.00E+00	0.00E+00	0.00E+00	2.37E-04	1.32E-05
	Industrial Commercial	1.21E-03	0.00E+00	0.00E+00	0.00E+00	3.84E-03	9.34E-05	0.00E+00	1.27E-03	2.13E-03	0.00E+00	0.00E+00	0.00E+00	4.76E-04	2.94E-05
Lake Water (Bq/L)	Outfall	0.00E+00	9.02E-05	0.00E+00	6.28E-05	1.22E-04	4.24E-05	2.40E-05	6.48E-05	0.00E+00	1.37E-04	6.48E-05	2.42E-01	2.03E-05	0.00E+00
	Beach	1.17E-05	1.68E-05	0.00E+00	1.19E-05	2.31E-05	8.05E-06	4.45E-06	1.23E-05	0.00E+00	1.53E-05	1.22E-05	4.59E-02	3.72E-06	0.00E+00
	WSP (Osh)	5.02E-06	7.04E-06	0.00E+00	5.09E-06	9.92E-06	3.46E-06	1.87E-06	5.29E-06	0.00E+00	3.80E-06	5.22E-06	1.97E-02	1.54E-06	0.00E+00
	WSP (Bow)	5.49E-06	7.73E-06	0.00E+00	5.56E-06	1.08E-05	3.78E-06	2.06E-06	5.78E-06	0.00E+00	4.71E-06	5.71E-06	2.16E-02	1.70E-06	0.00E+00
Deep Well (Bq/L)	WEB Resident	1.35E-122	0.00E+00	7.77E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.72E-01	0.00E+00	0.00E+00
	Farm	3.44E-197	0.00E+00	7.24E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.73E-01	0.00E+00	0.00E+00
	Dairy Farm	1.94E-122	0.00E+00	1.04E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.08E-02	0.00E+00	0.00E+00
	Rural Resident	1.19E-103	0.00E+00	3.86E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.81E-01	0.00E+00	0.00E+00
Shallow Well (Bq/L)	WEB Resident	2.46E-06	1.51E-09	8.36E-05	3.24E-09	3.41E-06	1.76E-07	3.87E-10	2.41E-06	3.12E-06	4.86E-11	1.51E-09	1.61E+00	3.06E-05	1.92E-06
	Farm	4.29E-06	0.00E+00	8.16E-05	0.00E+00	7.31E-06	3.08E-07	0.00E+00	4.19E-06	6.95E-06	0.00E+00	0.00E+00	1.57E+00	3.08E-05	1.95E-06
	Dairy Farm	5.67E-07	0.00E+00	1.12E-05	0.00E+00	9.66E-07	4.07E-08	0.00E+00	5.55E-07	6.06E-07	0.00E+00	0.00E+00	2.17E-01	4.21E-06	2.05E-07
	Rural Resident	1.71E-06	1.51E-09	4.10E-05	3.24E-09	2.12E-06	1.22E-07	3.87E-10	1.67E-06	1.81E-06	4.86E-11	1.51E-09	7.92E-01	1.51E-05	9.79E-07
Sediment (Bq/kg(dw))	Beach	6.74E-02	3.35E-02	0.00E+00	5.10E-01	9.92E-01	7.64E-02	4.23E-02	1.17E-01	0.00E+00	4.85E-02	6.11E-02	0.00E+00	1.64E-02	0.00E+00

Environmental Media	Location	Estimated Point Concentrations of Radionuclides													
		I-133	I-134	I-135	Kr-85	Kr-85m	Kr-87	Kr-88	La-140d	Mn-54	Na-24	OBT	Rb-88d	Sr-91	Xe-131md
Outdoor Air (Bq/m^3)	Oshawa Resident	1.40E-05	2.09E-05	2.46E-05	1.34E-02	1.71E-04	3.80E-04	5.41E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.24E-04	0.00E+00	9.69E-09
	Bowmanville Resident	2.11E-05	5.08E-05	3.88E-05	1.97E-02	2.79E-04	7.98E-04	9.37E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.69E-04	0.00E+00	6.34E-09
	WEB Resident	8.65E-05	2.27E-04	1.61E-04	8.05E-02	1.16E-03	3.47E-03	3.94E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.45E-03	0.00E+00	2.06E-08
	Farm	8.46E-05	2.29E-04	1.58E-04	7.86E-02	1.14E-03	3.46E-03	3.89E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.29E-03	0.00E+00	1.81E-08
	Dairy Farm	1.13E-05	1.62E-05	1.97E-05	1.08E-02	1.37E-04	2.98E-04	4.31E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.26E-04	0.00E+00	8.11E-09
	Rural Resident	4.26E-05	1.22E-04	7.98E-05	3.95E-02	5.81E-04	1.81E-03	1.99E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.03E-03	0.00E+00	7.34E-09
	Sport Fisher	2.10E-04	6.57E-04	3.97E-04	1.94E-01	2.91E-03	9.51E-03	1.01E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.71E-03	0.00E+00	2.22E-08
	Camper	3.54E-05	7.02E-05	6.39E-05	3.34E-02	4.53E-04	1.17E-03	1.49E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.26E-03	0.00E+00	1.64E-08
	Industrial Commercial	7.20E-05	1.84E-04	1.33E-04	6.71E-02	9.63E-04	2.83E-03	3.26E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.13E-03	0.00E+00	1.87E-08
Soil (Bq/kg(dw))	Oshawa Resident	4.58E-05	2.88E-06	2.54E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.77E-07	1.55E-05	3.69E-09	0.00E+00	4.34E-05	1.45E-09	6.59E-05
	Bowmanville Resident	6.74E-05	6.85E-06	3.93E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.37E-07	1.75E-05	4.61E-09	0.00E+00	3.35E-05	1.93E-09	9.50E-05
	WEB Resident	2.74E-04	3.03E-05	1.61E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.37E-07	1.75E-05	4.61E-09	0.00E+00	8.68E-05	1.93E-09	3.85E-04
	Farm	2.76E-04	3.14E-05	1.63E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.86E-04	0.00E+00	3.87E-04
	Dairy Farm	3.68E-05	2.22E-06	2.04E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.33E-05	0.00E+00	5.30E-05
	Rural Resident	1.36E-04	1.63E-05	8.06E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.37E-07	1.75E-05	4.61E-09	0.00E+00	4.50E-05	1.93E-09	1.90E-04
	Camper	1.16E-04	9.64E-06	6.61E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.03E-04	0.00E+00	1.64E-04
	Industrial Commercial	2.35E-04	2.52E-05	1.38E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.67E-04	0.00E+00	3.30E-04
Lake Water (Bq/L)	Outfall	3.50E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E-04	3.50E-05	0.00E+00	0.00E+00	3.69E-05	0.00E+00
	Beach	4.83E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.58E-06	2.28E-05	4.27E-06	0.00E+00	0.00E+00	3.48E-06	8.78E-08
	WSP (Osh)	1.48E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.07E-06	9.79E-06	1.15E-06	0.00E+00	0.00E+00	7.15E-07	7.52E-08
	WSP (Bow)	1.75E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.04E-06	1.07E-05	1.40E-06	0.00E+00	0.00E+00	9.23E-07	7.31E-08
Deep Well (Bq/L)	WEB Resident	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.86E-148
	Farm	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.68E-242
	Dairy Farm	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.52E-148
	Rural Resident	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.62E-125
Shallow Well (Bq/L)	WEB Resident	1.51E-05	1.67E-06	8.88E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.32E-10	1.59E-08	2.77E-11	0.00E+00	4.82E-07	2.79E-11	2.50E-03
	Farm	1.52E-05	1.73E-06	8.97E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.03E-06	0.00E+00	2.52E-03
	Dairy Farm	2.03E-06	1.22E-07	1.12E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.85E-07	0.00E+00	3.44E-04
	Rural Resident	7.49E-06	8.99E-07	4.44E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.32E-10	1.59E-08	2.77E-11	0.00E+00	2.50E-07	2.79E-11	1.24E-03
Sediment (Bq/kg(dw))	Beach	2.13E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.38E-03	2.96E+00	2.05E-03	0.00E+00	0.00E+00	6.60E-04	0.00E+00

Environmental Media	Location	Estimated Point Concentrations of Radionuclides										
		Xe-133	Xe-133dd	Xe-133md	Xe-135	Xe-135d	Xe-135dd	Xe-135m	Xe-135md	Xe-138	Y-91	Zn-65
Outdoor Air (Bq/m^3)	Oshawa Resident	9.68E-03	9.18E-10	2.35E-07	7.20E-03	1.75E-04	2.25E-06	5.44E-04	3.74E-06	9.33E-04	0.00E+00	0.00E+00
	Bowmanville Resident	1.43E-02	2.83E-10	1.56E-07	1.11E-02	2.12E-04	1.52E-06	2.88E-03	4.62E-06	5.24E-03	0.00E+00	0.00E+00
	WEB Resident	5.84E-02	7.57E-10	5.08E-07	4.60E-02	7.78E-04	4.93E-06	1.53E-02	1.70E-05	2.84E-02	0.00E+00	0.00E+00
	Farm	5.70E-02	5.90E-10	4.47E-07	4.50E-02	7.25E-04	4.33E-06	1.63E-02	1.58E-05	3.04E-02	0.00E+00	0.00E+00
	Dairy Farm	7.81E-03	7.82E-10	1.96E-07	5.79E-03	1.43E-04	1.88E-06	3.70E-04	3.05E-06	6.25E-04	0.00E+00	0.00E+00
	Rural Resident	2.87E-02	1.89E-10	1.81E-07	2.28E-02	3.28E-04	1.75E-06	9.60E-03	7.17E-06	1.80E-02	0.00E+00	0.00E+00
	Sport Fisher	1.41E-01	3.43E-10	5.51E-07	1.13E-01	1.18E-03	5.26E-06	6.31E-02	2.59E-05	1.21E-01	0.00E+00	0.00E+00
	Camper	2.42E-02	1.11E-09	4.00E-07	1.85E-02	4.06E-04	3.89E-06	2.93E-03	8.77E-06	5.22E-03	0.00E+00	0.00E+00
	Industrial Commercial	4.87E-02	7.40E-10	4.61E-07	3.82E-02	6.74E-04	4.48E-06	1.18E-02	1.47E-05	2.17E-02	0.00E+00	0.00E+00
Soil (Bq/kg(dw))	Oshawa Resident	0.00E+00	3.54E-05	4.24E-05	0.00E+00	0.00E+00	2.51E-05	0.00E+00	4.07E-06	0.00E+00	6.07E-09	5.05E-06
	Bowmanville Resident	0.00E+00	5.21E-05	6.23E-05	0.00E+00	0.00E+00	3.87E-05	0.00E+00	6.28E-06	0.00E+00	6.83E-09	5.67E-06
	WEB Resident	0.00E+00	2.12E-04	2.54E-04	0.00E+00	0.00E+00	1.59E-04	0.00E+00	2.58E-05	0.00E+00	6.83E-09	5.67E-06
	Farm	0.00E+00	2.13E-04	2.55E-04	0.00E+00	0.00E+00	1.61E-04	0.00E+00	2.60E-05	0.00E+00	0.00E+00	0.00E+00
	Dairy Farm	0.00E+00	2.84E-05	3.40E-05	0.00E+00	0.00E+00	2.01E-05	0.00E+00	3.25E-06	0.00E+00	0.00E+00	0.00E+00
	Rural Resident	0.00E+00	1.05E-04	1.26E-04	0.00E+00	0.00E+00	7.94E-05	0.00E+00	1.29E-05	0.00E+00	6.83E-09	5.67E-06
	Camper	0.00E+00	8.94E-05	1.07E-04	0.00E+00	0.00E+00	6.52E-05	0.00E+00	1.06E-05	0.00E+00	0.00E+00	0.00E+00
	Industrial Commercial	0.00E+00	1.81E-04	2.17E-04	0.00E+00	0.00E+00	1.36E-04	0.00E+00	2.20E-05	0.00E+00	0.00E+00	0.00E+00
Lake Water (Bq/L)	Outfall	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.98E-05
	Beach	0.00E+00	1.89E-08	6.75E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.38E-08	9.44E-06
	WSP (Osh)	0.00E+00	2.89E-08	4.74E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.54E-08	4.05E-06
	WSP (Bow)	0.00E+00	2.56E-08	4.82E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E-08	4.43E-06
Deep Well (Bq/L)	WEB Resident	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Farm	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Dairy Farm	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Rural Resident	0.00E+00	1.04E-276	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Shallow Well (Bq/L)	WEB Resident	0.00E+00	1.38E-03	1.65E-03	0.00E+00	0.00E+00	1.03E-03	0.00E+00	1.68E-04	0.00E+00	9.48E-12	2.36E-09
	Farm	0.00E+00	1.39E-03	1.66E-03	0.00E+00	0.00E+00	1.04E-03	0.00E+00	1.69E-04	0.00E+00	0.00E+00	0.00E+00
	Dairy Farm	0.00E+00	1.85E-04	2.21E-04	0.00E+00	0.00E+00	1.30E-04	0.00E+00	2.12E-05	0.00E+00	0.00E+00	0.00E+00
	Rural Resident	0.00E+00	6.82E-04	8.16E-04	0.00E+00	0.00E+00	5.16E-04	0.00E+00	8.37E-05	0.00E+00	9.48E-12	2.36E-09
Sediment (Bq/kg(dw))	Beach	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.04E-05	4.72E-03

Table B-5: Estimated Concentrations of Radionuclides in Food Items for Human Receptors under an Air and Water Release Scenario

Food Item	Location	Estimated Point Concentrations of Radionuclides in Food Items for Human Receptors (Bq/kg(fw))													
		Ba-137md	Ba-140	C-14	Co-58	Co-60	Cs-134	Cs-136	Cs-137	Cs-138d	Cu-64	Fe-59	HTO	I-131	I-132
Freshwater Fish	Outfall	0.00E+00	8.39E-05	0.00E+00	3.39E-03	6.57E-03	1.48E-01	8.39E-02	2.27E-01	0.00E+00	3.69E-02	1.56E-02	1.81E-01	1.22E-04	0.00E+00
Walleye	Outfall	0.00E+00	8.39E-05	0.00E+00	3.39E-03	6.57E-03	1.48E-01	8.39E-02	2.27E-01	0.00E+00	3.69E-02	1.56E-02	1.81E-01	1.22E-04	0.00E+00
Freshwater Fish	Beach	0.00E+00	1.56E-05	0.00E+00	6.41E-04	1.25E-03	2.82E-02	1.56E-02	4.30E-02	0.00E+00	4.14E-03	2.93E-03	3.44E-02	2.23E-05	0.00E+00
Honeybee	Apiary	0.00E+00	0.00E+00	9.66E+00	0.00E+00	5.51E-04	1.86E-05	0.00E+00	2.95E-05	0.00E+00	0.00E+00	0.00E+00	2.43E+00	4.75E-01	0.00E+00
Fruits	Oshawa Resident	2.32E-10	5.95E-07	5.80E-01	8.76E-07	2.67E-05	1.94E-05	1.62E-06	3.22E-05	6.44E-03	1.92E-07	7.96E-07	3.50E-01	7.80E-04	4.93E-05
Garden Vegetables	Oshawa Resident	2.32E-10	5.95E-07	5.80E-01	8.76E-07	2.67E-05	1.94E-05	1.62E-06	3.22E-05	6.44E-03	1.92E-07	7.96E-07	3.50E-01	7.80E-04	4.93E-05
Potatoes	Oshawa Resident	1.10E-10	2.86E-07	1.22E+00	4.31E-07	1.96E-05	9.51E-06	7.72E-07	1.92E-05	3.07E-03	9.16E-08	3.80E-07	3.07E-01	3.72E-04	2.35E-05
Fruits	Bowmanville Resident	2.62E-10	6.72E-07	8.51E-01	9.84E-07	2.94E-05	2.20E-05	1.83E-06	3.61E-05	1.10E-02	2.44E-07	8.95E-07	5.02E-01	1.12E-03	8.65E-05
Garden Vegetables	Bowmanville Resident	2.62E-10	6.72E-07	8.51E-01	9.84E-07	2.94E-05	2.20E-05	1.83E-06	3.61E-05	1.10E-02	2.44E-07	8.95E-07	5.02E-01	1.12E-03	8.65E-05
Potatoes	Bowmanville Resident	1.25E-10	3.22E-07	1.79E+00	4.85E-07	2.03E-05	1.07E-05	8.71E-07	2.10E-05	5.25E-03	1.16E-07	4.27E-07	4.40E-01	5.33E-04	4.13E-05
Fruits	WEB Resident	6.39E-10	1.82E-07	3.48E+00	2.72E-07	9.43E-05	5.19E-05	4.92E-07	8.78E-05	3.87E-02	6.58E-08	2.41E-07	3.04E+00	4.52E-03	3.62E-04
Garden Vegetables	WEB Resident	6.39E-10	1.82E-07	3.48E+00	2.72E-07	9.43E-05	5.19E-05	4.92E-07	8.78E-05	3.87E-02	6.58E-08	2.41E-07	3.04E+00	4.52E-03	3.62E-04
Potatoes	WEB Resident	3.04E-10	8.90E-08	7.32E+00	1.45E-07	6.16E-05	2.53E-05	2.36E-07	4.95E-05	1.84E-02	3.15E-08	1.16E-07	2.67E+00	2.16E-03	1.73E-04
Fruits	Farm	8.41E-10	0.00E+00	3.40E+00	0.00E+00	1.41E-04	7.11E-05	0.00E+00	1.19E-04	5.47E-02	0.00E+00	0.00E+00	3.39E+00	4.58E-03	3.71E-04
Garden Vegetables	Farm	8.41E-10	0.00E+00	3.40E+00	0.00E+00	1.41E-04	7.11E-05	0.00E+00	1.19E-04	5.47E-02	0.00E+00	0.00E+00	3.39E+00	4.58E-03	3.71E-04
Potatoes	Farm	4.01E-10	0.00E+00	7.14E+00	0.00E+00	1.03E-04	3.48E-05	0.00E+00	7.00E-05	2.60E-02	0.00E+00	0.00E+00	2.97E+00	2.19E-03	1.77E-04
Beef (meat)	Farm	0.00E+00	0.00E+00	1.37E+01	0.00E+00	7.39E-06	1.03E-04	0.00E+00	2.24E-04	0.00E+00	0.00E+00	0.00E+00	9.10E-01	1.80E-03	0.00E+00
Lamb	Farm	0.00E+00	0.00E+00	1.87E+01	0.00E+00	1.52E-04	2.03E-04	0.00E+00	3.86E-04	0.00E+00	0.00E+00	0.00E+00	1.01E+00	1.69E-02	0.00E+00
Pig	Farm	0.00E+00	0.00E+00	1.96E+01	0.00E+00	1.09E-04	2.15E-04	0.00E+00	3.90E-04	0.00E+00	0.00E+00	0.00E+00	3.61E-01	2.60E-03	0.00E+00
Poultry (egg)	Farm	0.00E+00	0.00E+00	1.07E-01	0.00E+00	8.46E-07	3.82E-07	0.00E+00	3.53E-06	0.00E+00	0.00E+00	0.00E+00	3.55E-01	7.99E-05	0.00E+00
Poultry (meat)	Farm	0.00E+00	0.00E+00	1.66E-01	0.00E+00	2.49E-05	2.58E-06	0.00E+00	2.38E-05	0.00E+00	0.00E+00	0.00E+00	3.55E-01	2.90E-07	0.00E+00
Fruits	Dairy Farm	1.13E-10	0.00E+00	4.68E-01	0.00E+00	1.88E-05	9.52E-06	0.00E+00	1.57E-05	4.86E-03	0.00E+00	0.00E+00	3.57E-01	6.27E-04	3.91E-05
Garden Vegetables	Dairy Farm	1.13E-10	0.00E+00	4.68E-01	0.00E+00	1.88E-05	9.52E-06	0.00E+00	1.57E-05	4.86E-03	0.00E+00	0.00E+00	3.57E-01	6.27E-04	3.91E-05
Potatoes	Dairy Farm	5.40E-11	0.00E+00	9.83E-01	0.00E+00	1.37E-05	4.67E-06	0.00E+00	9.23E-06	2.31E-03	0.00E+00	0.00E+00	3.14E-01	2.99E-04	1.86E-05
Beef (meat)	Dairy Farm	0.00E+00	0.00E+00	1.67E+00	0.00E+00	6.52E-06	2.52E-05	0.00E+00	4.69E-05	0.00E+00	0.00E+00	0.00E+00	1.19E-01	4.73E-03	0.00E+00
Cow (milk)	Dairy Farm	0.00E+00	0.00E+00	5.42E-01	0.00E+00	2.51E-06	7.91E-06	0.00E+00	1.48E-05	0.00E+00	0.00E+00	0.00E+00	1.49E-01	5.72E-03	0.00E+00
Poultry (egg)	Dairy Farm	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.06E-07	3.14E-08	0.00E+00	4.20E-07	0.00E+00	0.00E+00	0.00E+00	5.74E-02	3.79E-06	0.00E+00
Poultry (meat)	Dairy Farm	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.12E-06	2.12E-07	0.00E+00	2.83E-06	0.00E+00	0.00E+00	0.00E+00	5.74E-02	1.38E-08	0.00E+00
Fruits	Rural Resident	3.10E-10	1.48E-09	1.71E+00	9.86E-09	5.05E-05	2.64E-05	8.30E-10	4.43E-05	1.97E-02	1.06E-10	7.20E-10	1.41E+00	2.24E-03	1.85E-04
Garden Vegetables	Rural Resident	3.10E-10	1.48E-09	1.71E+00	9.86E-09	5.05E-05	2.64E-05	8.30E-10	4.43E-05	1.97E-02	1.06E-10	7.20E-10	1.41E+00	2.24E-03	1.85E-04
Potatoes	Rural Resident	1.48E-10	3.06E-09	3.59E+00	2.05E-08	3.44E-05	1.29E-05	1.63E-09	2.64E-05	9.39E-03	2.21E-10	1.43E-09	1.24E+00	1.07E-03	8.84E-05
Poultry (egg)	Rural Resident	0.00E+00	2.63E-09	0.00E+00	3.75E-10	2.54E-07	1.06E-07	3.31E-10	1.43E-06	0.00E+00	5.88E-11	1.30E-08	4.57E-01	2.23E-05	0.00E+00
Canada Goose	Harvester	1.10E-09	0.00E+00	1.66E+01	0.00E+00	1.81E-03	2.99E-04	0.00E+00	4.76E-04	1.99E-02	0.00E+00	0.00E+00	1.51E+00	8.11E-04	4.27E-07
Deer	Harvester	0.00E+00	0.00E+00	1.37E+01	0.00E+00	6.38E-04	4.71E-04	0.00E+00	7.57E-04	0.00E+00	0.00E+00	0.00E+00	1.62E+00	8.45E-02	0.00E+00
Deer Organ	Harvester	1.23E-07	0.00E+00	1.37E+01	0.00E+00	2.41E-02	4.27E-04	0.00E+00	6.86E-04	2.61E-02	0.00E+00	0.00E+00	1.62E+00	2.39E-02	1.17E-05
Mallard	Harvester	0.00E+00	0.00E+00	3.98E+01	0.00E+00	2.34E-04	5.44E-05	0.00E+00	8.65E-05	0.00E+00	0.00E+00	0.00E+00	2.03E+00	4.48E-06	0.00E+00
Rabbit	Harvester	0.00E+00	0.00E+00	1.37E+01	0.00E+00	4.34E-04	1.54E-02	0.00E+00	2.71E-02	0.00E+00	0.00E+00	0.00E+00	1.71E+00	5.34E-02	0.00E+00

Table B- 6: Estimated Radiation Doses by Pathways for Human Receptors under an Air and Water Release Scenario

Food Item	Location	Estimated Point Concentrations of Radionuclides in Food Items for Human Receptors (Bq/kg(fw))											
		I-133	I-134	I-135	La-140d	Mn-54	Na-24	OBT	Rb-88d	Sr-91	Y-91	Zn-65	Zn-69m
Freshwater Fish	Outfall	2.10E-04	0.00E+00	0.00E+00	0.00E+00	2.88E-02	2.94E-03	3.38E-02	0.00E+00	7.38E-05	0.00E+00	2.49E-01	3.86E-01
Walleye	Outfall	2.10E-04	0.00E+00	0.00E+00	0.00E+00	2.88E-02	2.94E-03	3.38E-02	0.00E+00	7.38E-05	0.00E+00	2.49E-01	3.86E-01
Freshwater Fish	Beach	2.90E-05	0.00E+00	0.00E+00	3.87E-05	5.47E-03	3.58E-04	6.42E-03	0.00E+00	6.95E-06	4.75E-07	4.72E-02	4.53E-02
Honeybee	Apiary	1.47E-01	0.00E+00	1.54E-02	0.00E+00	0.00E+00	0.00E+00	2.38E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fruits	Oshawa Resident	4.68E-04	3.03E-05	2.65E-04	3.23E-08	2.01E-05	6.85E-08	1.53E-02	9.17E-04	2.73E-08	2.54E-09	8.67E-06	1.29E-07
Garden Vegetables	Oshawa Resident	4.68E-04	3.03E-05	2.65E-04	3.23E-08	2.01E-05	6.85E-08	1.53E-02	9.17E-04	2.73E-08	2.54E-09	8.67E-06	1.29E-07
Potatoes	Oshawa Resident	2.23E-04	1.44E-05	1.26E-04	1.62E-08	1.05E-05	3.27E-08	3.20E-02	4.37E-04	1.32E-08	1.23E-09	5.19E-06	6.31E-08
Fruits	Bowmanville Resident	6.85E-04	7.16E-05	4.08E-04	3.28E-08	2.26E-05	8.54E-08	2.19E-02	9.09E-04	3.62E-08	2.69E-09	9.73E-06	1.63E-07
Garden Vegetables	Bowmanville Resident	6.85E-04	7.16E-05	4.08E-04	3.28E-08	2.26E-05	8.54E-08	2.19E-02	9.09E-04	3.62E-08	2.69E-09	9.73E-06	1.63E-07
Potatoes	Bowmanville Resident	3.27E-04	3.42E-05	1.94E-04	1.65E-08	1.18E-05	4.08E-08	4.59E-02	4.33E-04	1.75E-08	1.31E-09	5.83E-06	7.94E-08
Fruits	WEB Resident	2.78E-03	3.16E-04	1.67E-03	9.23E-09	6.56E-06	2.30E-08	1.32E-01	2.91E-03	9.85E-09	7.36E-10	3.16E-06	4.47E-08
Garden Vegetables	WEB Resident	2.78E-03	3.16E-04	1.67E-03	9.23E-09	6.56E-06	2.30E-08	1.32E-01	2.91E-03	9.85E-09	7.36E-10	3.16E-06	4.47E-08
Potatoes	WEB Resident	1.33E-03	1.51E-04	7.96E-04	5.27E-09	4.11E-06	1.11E-08	2.78E-01	1.38E-03	4.96E-09	3.75E-10	2.70E-06	2.31E-08
Fruits	Farm	2.82E-03	3.30E-04	1.70E-03	0.00E+00	0.00E+00	0.00E+00	1.47E-01	3.97E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Garden Vegetables	Farm	2.82E-03	3.30E-04	1.70E-03	0.00E+00	0.00E+00	0.00E+00	1.47E-01	3.97E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potatoes	Farm	1.35E-03	1.58E-04	8.09E-04	0.00E+00	0.00E+00	0.00E+00	3.10E-01	1.89E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beef (meat)	Farm	5.74E-04	0.00E+00	1.20E-04	0.00E+00	0.00E+00	0.00E+00	5.42E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Lamb	Farm	5.29E-03	0.00E+00	6.03E-04	0.00E+00	0.00E+00	0.00E+00	4.42E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Pig	Farm	8.33E-04	0.00E+00	1.78E-04	0.00E+00	0.00E+00	0.00E+00	9.11E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Poultry (egg)	Farm	1.10E-04	0.00E+00	1.72E-04	0.00E+00	0.00E+00	0.00E+00	3.10E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Poultry (meat)	Farm	3.99E-07	0.00E+00	6.23E-07	0.00E+00	0.00E+00	0.00E+00	3.91E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fruits	Dairy Farm	3.76E-04	2.33E-05	2.12E-04	0.00E+00	0.00E+00	0.00E+00	1.56E-02	7.22E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Garden Vegetables	Dairy Farm	3.76E-04	2.33E-05	2.12E-04	0.00E+00	0.00E+00	0.00E+00	1.56E-02	7.22E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potatoes	Dairy Farm	1.79E-04	1.11E-05	1.01E-04	0.00E+00	0.00E+00	0.00E+00	3.27E-02	3.44E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beef (meat)	Dairy Farm	1.44E-03	0.00E+00	1.52E-04	0.00E+00	0.00E+00	0.00E+00	7.53E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cow (milk)	Dairy Farm	1.74E-03	0.00E+00	1.81E-04	0.00E+00	0.00E+00	0.00E+00	2.37E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Poultry (egg)	Dairy Farm	1.25E-05	0.00E+00	2.12E-05	0.00E+00	0.00E+00	0.00E+00	4.99E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Poultry (meat)	Dairy Farm	4.53E-08	0.00E+00	7.68E-08	0.00E+00	0.00E+00	0.00E+00	6.31E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fruits	Rural Resident	1.38E-03	1.71E-04	8.35E-04	5.40E-10	6.18E-07	5.56E-11	6.15E-02	1.32E-03	1.68E-10	1.54E-11	7.38E-07	1.13E-09
Garden Vegetables	Rural Resident	1.38E-03	1.71E-04	8.35E-04	5.40E-10	6.18E-07	5.56E-11	6.15E-02	1.32E-03	1.68E-10	1.54E-11	7.38E-07	1.13E-09
Potatoes	Rural Resident	6.58E-04	8.14E-05	3.98E-04	1.13E-09	1.29E-06	1.16E-10	1.29E-01	6.31E-04	3.52E-10	3.17E-11	1.55E-06	2.38E-09
Poultry (egg)	Rural Resident	5.13E-05	0.00E+00	8.81E-05	2.67E-11	3.91E-09	1.22E-10	3.98E-02	0.00E+00	5.88E-12	1.45E-13	4.13E-08	6.35E-11
Canada Goose	Harvester	2.54E-04	8.70E-07	2.77E-05	0.00E+00	0.00E+00	0.00E+00	1.05E-01	1.10E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Deer	Harvester	2.64E-02	0.00E+00	2.88E-03	0.00E+00	0.00E+00	0.00E+00	1.32E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Deer Organ	Harvester	7.49E-03	2.36E-05	8.16E-04	0.00E+00	0.00E+00	0.00E+00	1.32E-01	1.18E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mallard	Harvester	2.68E-06	0.00E+00	2.01E-06	0.00E+00	0.00E+00	0.00E+00	5.93E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Rabbit	Harvester	1.67E-02	0.00E+00	1.83E-03	0.00E+00	0.00E+00	0.00E+00	1.50E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Note: Estimated concentrations of noble gases in the tissues of ecological receptors are zero, which are not shown in this table.

Table B- 7: Estimated Radiation Doses by Pathways for Human Receptors under an Air and Water Release Scenario

Human Receptor	COPC	Radiological Dose by Pathway during Project Phases (mSv/a)												
		Air (internal)	Air (external)	Water (internal)	Water (external)	Soil (internal)	Soil (external)	Sediment (internal)	Sediment (external)	Aquatic plants	Aquatic animals	Terrestrial plants	Terrestrial animals	Total by COPC
Oshawa Resident Adult +worker	Ba-140	0.00E+00	0.00E+00	5.08E-09	2.72E-10	6.39E-16	2.45E-09	1.55E-11	4.86E-07	0.00E+00	0.00E+00	1.38E-12	0.00E+00	4.94E-07
	C-14	1.80E-07	2.07E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.69E-04	2.49E-05	1.94E-04
	Co-58	0.00E+00	0.00E+00	1.04E-09	1.08E-09	7.30E-16	3.39E-09	6.74E-11	2.57E-06	0.00E+00	0.00E+00	5.80E-13	0.00E+00	2.58E-06
	Co-60	4.13E-09	1.57E-10	9.35E-09	5.61E-09	1.71E-12	4.30E-06	6.02E-10	1.27E-05	0.00E+00	0.00E+00	2.64E-08	4.15E-10	1.71E-05
	Cs-134	1.64E-10	5.58E-12	1.82E-08	1.16E-09	3.42E-13	9.90E-08	2.59E-10	6.18E-07	0.00E+00	0.00E+00	6.74E-08	7.26E-09	8.11E-07
	Cs-136	0.00E+00	0.00E+00	1.56E-09	9.00E-10	2.04E-16	5.13E-10	2.26E-11	4.70E-07	0.00E+00	0.00E+00	4.31E-12	0.00E+00	4.73E-07
	Cs-137	1.73E-10	3.07E-12	1.91E-08	6.45E-10	3.20E-12	5.08E-07	2.71E-10	3.43E-07	0.00E+00	0.00E+00	8.06E-08	1.01E-08	9.61E-07
	Cs-138d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.60E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.49E-07	0.00E+00	2.49E-07
	Cu-64	0.00E+00	0.00E+00	1.27E-10	2.22E-10	6.62E-19	3.84E-12	1.04E-12	5.08E-08	0.00E+00	0.00E+00	2.05E-14	0.00E+00	5.11E-08
	Fe-59	0.00E+00	0.00E+00	2.61E-09	1.41E-09	1.15E-15	2.61E-09	1.96E-11	3.74E-07	0.00E+00	0.00E+00	1.27E-12	0.00E+00	3.81E-07
	HTO	1.09E-06	0.00E+00	1.09E-07	6.70E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.95E-06	4.52E-08	5.21E-06
	I-131	3.89E-07	1.05E-09	9.41E-09	1.27E-10	1.17E-12	7.22E-08	6.42E-11	3.22E-08	0.00E+00	0.00E+00	4.99E-06	1.32E-07	5.63E-06
	I-132	2.52E-08	2.72E-08	0.00E+00	0.00E+00	7.72E-16	2.18E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.33E-09	0.00E+00	7.95E-08
	I-133	3.46E-07	7.61E-09	1.77E-09	2.30E-10	1.10E-13	5.90E-08	1.63E-11	6.70E-08	0.00E+00	0.00E+00	6.01E-07	8.26E-09	1.09E-06
	I-134	2.00E-08	5.18E-08	0.00E+00	0.00E+00	1.83E-16	1.57E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-09	0.00E+00	8.93E-08
	I-135	1.40E-07	3.65E-08	0.00E+00	0.00E+00	1.33E-14	7.81E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.81E-08	3.66E-10	3.33E-07
	Kr-85	0.00E+00	6.71E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.71E-08
	Kr-85m	0.00E+00	2.31E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.31E-08
	Kr-87	0.00E+00	3.00E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.00E-07
	Kr-88	5.39E-08	1.44E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.49E-06
	La-140d	0.00E+00	0.00E+00	1.15E-09	0.00E+00	5.11E-16	0.00E+00	1.56E-12	0.00E+00	0.00E+00	0.00E+00	5.80E-14	0.00E+00	1.15E-09
	Mn-54	0.00E+00	0.00E+00	1.93E-09	1.79E-09	5.91E-15	2.45E-08	3.75E-10	1.28E-05	0.00E+00	0.00E+00	1.29E-11	0.00E+00	1.28E-05
	Na-24	0.00E+00	0.00E+00	1.37E-10	1.45E-09	8.49E-19	2.63E-11	1.57E-13	4.18E-08	0.00E+00	0.00E+00	2.61E-14	0.00E+00	4.34E-08
	OBT	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.81E-07	9.29E-09	5.90E-07
	Rb-88d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.16E-15	6.63E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.77E-08	0.00E+00	8.40E-08
	Sr-91	0.00E+00	0.00E+00	1.29E-10	1.77E-10	5.05E-19	1.09E-12	7.65E-14	2.50E-09	0.00E+00	0.00E+00	1.58E-14	0.00E+00	2.80E-09
	Xe-131md	0.00E+00	6.86E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.86E-14
	Xe-133	0.00E+00	2.64E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.64E-07
	Xe-133dd	0.00E+00	2.41E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.41E-14
	Xe-133md	0.00E+00	5.70E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.70E-12
	Xe-135	0.00E+00	1.57E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.57E-06
	Xe-135dd	0.00E+00	4.78E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.78E-10
	Xe-135m	0.00E+00	2.38E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.38E-07
	Xe-135md	0.00E+00	1.35E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.35E-09
	Xe-138	1.60E-07	3.63E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.79E-06
	Y-91	0.00E+00	0.00E+00	1.03E-11	2.60E-14	7.80E-18	9.00E-13	1.73E-14	1.60E-12	0.00E+00	0.00E+00	5.43E-15	0.00E+00	1.28E-11
	Zn-65	0.00E+00	0.00E+00	4.38E-09	5.26E-10	1.05E-14	5.44E-09	3.28E-12	1.41E-08	0.00E+00	0.00E+00	3.16E-11	0.00E+00	2.45E-08
	Zn-69m	0.00E+00	0.00E+00	2.15E-10	2.92E-10	1.22E-18	5.67E-12	2.66E-13	1.04E-08	0.00E+00	0.00E+00	3.81E-14	0.00E+00	1.09E-08
	Total by pathway	2.41E-06	7.66E-06	1.86E-07	2.26E-08	6.58E-12	5.26E-06	1.72E-09	3.06E-05	0.00E+00	0.00E+00	1.80E-04	2.52E-05	2.51E-04

Human Receptor	COPC	Radiological Dose by Pathway during Project Phases (mSv/a)												
		Air (internal)	Air (external)	Water (internal)	Water (external)	Soil (internal)	Soil (external)	Sediment (internal)	Sediment (external)	Aquatic plants	Aquatic animals	Terrestrial plants	Terrestrial animals	Total by COPC
Oshawa Resident Child-10y	Ba-140	0.00E+00	0.00E+00	4.49E-09	2.75E-10	1.98E-14	2.47E-09	4.81E-10	4.90E-07	0.00E+00	0.00E+00	2.15E-12	0.00E+00	4.98E-07
	C-14	2.48E-07	2.00E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.51E-04	1.85E-05	1.70E-04
	Co-58	0.00E+00	0.00E+00	9.50E-10	1.09E-09	2.33E-14	3.43E-09	2.15E-09	2.60E-06	0.00E+00	0.00E+00	9.34E-13	0.00E+00	2.60E-06
	Co-60	5.69E-09	1.51E-10	1.20E-08	5.66E-09	7.37E-11	4.17E-06	2.70E-08	1.29E-05	0.00E+00	0.00E+00	5.59E-08	7.48E-10	1.71E-05
	Cs-134	1.21E-10	5.38E-12	5.32E-09	1.18E-09	3.40E-12	9.73E-08	2.65E-09	6.24E-07	0.00E+00	0.00E+00	3.26E-08	2.87E-09	7.66E-07
	Cs-136	0.00E+00	0.00E+00	9.06E-10	9.09E-10	4.14E-15	5.17E-10	4.61E-10	4.75E-07	0.00E+00	0.00E+00	4.44E-12	0.00E+00	4.78E-07
	Cs-137	1.28E-10	2.96E-12	5.81E-09	6.51E-10	3.33E-11	4.99E-07	2.89E-09	3.46E-07	0.00E+00	0.00E+00	4.06E-08	4.18E-09	9.00E-07
	Cs-138d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.85E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.01E-07	0.00E+00	3.01E-07
	Cu-64	0.00E+00	0.00E+00	1.04E-10	2.24E-10	1.92E-17	3.87E-12	3.00E-11	5.12E-08	0.00E+00	0.00E+00	2.99E-14	0.00E+00	5.16E-08
	Fe-59	0.00E+00	0.00E+00	2.70E-09	1.42E-09	4.16E-14	2.63E-09	7.11E-10	3.78E-07	0.00E+00	0.00E+00	2.33E-12	0.00E+00	3.85E-07
	HTO	1.25E-06	0.00E+00	5.42E-08	5.64E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.22E-06	3.14E-08	4.57E-06
	I-131	8.57E-07	1.01E-09	8.81E-09	1.28E-10	3.67E-11	6.96E-08	2.11E-09	3.25E-08	0.00E+00	0.00E+00	7.73E-06	1.79E-07	8.88E-06
	I-132	4.72E-08	2.59E-08	0.00E+00	0.00E+00	2.16E-14	2.08E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.47E-09	0.00E+00	1.01E-07
	I-133	7.70E-07	7.33E-09	1.63E-09	2.33E-10	3.40E-12	5.69E-08	5.26E-10	6.76E-08	0.00E+00	0.00E+00	9.15E-07	1.10E-08	1.83E-06
	I-134	2.61E-08	4.84E-08	0.00E+00	0.00E+00	4.49E-15	1.46E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.25E-09	0.00E+00	9.13E-08
	I-135	2.92E-07	3.51E-08	0.00E+00	0.00E+00	4.15E-13	7.51E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.21E-07	4.80E-10	5.24E-07
	Kr-85	0.00E+00	6.47E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.47E-08
	Kr-85m	0.00E+00	2.21E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.21E-08
	Kr-87	0.00E+00	2.83E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.83E-07
	Kr-88	9.80E-08	1.38E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.47E-06
	La-140d	0.00E+00	0.00E+00	9.54E-10	0.00E+00	1.49E-14	0.00E+00	4.55E-11	0.00E+00	0.00E+00	0.00E+00	8.54E-14	0.00E+00	1.00E-09
	Mn-54	0.00E+00	0.00E+00	1.40E-09	1.80E-09	1.50E-13	2.47E-08	9.53E-09	1.29E-05	0.00E+00	0.00E+00	1.66E-11	0.00E+00	1.30E-05
	Na-24	0.00E+00	0.00E+00	9.74E-11	1.47E-09	2.11E-17	2.65E-11	3.90E-12	4.22E-08	0.00E+00	0.00E+00	3.28E-14	0.00E+00	4.38E-08
	OBT	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.14E-07	6.98E-09	5.21E-07
	Rb-88d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.48E-14	6.46E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.19E-08	0.00E+00	8.66E-08
	Sr-91	0.00E+00	0.00E+00	9.43E-11	1.79E-10	1.29E-17	1.10E-12	1.96E-12	2.52E-09	0.00E+00	0.00E+00	2.04E-14	0.00E+00	2.80E-09
	Xe-131md	0.00E+00	6.80E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.80E-14
	Xe-133	0.00E+00	2.55E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.55E-07
	Xe-133dd	0.00E+00	2.42E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.42E-14
	Xe-133md	0.00E+00	5.64E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.64E-12
	Xe-135	0.00E+00	1.51E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.51E-06
	Xe-135dd	0.00E+00	4.73E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.73E-10
	Xe-135m	0.00E+00	2.00E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.00E-07
	Xe-135md	0.00E+00	1.31E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.31E-09
	Xe-138	2.64E-07	3.01E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.27E-06
	Y-91	0.00E+00	0.00E+00	8.81E-12	2.63E-14	2.35E-16	9.09E-13	5.20E-13	1.62E-12	0.00E+00	0.00E+00	8.25E-15	0.00E+00	1.19E-11
	Zn-65	0.00E+00	0.00E+00	2.85E-09	5.31E-10	2.40E-13	5.49E-09	7.48E-11	1.42E-08	0.00E+00	0.00E+00	3.64E-11	0.00E+00	2.32E-08
	Zn-69m	0.00E+00	0.00E+00	1.80E-10	2.95E-10	3.60E-17	5.73E-12	7.84E-12	1.05E-08	0.00E+00	0.00E+00	5.67E-14	0.00E+00	1.10E-08
	Total by pathway	3.86E-06	6.84E-06	1.02E-07	2.17E-08	1.52E-10	5.11E-06	4.87E-08	3.09E-05	0.00E+00	0.00E+00	1.64E-04	1.87E-05	2.29E-04

Human Receptor	COPC	Radiological Dose by Pathway during Project Phases (mSv/a)												
		Air (internal)	Air (external)	Water (internal)	Water (external)	Soil (internal)	Soil (external)	Sediment (internal)	Sediment (external)	Aquatic plants	Aquatic animals	Terrestrial plants	Terrestrial animals	Total by COPC
Oshawa Resident Infant-1y	Ba-140	0.00E+00	0.00E+00	9.11E-09	4.93E-11	6.81E-14	3.22E-09	1.66E-09	6.38E-07	0.00E+00	0.00E+00	3.15E-12	0.00E+00	6.52E-07
	C-14	1.69E-07	2.00E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.34E-04	1.08E-05	1.45E-04
	Co-58	0.00E+00	0.00E+00	1.61E-09	1.97E-10	6.68E-14	4.45E-09	6.17E-09	3.38E-06	0.00E+00	0.00E+00	1.14E-12	0.00E+00	3.39E-06
	Co-60	4.17E-09	1.97E-10	1.93E-08	1.03E-09	2.01E-10	5.42E-06	7.35E-08	1.67E-05	0.00E+00	0.00E+00	6.58E-08	4.65E-10	2.23E-05
	Cs-134	5.37E-11	6.99E-12	3.98E-09	2.13E-10	4.31E-12	1.27E-07	3.36E-09	8.11E-07	0.00E+00	0.00E+00	1.83E-08	9.28E-10	9.64E-07
	Cs-136	0.00E+00	0.00E+00	1.28E-09	1.63E-10	9.92E-15	6.73E-10	1.10E-09	6.17E-07	0.00E+00	0.00E+00	4.52E-12	0.00E+00	6.21E-07
	Cs-137	6.02E-11	3.84E-12	4.56E-09	1.18E-10	4.43E-11	6.50E-07	3.85E-09	4.50E-07	0.00E+00	0.00E+00	2.37E-08	1.45E-09	1.13E-06
	Cs-138d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.48E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.14E-07	0.00E+00	5.14E-07
	Cu-64	0.00E+00	0.00E+00	2.27E-10	3.03E-11	7.05E-17	5.03E-12	1.11E-10	6.64E-08	0.00E+00	0.00E+00	4.68E-14	0.00E+00	6.68E-08
	Fe-59	0.00E+00	0.00E+00	4.88E-09	2.56E-10	1.28E-13	3.42E-09	2.18E-09	4.91E-07	0.00E+00	0.00E+00	3.04E-12	0.00E+00	5.02E-07
	HTO	8.65E-07	0.00E+00	7.52E-08	1.11E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.24E-06	2.09E-08	4.20E-06
	I-131	9.23E-07	1.31E-09	2.00E-08	2.28E-11	1.41E-10	9.05E-08	8.08E-09	4.22E-08	0.00E+00	0.00E+00	1.32E-05	1.59E-07	1.44E-05
	I-132	5.49E-08	3.37E-08	0.00E+00	0.00E+00	9.29E-14	2.70E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.42E-08	0.00E+00	1.30E-07
	I-133	1.05E-06	9.52E-09	4.69E-09	3.55E-11	1.66E-11	7.39E-08	2.57E-09	8.79E-08	0.00E+00	0.00E+00	1.98E-06	1.25E-08	3.22E-06
	I-134	2.65E-08	6.29E-08	0.00E+00	0.00E+00	1.78E-14	1.90E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.95E-09	0.00E+00	1.12E-07
	I-135	3.82E-07	4.56E-08	0.00E+00	0.00E+00	1.86E-12	9.76E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.41E-07	5.32E-10	7.67E-07
	Kr-85	0.00E+00	8.44E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.44E-08
	Kr-85m	0.00E+00	2.88E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.88E-08
	Kr-87	0.00E+00	3.68E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.68E-07
	Kr-88	1.19E-07	1.79E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.91E-06
	La-140d	0.00E+00	0.00E+00	1.93E-09	0.00E+00	5.11E-14	0.00E+00	1.56E-10	0.00E+00	0.00E+00	0.00E+00	1.24E-13	0.00E+00	2.09E-09
	Mn-54	0.00E+00	0.00E+00	2.18E-09	3.27E-10	3.97E-13	3.22E-08	2.52E-08	1.68E-05	0.00E+00	0.00E+00	1.86E-11	0.00E+00	1.68E-05
	Na-24	0.00E+00	0.00E+00	1.90E-10	2.08E-10	6.99E-17	3.45E-11	1.29E-11	5.48E-08	0.00E+00	0.00E+00	4.63E-14	0.00E+00	5.53E-08
	OBT	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.71E-07	4.31E-09	4.76E-07
	Rb-88d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.22E-13	8.40E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.93E-08	0.00E+00	1.23E-07
	Sr-91	0.00E+00	0.00E+00	2.06E-10	2.15E-11	4.78E-17	1.43E-12	7.25E-12	3.27E-09	0.00E+00	0.00E+00	3.21E-14	0.00E+00	3.51E-09
	Xe-131md	0.00E+00	8.84E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.84E-14
	Xe-133	0.00E+00	3.31E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.31E-07
	Xe-133dd	0.00E+00	3.14E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.14E-14
	Xe-133md	0.00E+00	7.34E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.34E-12
	Xe-135	0.00E+00	1.97E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.97E-06
	Xe-135dd	0.00E+00	6.15E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.15E-10
	Xe-135m	0.00E+00	2.60E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.60E-07
	Xe-135md	0.00E+00	1.71E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.71E-09
	Xe-138	3.07E-07	3.91E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.22E-06
	Y-91	0.00E+00	0.00E+00	2.00E-11	4.34E-15	9.00E-16	1.18E-12	2.00E-12	2.10E-12	0.00E+00	0.00E+00	1.35E-14	0.00E+00	2.53E-11
	Zn-65	0.00E+00	0.00E+00	4.66E-09	9.61E-11	6.65E-13	7.14E-09	2.07E-10	1.85E-08	0.00E+00	0.00E+00	4.25E-11	0.00E+00	3.07E-08
	Zn-69m	0.00E+00	0.00E+00	3.88E-10	4.09E-11	1.31E-16	7.45E-12	2.86E-11	1.36E-08	0.00E+00	0.00E+00	8.78E-14	0.00E+00	1.41E-08
	Total by pathway	3.90E-06	8.89E-06	1.54E-07	3.91E-09	4.12E-10	6.64E-06	1.28E-07	4.02E-05	0.00E+00	0.00E+00	1.54E-04	1.10E-05	2.25E-04

Human Receptor	COPC	Radiological Dose by Pathway during Project Phases (mSv/a)												
		Air (internal)	Air (external)	Water (internal)	Water (external)	Soil (internal)	Soil (external)	Sediment (internal)	Sediment (external)	Aquatic plants	Aquatic animals	Terrestrial plants	Terrestrial animals	Total by COPC
Bowmanville Resident Adult +worker	Ba-140	0.00E+00	0.00E+00	6.14E-09	2.82E-10	7.10E-16	2.72E-09	1.53E-11	4.78E-07	0.00E+00	0.00E+00	2.59E-11	0.00E+00	4.87E-07
	C-14	2.71E-07	3.11E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.25E-04	1.16E-05	1.37E-04
	Co-58	0.00E+00	0.00E+00	1.26E-09	1.12E-09	8.07E-16	3.75E-09	6.63E-11	2.53E-06	0.00E+00	0.00E+00	1.09E-11	0.00E+00	2.54E-06
	Co-60	6.21E-09	2.35E-10	1.13E-08	5.79E-09	1.65E-12	4.16E-06	5.92E-10	1.25E-05	0.00E+00	0.00E+00	1.90E-08	1.94E-10	1.67E-05
	Cs-134	2.46E-10	8.37E-12	2.19E-08	1.20E-09	3.46E-13	1.00E-07	2.55E-10	6.08E-07	0.00E+00	0.00E+00	5.03E-08	3.38E-09	7.85E-07
	Cs-136	0.00E+00	0.00E+00	1.89E-09	9.32E-10	2.26E-16	5.69E-10	2.23E-11	4.63E-07	0.00E+00	0.00E+00	8.10E-11	0.00E+00	4.66E-07
	Cs-137	2.60E-10	4.60E-12	2.30E-08	6.66E-10	3.24E-12	5.13E-07	2.66E-10	3.37E-07	0.00E+00	0.00E+00	6.01E-08	4.72E-09	9.40E-07
	Cs-138d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.24E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.78E-07	0.00E+00	1.78E-07
	Cu-64	0.00E+00	0.00E+00	1.73E-10	2.39E-10	8.29E-19	4.80E-12	1.02E-12	5.00E-08	0.00E+00	0.00E+00	4.33E-13	0.00E+00	5.04E-08
	Fe-59	0.00E+00	0.00E+00	3.14E-09	1.45E-09	1.27E-15	2.89E-09	1.93E-11	3.68E-07	0.00E+00	0.00E+00	2.38E-11	0.00E+00	3.76E-07
	HTO	1.64E-06	0.00E+00	1.32E-07	6.94E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.78E-06	2.56E-08	4.58E-06
	I-131	5.86E-07	1.57E-09	1.14E-08	1.31E-10	1.73E-12	1.07E-07	6.32E-11	3.17E-08	0.00E+00	0.00E+00	3.64E-06	5.90E-08	4.43E-06
	I-132	4.60E-08	4.95E-08	0.00E+00	0.00E+00	1.38E-15	3.90E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.87E-09	0.00E+00	1.38E-07
	I-133	5.32E-07	1.17E-08	2.30E-09	2.45E-10	1.66E-13	8.89E-08	1.60E-11	6.59E-08	0.00E+00	0.00E+00	4.37E-07	3.92E-09	1.14E-06
	I-134	4.84E-08	1.25E-07	0.00E+00	0.00E+00	4.34E-16	3.71E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.30E-09	0.00E+00	2.12E-07
	I-135	2.25E-07	5.88E-08	0.00E+00	0.00E+00	2.10E-14	1.23E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.68E-08	2.68E-10	4.65E-07
	Kr-85	0.00E+00	1.01E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.01E-07
	Kr-85m	0.00E+00	3.84E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.84E-08
	Kr-87	0.00E+00	6.32E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.32E-07
	Kr-88	9.48E-08	2.53E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.63E-06
	La-140d	0.00E+00	0.00E+00	1.25E-09	0.00E+00	5.65E-16	0.00E+00	1.54E-12	0.00E+00	0.00E+00	0.00E+00	9.85E-13	0.00E+00	1.25E-09
	Mn-54	0.00E+00	0.00E+00	2.32E-09	1.85E-09	6.53E-15	2.71E-08	3.69E-10	1.26E-05	0.00E+00	0.00E+00	2.44E-10	0.00E+00	1.26E-05
	Na-24	0.00E+00	0.00E+00	1.84E-10	1.56E-09	1.04E-18	3.23E-11	1.55E-13	4.11E-08	0.00E+00	0.00E+00	5.43E-13	0.00E+00	4.29E-08
	OBT	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.10E-07	5.29E-09	4.15E-07
	Rb-88d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.79E-15	5.49E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.28E-08	0.00E+00	6.77E-08
	Sr-91	0.00E+00	0.00E+00	1.83E-10	1.92E-10	6.59E-19	1.42E-12	7.53E-14	2.46E-09	0.00E+00	0.00E+00	3.49E-13	0.00E+00	2.83E-09
	Xe-131md	0.00E+00	4.67E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.67E-14
	Xe-133	0.00E+00	3.98E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.98E-07
	Xe-133dd	0.00E+00	7.75E-15	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.75E-15
	Xe-133md	0.00E+00	3.94E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.94E-12
	Xe-135	0.00E+00	2.48E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.48E-06
	Xe-135dd	0.00E+00	3.34E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.34E-10
	Xe-135m	0.00E+00	1.14E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.14E-06
	Xe-135md	0.00E+00	1.71E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.71E-09
	Xe-138	8.08E-07	1.83E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.91E-05
	Y-91	0.00E+00	0.00E+00	1.17E-11	2.61E-14	8.62E-18	9.95E-13	1.70E-14	1.58E-12	0.00E+00	0.00E+00	9.59E-14	0.00E+00	1.44E-11
	Zn-65	0.00E+00	0.00E+00	5.28E-09	5.43E-10	1.16E-14	6.01E-09	3.23E-12	1.39E-08	0.00E+00	0.00E+00	6.02E-10	0.00E+00	2.63E-08
	Zn-69m	0.00E+00	0.00E+00	2.90E-10	3.14E-10	1.51E-18	7.03E-12	2.62E-13	1.02E-08	0.00E+00	0.00E+00	8.00E-13	0.00E+00	1.09E-08
	Total by pathway	4.26E-06	2.58E-05	2.24E-07	2.34E-08	7.20E-12	5.26E-06	1.69E-09	3.01E-05	0.00E+00	0.00E+00	1.33E-04	1.17E-05	2.10E-04

Human Receptor	COPC	Radiological Dose by Pathway during Project Phases (mSv/a)												
		Air (internal)	Air (external)	Water (internal)	Water (external)	Soil (internal)	Soil (external)	Sediment (internal)	Sediment (external)	Aquatic plants	Aquatic animals	Terrestrial plants	Terrestrial animals	Total by COPC
Bowmanville Resident Child-10y	Ba-140	0.00E+00	0.00E+00	5.42E-09	2.89E-10	2.23E-14	2.79E-09	4.81E-10	4.90E-07	0.00E+00	0.00E+00	3.75E-11	0.00E+00	4.99E-07
	C-14	3.64E-07	2.94E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.13E-04	8.52E-06	1.22E-04
	Co-58	0.00E+00	0.00E+00	1.14E-09	1.14E-09	2.62E-14	3.85E-09	2.15E-09	2.60E-06	0.00E+00	0.00E+00	1.62E-11	0.00E+00	2.61E-06
	Co-60	8.35E-09	2.22E-10	1.44E-08	5.94E-09	6.72E-11	3.80E-06	2.70E-08	1.29E-05	0.00E+00	0.00E+00	4.07E-08	3.30E-10	1.68E-05
	Cs-134	1.77E-10	7.89E-12	6.40E-09	1.23E-09	3.34E-12	9.55E-08	2.65E-09	6.24E-07	0.00E+00	0.00E+00	2.46E-08	1.31E-09	7.56E-07
	Cs-136	0.00E+00	0.00E+00	1.09E-09	9.56E-10	4.68E-15	5.84E-10	4.61E-10	4.75E-07	0.00E+00	0.00E+00	7.72E-11	0.00E+00	4.78E-07
	Cs-137	1.87E-10	4.34E-12	6.98E-09	6.83E-10	3.27E-11	4.90E-07	2.89E-09	3.46E-07	0.00E+00	0.00E+00	3.06E-08	1.92E-09	8.80E-07
	Cs-138d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.13E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.19E-07	0.00E+00	2.19E-07
	Cu-64	0.00E+00	0.00E+00	1.42E-10	2.45E-10	2.44E-17	4.93E-12	3.00E-11	5.12E-08	0.00E+00	0.00E+00	5.86E-13	0.00E+00	5.17E-08
	Fe-59	0.00E+00	0.00E+00	3.25E-09	1.49E-09	4.68E-14	2.96E-09	7.11E-10	3.78E-07	0.00E+00	0.00E+00	4.04E-11	0.00E+00	3.86E-07
	HTO	1.84E-06	0.00E+00	6.51E-08	5.93E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.30E-06	1.72E-08	4.23E-06
	I-131	1.26E-06	1.48E-09	1.07E-08	1.35E-10	5.29E-11	1.00E-07	2.11E-09	3.25E-08	0.00E+00	0.00E+00	5.71E-06	7.39E-08	7.19E-06
	I-132	8.50E-08	4.66E-08	0.00E+00	0.00E+00	3.81E-14	3.66E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.49E-09	0.00E+00	1.74E-07
	I-133	1.16E-06	1.10E-08	2.11E-09	2.51E-10	5.01E-12	8.37E-08	5.26E-10	6.76E-08	0.00E+00	0.00E+00	6.76E-07	4.81E-09	2.00E-06
	I-134	6.33E-08	1.17E-07	0.00E+00	0.00E+00	1.07E-14	3.48E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.64E-09	0.00E+00	2.17E-07
	I-135	4.61E-07	5.54E-08	0.00E+00	0.00E+00	6.42E-13	1.16E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.93E-08	3.27E-10	7.22E-07
	Kr-85	0.00E+00	9.50E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.50E-08
	Kr-85m	0.00E+00	3.61E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.61E-08
	Kr-87	0.00E+00	5.93E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.93E-07
	Kr-88	1.70E-07	2.38E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.55E-06
	La-140d	0.00E+00	0.00E+00	1.04E-09	0.00E+00	1.67E-14	0.00E+00	4.55E-11	0.00E+00	0.00E+00	0.00E+00	1.34E-12	0.00E+00	1.08E-09
	Mn-54	0.00E+00	0.00E+00	1.68E-09	1.89E-09	1.69E-13	2.78E-08	9.53E-09	1.29E-05	0.00E+00	0.00E+00	2.90E-10	0.00E+00	1.30E-05
	Na-24	0.00E+00	0.00E+00	1.30E-10	1.60E-09	2.63E-17	3.31E-11	3.90E-12	4.22E-08	0.00E+00	0.00E+00	6.32E-13	0.00E+00	4.39E-08
	OBT	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.68E-07	3.85E-09	3.72E-07
	Rb-88d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.23E-14	4.99E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.61E-08	0.00E+00	6.60E-08
	Sr-91	0.00E+00	0.00E+00	1.34E-10	1.97E-10	1.72E-17	1.45E-12	1.96E-12	2.52E-09	0.00E+00	0.00E+00	4.18E-13	0.00E+00	2.85E-09
	Xe-131md	0.00E+00	4.45E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.45E-14
	Xe-133	0.00E+00	3.76E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.76E-07
	Xe-133dd	0.00E+00	7.44E-15	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.44E-15
	Xe-133md	0.00E+00	3.75E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.75E-12
	Xe-135	0.00E+00	2.34E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.34E-06
	Xe-135dd	0.00E+00	3.19E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.19E-10
	Xe-135m	0.00E+00	1.06E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.06E-06
	Xe-135md	0.00E+00	1.62E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.62E-09
	Xe-138	1.48E-06	1.69E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.84E-05
	Y-91	0.00E+00	0.00E+00	1.00E-11	2.68E-14	2.64E-16	1.02E-12	5.20E-13	1.62E-12	0.00E+00	0.00E+00	1.35E-13	0.00E+00	1.33E-11
	Zn-65	0.00E+00	0.00E+00	3.43E-09	5.57E-10	2.69E-13	6.17E-09	7.48E-11	1.42E-08	0.00E+00	0.00E+00	6.42E-10	0.00E+00	2.51E-08
	Zn-69m	0.00E+00	0.00E+00	2.43E-10	3.23E-10	4.53E-17	7.21E-12	7.84E-12	1.05E-08	0.00E+00	0.00E+00	1.10E-12	0.00E+00	1.11E-08
	Total by pathway	6.89E-06	2.40E-05	1.23E-07	2.29E-08	1.63E-10	4.85E-06	4.87E-08	3.09E-05	0.00E+00	0.00E+00	1.23E-04	8.63E-06	1.98E-04

Human Receptor	COPC	Radiological Dose by Pathway during Project Phases (mSv/a)												
		Air (internal)	Air (external)	Water (internal)	Water (external)	Soil (internal)	Soil (external)	Sediment (internal)	Sediment (external)	Aquatic plants	Aquatic animals	Terrestrial plants	Terrestrial animals	Total by COPC
Bowmanville Resident Infant-1y	Ba-140	0.00E+00	0.00E+00	1.10E-08	5.41E-11	7.69E-14	3.63E-09	1.66E-09	6.38E-07	0.00E+00	0.00E+00	4.80E-11	0.00E+00	6.54E-07
	C-14	2.49E-07	2.94E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.95E-05	5.15E-06	1.05E-04
	Co-58	0.00E+00	0.00E+00	1.94E-09	2.15E-10	7.51E-14	5.01E-09	6.17E-09	3.38E-06	0.00E+00	0.00E+00	1.73E-11	0.00E+00	3.39E-06
	Co-60	6.12E-09	2.88E-10	2.32E-08	1.12E-09	1.83E-10	4.94E-06	7.35E-08	1.67E-05	0.00E+00	0.00E+00	4.75E-08	2.43E-10	2.18E-05
	Cs-134	7.88E-11	1.03E-11	4.78E-09	2.33E-10	4.23E-12	1.24E-07	3.36E-09	8.11E-07	0.00E+00	0.00E+00	1.36E-08	4.44E-10	9.58E-07
	Cs-136	0.00E+00	0.00E+00	1.55E-09	1.79E-10	1.12E-14	7.59E-10	1.10E-09	6.17E-07	0.00E+00	0.00E+00	6.88E-11	0.00E+00	6.21E-07
	Cs-137	8.83E-11	5.63E-12	5.49E-09	1.29E-10	4.35E-11	6.38E-07	3.85E-09	4.50E-07	0.00E+00	0.00E+00	1.76E-08	7.00E-10	1.12E-06
	Cs-138d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.97E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.70E-07	0.00E+00	3.70E-07
	Cu-64	0.00E+00	0.00E+00	3.09E-10	3.74E-11	8.97E-17	6.40E-12	1.11E-10	6.64E-08	0.00E+00	0.00E+00	8.04E-13	0.00E+00	6.69E-08
	Fe-59	0.00E+00	0.00E+00	5.88E-09	2.80E-10	1.44E-13	3.85E-09	2.18E-09	4.91E-07	0.00E+00	0.00E+00	4.62E-11	0.00E+00	5.03E-07
	HTO	1.27E-06	0.00E+00	9.04E-08	1.21E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.30E-06	1.40E-08	3.67E-06
	I-131	1.36E-06	1.93E-09	2.42E-08	2.51E-11	2.03E-10	1.30E-07	8.08E-09	4.22E-08	0.00E+00	0.00E+00	9.59E-06	7.85E-08	1.12E-05
	I-132	9.88E-08	6.06E-08	0.00E+00	0.00E+00	1.64E-13	4.76E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.03E-08	0.00E+00	2.17E-07
	I-133	1.58E-06	1.43E-08	6.09E-09	4.19E-11	2.44E-11	1.09E-07	2.57E-09	8.79E-08	0.00E+00	0.00E+00	1.44E-06	6.91E-09	3.25E-06
	I-134	6.42E-08	1.53E-07	0.00E+00	0.00E+00	4.23E-14	4.52E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.85E-09	0.00E+00	2.65E-07
	I-135	6.03E-07	7.20E-08	0.00E+00	0.00E+00	2.88E-12	1.51E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-07	5.73E-10	1.00E-06
	Kr-85	0.00E+00	1.24E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.24E-07
	Kr-85m	0.00E+00	4.70E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.70E-08
	Kr-87	0.00E+00	7.71E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.71E-07
	Kr-88	2.06E-07	3.10E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.30E-06
	La-140d	0.00E+00	0.00E+00	2.10E-09	0.00E+00	5.75E-14	0.00E+00	1.56E-10	0.00E+00	0.00E+00	0.00E+00	1.72E-12	0.00E+00	2.26E-09
	Mn-54	0.00E+00	0.00E+00	2.62E-09	3.57E-10	4.46E-13	3.61E-08	2.52E-08	1.68E-05	0.00E+00	0.00E+00	2.85E-10	0.00E+00	1.69E-05
	Na-24	0.00E+00	0.00E+00	2.54E-10	2.53E-10	8.72E-17	4.31E-11	1.29E-11	5.48E-08	0.00E+00	0.00E+00	7.79E-13	0.00E+00	5.54E-08
	OBT	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.36E-07	2.98E-09	3.39E-07
	Rb-88d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.71E-13	6.48E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.85E-08	0.00E+00	9.33E-08
	Sr-91	0.00E+00	0.00E+00	2.92E-10	2.77E-11	6.35E-17	1.89E-12	7.25E-12	3.27E-09	0.00E+00	0.00E+00	5.76E-13	0.00E+00	3.60E-09
	Xe-131md	0.00E+00	5.79E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.79E-14
	Xe-133	0.00E+00	4.88E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.88E-07
	Xe-133dd	0.00E+00	9.68E-15	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.68E-15
	Xe-133md	0.00E+00	4.87E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.87E-12
	Xe-135	0.00E+00	3.04E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.04E-06
	Xe-135dd	0.00E+00	4.14E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.14E-10
	Xe-135m	0.00E+00	1.38E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.38E-06
	Xe-135md	0.00E+00	2.10E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.10E-09
	Xe-138	1.73E-06	2.20E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.37E-05
	Y-91	0.00E+00	0.00E+00	2.27E-11	4.47E-15	1.01E-15	1.33E-12	2.00E-12	2.10E-12	0.00E+00	0.00E+00	1.93E-13	0.00E+00	2.83E-11
	Zn-65	0.00E+00	0.00E+00	5.61E-09	1.05E-10	7.47E-13	8.02E-09	2.07E-10	1.85E-08	0.00E+00	0.00E+00	6.59E-10	0.00E+00	3.31E-08
	Zn-69m	0.00E+00	0.00E+00	5.23E-10	5.01E-11	1.65E-16	9.38E-12	2.86E-11	1.36E-08	0.00E+00	0.00E+00	1.50E-12	0.00E+00	1.43E-08
	Total by pathway	7.16E-06	3.12E-05	1.86E-07	4.32E-09	4.65E-10	6.31E-06	1.28E-07	4.02E-05	0.00E+00	0.00E+00	1.14E-04	5.25E-06	2.04E-04

Human Receptor	COPC	Radiological Dose by Pathway during Project Phases (mSv/a)												
		Air (internal)	Air (external)	Water (internal)	Water (external)	Soil (internal)	Soil (external)	Sediment (internal)	Sediment (external)	Aquatic plants	Aquatic animals	Terrestrial plants	Terrestrial animals	Total by COPC
WEB Resident Adult +worker	Ba-140	0.00E+00	0.00E+00	1.06E-10	1.27E-10	7.18E-16	2.75E-09	1.55E-11	4.84E-07	0.00E+00	7.23E-10	5.01E-12	0.00E+00	4.87E-07
	C-14	1.04E-06	1.20E-09	1.36E-08	1.70E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.57E-04	2.00E-06	1.60E-04
	Co-58	0.00E+00	0.00E+00	2.18E-11	4.98E-10	8.17E-16	3.80E-09	6.71E-11	2.56E-06	0.00E+00	8.32E-09	2.19E-12	0.00E+00	2.57E-06
	Co-60	2.39E-08	9.06E-10	1.27E-09	2.87E-09	4.05E-12	1.02E-05	5.99E-10	1.27E-05	0.00E+00	7.40E-08	2.17E-08	6.72E-12	2.30E-05
	Cs-134	9.46E-10	3.22E-11	6.86E-10	5.46E-10	6.73E-13	1.95E-07	2.58E-10	6.15E-07	0.00E+00	9.35E-06	5.61E-08	4.91E-10	1.02E-05
	Cs-136	0.00E+00	0.00E+00	3.24E-11	4.20E-10	2.29E-16	5.76E-10	2.25E-11	4.68E-07	0.00E+00	8.35E-07	1.55E-11	0.00E+00	1.30E-06
	Cs-137	9.99E-10	1.77E-11	3.29E-09	3.41E-10	6.29E-12	9.99E-07	2.70E-10	3.41E-07	0.00E+00	9.77E-06	6.72E-08	7.37E-10	1.12E-05
	Cs-138d	0.00E+00	0.00E+00	2.65E-11	0.00E+00	5.80E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.06E-07	0.00E+00	2.06E-07
	Cu-64	0.00E+00	0.00E+00	2.96E-12	1.32E-10	8.39E-19	4.86E-12	1.03E-12	5.05E-08	0.00E+00	1.47E-08	8.30E-14	0.00E+00	6.54E-08
	Fe-59	0.00E+00	0.00E+00	5.41E-11	6.50E-10	1.29E-15	2.92E-09	1.95E-11	3.72E-07	0.00E+00	9.28E-08	4.58E-12	0.00E+00	4.69E-07
	HTO	6.32E-06	0.00E+00	5.69E-06	1.41E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E-08	3.48E-06	5.63E-09	1.56E-05
	I-131	2.26E-06	6.06E-09	6.25E-08	4.32E-10	6.59E-12	4.06E-07	6.39E-11	3.20E-08	0.00E+00	8.88E-09	4.43E-06	1.02E-08	7.21E-06
	I-132	1.83E-07	1.97E-07	5.14E-11	1.44E-10	5.43E-15	1.53E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.72E-09	0.00E+00	5.38E-07
	I-133	2.05E-06	4.51E-08	6.05E-09	4.23E-10	6.36E-13	3.40E-07	1.62E-11	6.66E-08	0.00E+00	3.00E-09	5.33E-07	6.89E-10	3.05E-06
	I-134	2.02E-07	5.23E-07	1.70E-11	1.46E-10	1.80E-15	1.54E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E-09	0.00E+00	8.81E-07
	I-135	8.77E-07	2.29E-07	7.64E-10	4.79E-10	8.08E-14	4.75E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.93E-08	5.20E-11	1.65E-06
	Kr-85	0.00E+00	3.88E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.88E-07
	Kr-85m	0.00E+00	1.50E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.50E-07
	Kr-87	0.00E+00	2.58E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.58E-06
	Kr-88	3.75E-07	1.00E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.04E-05
	La-140d	0.00E+00	0.00E+00	2.15E-11	0.00E+00	5.72E-16	0.00E+00	1.56E-12	0.00E+00	0.00E+00	0.00E+00	2.05E-13	0.00E+00	2.33E-11
	Mn-54	0.00E+00	0.00E+00	4.08E-11	8.24E-10	6.60E-15	2.74E-08	3.73E-10	1.27E-05	0.00E+00	6.79E-08	5.32E-11	0.00E+00	1.28E-05
	Na-24	0.00E+00	0.00E+00	3.15E-12	8.37E-10	1.05E-18	3.27E-11	1.56E-13	4.16E-08	0.00E+00	4.20E-09	1.04E-13	0.00E+00	4.66E-08
	OBT	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.16E-09	5.22E-07	8.38E-10	5.28E-07
	Rb-88d	0.00E+00	0.00E+00	4.01E-12	0.00E+00	4.27E-15	1.31E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.47E-08	0.00E+00	1.46E-07
	Sr-91	0.00E+00	0.00E+00	3.14E-12	1.13E-10	6.67E-19	1.43E-12	7.62E-14	2.48E-09	0.00E+00	1.59E-10	6.84E-14	0.00E+00	2.76E-09
	Xe-131md	0.00E+00	1.44E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.44E-13
	Xe-133	0.00E+00	1.53E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.53E-06
	Xe-133dd	0.00E+00	1.99E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.99E-14
	Xe-133md	0.00E+00	1.22E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.22E-11
	Xe-135	0.00E+00	9.64E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.64E-06
	Xe-135dd	0.00E+00	1.03E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.03E-09
	Xe-135m	0.00E+00	5.61E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.61E-06
	Xe-135md	0.00E+00	5.93E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.93E-09
	Xe-138	4.04E-06	9.13E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.54E-05
	Y-91	0.00E+00	0.00E+00	2.02E-13	9.42E-15	8.73E-18	1.01E-12	1.72E-14	1.59E-12	0.00E+00	0.00E+00	1.89E-14	0.00E+00	2.85E-12
	Zn-65	0.00E+00	0.00E+00	9.14E-11	2.42E-10	1.18E-14	6.09E-09	3.27E-12	1.40E-08	0.00E+00	3.22E-06	1.58E-10	0.00E+00	3.24E-06
	Zn-69m	0.00E+00	0.00E+00	4.97E-12	1.71E-10	1.53E-18	7.11E-12	2.65E-13	1.04E-08	0.00E+00	4.23E-07	1.59E-13	0.00E+00	4.33E-07
	Total by pathway	1.74E-05	1.22E-04	5.78E-06	1.50E-07	1.84E-11	1.31E-05	1.71E-09	3.05E-05	0.00E+00	2.39E-05	1.66E-04	2.01E-06	3.81E-04

Human Receptor	COPC	Radiological Dose by Pathway during Project Phases (mSv/a)												
		Air (internal)	Air (external)	Water (internal)	Water (external)	Soil (internal)	Soil (external)	Sediment (internal)	Sediment (external)	Aquatic plants	Aquatic animals	Terrestrial plants	Terrestrial animals	Total by COPC
WEB Resident Child-10y	Ba-140	0.00E+00	0.00E+00	3.26E-13	1.29E-10	2.23E-14	2.79E-09	4.81E-10	4.90E-07	0.00E+00	2.35E-09	7.24E-12	0.00E+00	4.96E-07
	C-14	1.49E-06	1.20E-09	7.55E-09	1.72E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.40E-04	1.57E-06	1.43E-04
	Co-58	0.00E+00	0.00E+00	2.05E-13	5.05E-10	2.62E-14	3.85E-09	2.15E-09	2.60E-06	0.00E+00	2.78E-08	3.26E-12	0.00E+00	2.63E-06
	Co-60	3.42E-08	9.08E-10	1.40E-09	2.91E-09	1.78E-10	1.01E-05	2.70E-08	1.29E-05	0.00E+00	3.48E-07	4.59E-08	1.24E-11	2.34E-05
	Cs-134	7.24E-10	3.23E-11	9.21E-11	5.53E-10	6.78E-12	1.94E-07	2.65E-09	6.24E-07	0.00E+00	1.00E-05	2.71E-08	2.07E-10	1.09E-05
	Cs-136	0.00E+00	0.00E+00	6.35E-14	4.25E-10	4.68E-15	5.84E-10	4.61E-10	4.75E-07	0.00E+00	1.78E-06	1.48E-11	0.00E+00	2.26E-06
	Cs-137	7.66E-10	1.78E-11	8.99E-10	3.46E-10	6.62E-11	9.93E-07	2.89E-09	3.46E-07	0.00E+00	1.09E-05	3.39E-08	3.24E-10	1.23E-05
	Cs-138d	0.00E+00	0.00E+00	1.98E-11	0.00E+00	1.46E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.50E-07	0.00E+00	2.50E-07
	Cu-64	0.00E+00	0.00E+00	4.53E-16	1.34E-10	2.44E-17	4.93E-12	3.00E-11	5.12E-08	0.00E+00	4.44E-08	1.12E-13	0.00E+00	9.59E-08
	Fe-59	0.00E+00	0.00E+00	2.64E-13	6.59E-10	4.68E-14	2.96E-09	7.11E-10	3.78E-07	0.00E+00	3.52E-07	7.75E-12	0.00E+00	7.34E-07
	HTO	7.53E-06	0.00E+00	2.87E-06	1.19E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.19E-08	2.84E-06	4.02E-09	1.34E-05
	I-131	5.16E-06	6.07E-09	5.94E-08	4.38E-10	2.15E-10	4.07E-07	2.11E-09	3.25E-08	0.00E+00	3.05E-08	6.87E-06	1.37E-08	1.26E-05
	I-132	3.60E-07	1.97E-07	4.43E-11	1.46E-10	1.60E-13	1.54E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.62E-09	0.00E+00	7.18E-07
	I-133	4.75E-06	4.52E-08	5.64E-09	4.29E-10	2.04E-11	3.41E-07	5.26E-10	6.76E-08	0.00E+00	1.01E-08	8.13E-07	9.16E-10	6.03E-06
	I-134	2.83E-07	5.25E-07	1.31E-11	1.48E-10	4.72E-14	1.54E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.99E-09	0.00E+00	9.63E-07
	I-135	1.91E-06	2.29E-07	7.29E-10	4.86E-10	2.63E-12	4.76E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.08E-07	7.03E-11	2.72E-06
	Kr-85	0.00E+00	3.89E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.89E-07
	Kr-85m	0.00E+00	1.51E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.51E-07
	Kr-87	0.00E+00	2.58E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.58E-06
	Kr-88	7.14E-07	1.00E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.07E-05
	La-140d	0.00E+00	0.00E+00	1.46E-13	0.00E+00	1.67E-14	0.00E+00	4.55E-11	0.00E+00	0.00E+00	0.00E+00	2.78E-13	0.00E+00	4.60E-11
	Mn-54	0.00E+00	0.00E+00	7.70E-13	8.36E-10	1.69E-13	2.78E-08	9.53E-09	1.29E-05	0.00E+00	1.81E-07	6.31E-11	0.00E+00	1.31E-05
	Na-24	0.00E+00	0.00E+00	7.97E-16	8.48E-10	2.63E-17	3.31E-11	3.90E-12	4.22E-08	0.00E+00	1.09E-08	1.21E-13	0.00E+00	5.40E-08
	OBT	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.03E-08	4.63E-07	6.56E-10	4.74E-07
	Rb-88d	0.00E+00	0.00E+00	3.06E-12	0.00E+00	1.10E-13	1.29E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.83E-08	0.00E+00	1.48E-07
	Sr-91	0.00E+00	0.00E+00	1.25E-15	1.15E-10	1.72E-17	1.45E-12	1.96E-12	2.52E-09	0.00E+00	4.27E-10	8.18E-14	0.00E+00	3.06E-09
	Xe-131md	0.00E+00	1.45E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.45E-13
	Xe-133	0.00E+00	1.54E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.54E-06
	Xe-133dd	0.00E+00	1.99E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.99E-14
	Xe-133md	0.00E+00	1.22E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.22E-11
	Xe-135	0.00E+00	9.66E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.66E-06
	Xe-135dd	0.00E+00	1.03E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.03E-09
	Xe-135m	0.00E+00	5.63E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.63E-06
	Xe-135md	0.00E+00	5.94E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.94E-09
	Xe-138	8.03E-06	9.16E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.96E-05
	Y-91	0.00E+00	0.00E+00	1.84E-15	9.55E-15	2.64E-16	1.02E-12	5.20E-13	1.62E-12	0.00E+00	0.00E+00	2.66E-14	0.00E+00	3.20E-12
	Zn-65	0.00E+00	0.00E+00	5.64E-13	2.46E-10	2.69E-13	6.17E-09	7.48E-11	1.42E-08	0.00E+00	7.68E-06	1.67E-10	0.00E+00	7.70E-06
	Zn-69m	0.00E+00	0.00E+00	9.49E-17	1.74E-10	4.53E-17	7.21E-12	7.84E-12	1.05E-08	0.00E+00	1.30E-06	2.18E-13	0.00E+00	1.31E-06
	Total by pathway	3.03E-05	1.23E-04	2.95E-06	1.29E-07	4.91E-10	1.30E-05	4.87E-08	3.09E-05	0.00E+00	3.28E-05	1.52E-04	1.59E-06	3.86E-04

Human Receptor	COPC	Radiological Dose by Pathway during Project Phases (mSv/a)												
		Air (internal)	Air (external)	Water (internal)	Water (external)	Soil (internal)	Soil (external)	Sediment (internal)	Sediment (external)	Aquatic plants	Aquatic animals	Terrestrial plants	Terrestrial animals	Total by COPC
WEB Resident Infant-1y	Ba-140	0.00E+00	0.00E+00	6.63E-13	4.72E-15	7.69E-14	3.63E-09	1.66E-09	6.38E-07	0.00E+00	2.54E-09	9.62E-12	0.00E+00	6.45E-07
	C-14	1.02E-06	1.20E-09	9.89E-09	7.08E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.21E-04	1.16E-06	1.23E-04
	Co-58	0.00E+00	0.00E+00	3.48E-13	5.60E-14	7.51E-14	5.01E-09	6.17E-09	3.38E-06	0.00E+00	2.51E-08	3.60E-12	0.00E+00	3.41E-06
	Co-60	2.50E-08	1.18E-09	2.25E-09	1.57E-10	4.85E-10	1.31E-05	7.35E-08	1.67E-05	0.00E+00	2.98E-07	5.25E-08	1.17E-11	3.03E-05
	Cs-134	3.23E-10	4.20E-11	6.89E-11	4.85E-12	8.60E-12	2.52E-07	3.36E-09	8.11E-07	0.00E+00	3.99E-06	1.47E-08	8.67E-11	5.07E-06
	Cs-136	0.00E+00	0.00E+00	8.97E-14	1.50E-14	1.12E-14	7.59E-10	1.10E-09	6.17E-07	0.00E+00	1.34E-06	1.37E-11	0.00E+00	1.96E-06
	Cs-137	3.62E-10	2.30E-11	7.06E-10	2.40E-11	8.81E-11	1.29E-06	3.85E-09	4.50E-07	0.00E+00	4.57E-06	1.91E-08	1.43E-10	6.34E-06
	Cs-138d	0.00E+00	0.00E+00	4.50E-11	0.00E+00	5.61E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.14E-07	0.00E+00	4.14E-07
	Cu-64	0.00E+00	0.00E+00	9.85E-16	1.73E-16	8.97E-17	6.40E-12	1.11E-10	6.64E-08	0.00E+00	5.14E-08	1.60E-13	0.00E+00	1.18E-07
	Fe-59	0.00E+00	0.00E+00	4.78E-13	3.30E-14	1.44E-13	3.85E-09	2.18E-09	4.91E-07	0.00E+00	3.40E-07	9.18E-12	0.00E+00	8.37E-07
	HTO	5.20E-06	0.00E+00	3.98E-06	6.09E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.61E-08	2.76E-06	3.52E-09	1.20E-05
	I-131	5.56E-06	7.90E-09	1.35E-07	2.02E-10	8.24E-10	5.29E-07	8.08E-09	4.22E-08	0.00E+00	3.68E-08	1.12E-05	1.77E-08	1.76E-05
	I-132	4.18E-07	2.57E-07	1.12E-10	7.81E-11	6.87E-13	2.00E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.21E-08	0.00E+00	8.87E-07
	I-133	6.49E-06	5.88E-08	1.62E-08	1.62E-10	9.94E-11	4.43E-07	2.57E-09	8.79E-08	0.00E+00	1.55E-08	1.69E-06	1.58E-09	8.81E-06
	I-134	2.87E-07	6.82E-07	3.06E-11	7.92E-11	1.87E-13	2.00E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.36E-09	0.00E+00	1.17E-06
	I-135	2.50E-06	2.98E-07	1.93E-09	2.60E-10	1.18E-11	6.19E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.06E-07	1.36E-10	3.62E-06
	Kr-85	0.00E+00	5.07E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.07E-07
	Kr-85m	0.00E+00	1.96E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.96E-07
	Kr-87	0.00E+00	3.36E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.36E-06
	Kr-88	8.66E-07	1.30E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.39E-05
	La-140d	0.00E+00	0.00E+00	2.96E-13	0.00E+00	5.75E-14	0.00E+00	1.56E-10	0.00E+00	0.00E+00	0.00E+00	3.67E-13	0.00E+00	1.57E-10
	Mn-54	0.00E+00	0.00E+00	1.20E-12	2.37E-13	4.46E-13	3.61E-08	2.52E-08	1.68E-05	0.00E+00	1.50E-07	6.38E-11	0.00E+00	1.70E-05
	Na-24	0.00E+00	0.00E+00	1.56E-15	2.24E-15	8.72E-17	4.31E-11	1.29E-11	5.48E-08	0.00E+00	1.14E-08	1.55E-13	0.00E+00	6.62E-08
	OBT	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.39E-09	4.12E-07	5.81E-10	4.20E-07
	Rb-88d	0.00E+00	0.00E+00	7.30E-12	0.00E+00	4.43E-13	1.68E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.17E-08	0.00E+00	2.00E-07
	Sr-91	0.00E+00	0.00E+00	2.72E-15	3.74E-16	6.35E-17	1.89E-12	7.25E-12	3.27E-09	0.00E+00	4.96E-10	1.17E-13	0.00E+00	3.78E-09
	Xe-131md	0.00E+00	1.88E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.88E-13
	Xe-133	0.00E+00	2.00E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.00E-06
	Xe-133dd	0.00E+00	2.59E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.59E-14
	Xe-133md	0.00E+00	1.59E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E-11
	Xe-135	0.00E+00	1.26E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.26E-05
	Xe-135dd	0.00E+00	1.35E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.35E-09
	Xe-135m	0.00E+00	7.32E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.32E-06
	Xe-135md	0.00E+00	7.73E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.73E-09
	Xe-138	9.35E-06	1.19E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.28E-04
	Y-91	0.00E+00	0.00E+00	4.17E-15	1.19E-18	1.01E-15	1.33E-12	2.00E-12	2.10E-12	0.00E+00	0.00E+00	3.93E-14	0.00E+00	5.47E-12
	Zn-65	0.00E+00	0.00E+00	9.23E-13	2.50E-14	7.47E-13	8.02E-09	2.07E-10	1.85E-08	0.00E+00	6.69E-06	1.76E-10	0.00E+00	6.72E-06
	Zn-69m	0.00E+00	0.00E+00	2.04E-16	2.83E-17	1.65E-16	9.38E-12	2.86E-11	1.36E-08	0.00E+00	1.49E-06	3.06E-13	0.00E+00	1.51E-06
	Total by pathway	3.17E-05	1.59E-04	4.15E-06	6.19E-08	1.53E-09	1.69E-05	1.28E-07	4.02E-05	0.00E+00	1.90E-05	1.38E-04	1.18E-06	4.10E-04

Human Receptor	COPC	Radiological Dose by Pathway during Project Phases (mSv/a)												
		Air (internal)	Air (external)	Water (internal)	Water (external)	Soil (internal)	Soil (external)	Sediment (internal)	Sediment (external)	Aquatic plants	Aquatic animals	Terrestrial plants	Terrestrial animals	Total by COPC
Farm Adult	Ba-140	0.00E+00	0.00E+00	3.48E-10	1.29E-10	0.00E+00	0.00E+00	1.57E-11	4.90E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.91E-07
	C-14	1.02E-06	1.17E-09	1.37E-08	1.63E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.46E-04	1.09E-04	4.56E-04
	Co-58	0.00E+00	0.00E+00	7.14E-11	5.05E-10	0.00E+00	0.00E+00	6.80E-11	2.60E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.60E-06
	Co-60	2.34E-08	8.86E-10	2.53E-09	3.05E-09	8.59E-12	2.16E-05	6.07E-10	1.29E-05	0.00E+00	0.00E+00	5.34E-08	2.37E-09	3.46E-05
	Cs-134	9.26E-10	3.15E-11	1.69E-09	5.55E-10	1.17E-12	3.38E-07	2.61E-10	6.24E-07	0.00E+00	0.00E+00	1.36E-07	3.35E-08	1.13E-06
	Cs-136	0.00E+00	0.00E+00	1.07E-10	4.25E-10	0.00E+00	0.00E+00	2.29E-11	4.75E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.75E-07
	Cs-137	9.77E-10	1.73E-11	5.44E-09	3.55E-10	1.09E-11	1.73E-06	2.73E-10	3.46E-07	0.00E+00	0.00E+00	1.62E-07	4.56E-08	2.29E-06
	Cs-138d	0.00E+00	0.00E+00	4.85E-11	0.00E+00	1.28E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.02E-07	0.00E+00	5.02E-07
	Cu-64	0.00E+00	0.00E+00	8.66E-12	1.34E-10	0.00E+00	0.00E+00	1.05E-12	5.12E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.14E-08
	Fe-59	0.00E+00	0.00E+00	1.78E-10	6.59E-10	0.00E+00	0.00E+00	1.98E-11	3.78E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.78E-07
	HTO	6.18E-06	0.00E+00	4.19E-06	9.90E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.02E-06	2.10E-07	1.87E-05
	I-131	2.21E-06	5.93E-09	5.20E-08	3.19E-10	6.64E-12	4.09E-07	6.48E-11	3.25E-08	0.00E+00	0.00E+00	1.01E-05	5.50E-07	1.33E-05
	I-132	1.81E-07	1.95E-07	4.29E-11	1.01E-10	5.54E-15	1.56E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.07E-08	0.00E+00	5.44E-07
	I-133	2.01E-06	4.42E-08	5.09E-09	3.35E-10	6.41E-13	3.43E-07	1.64E-11	6.76E-08	0.00E+00	0.00E+00	1.21E-06	3.61E-08	3.72E-06
	I-134	2.04E-07	5.28E-07	1.45E-11	1.05E-10	1.87E-15	1.60E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.63E-09	0.00E+00	8.96E-07
	I-135	8.62E-07	2.25E-07	6.33E-10	3.35E-10	8.18E-14	4.81E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.58E-07	2.31E-09	1.73E-06
	Kr-85	0.00E+00	3.79E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.79E-07
	Kr-85m	0.00E+00	1.48E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.48E-07
	Kr-87	0.00E+00	2.58E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.58E-06
	Kr-88	3.70E-07	9.90E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.03E-05
	La-140d	0.00E+00	0.00E+00	7.85E-11	0.00E+00	0.00E+00	0.00E+00	1.58E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.01E-11
	Mn-54	0.00E+00	0.00E+00	1.32E-10	8.35E-10	0.00E+00	0.00E+00	3.78E-10	1.29E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.29E-05
	Na-24	0.00E+00	0.00E+00	9.39E-12	8.48E-10	0.00E+00	0.00E+00	1.59E-13	4.22E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.30E-08
	OBT	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.19E-06	5.03E-08	1.24E-06
	Rb-88d	0.00E+00	0.00E+00	7.07E-12	0.00E+00	9.06E-15	2.78E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.56E-08	0.00E+00	3.13E-07
	Sr-91	0.00E+00	0.00E+00	8.83E-12	1.15E-10	0.00E+00	0.00E+00	7.73E-14	2.52E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.64E-09
	Xe-131md	0.00E+00	1.27E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.27E-13
	Xe-133	0.00E+00	1.50E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.50E-06
	Xe-133dd	0.00E+00	1.55E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.55E-14
	Xe-133md	0.00E+00	1.08E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.08E-11
	Xe-135	0.00E+00	9.46E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.46E-06
	Xe-135dd	0.00E+00	9.10E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.10E-10
	Xe-135m	0.00E+00	5.99E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.99E-06
	Xe-135md	0.00E+00	5.54E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.54E-09
	Xe-138	4.34E-06	9.80E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.02E-04
	Y-91	0.00E+00	0.00E+00	7.02E-13	9.55E-15	0.00E+00	0.00E+00	1.74E-14	1.62E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.35E-12
	Zn-65	0.00E+00	0.00E+00	3.00E-10	2.46E-10	0.00E+00	0.00E+00	3.31E-12	1.42E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.48E-08
	Zn-69m	0.00E+00	0.00E+00	1.47E-11	1.74E-10	0.00E+00	0.00E+00	2.69E-13	1.05E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.07E-08
	Total by pathway	1.74E-05	1.29E-04	4.27E-06	1.08E-07	2.82E-11	2.55E-05	1.73E-09	3.09E-05	0.00E+00	0.00E+00	3.68E-04	1.10E-04	6.84E-04

Human Receptor	COPC	Radiological Dose by Pathway during Project Phases (mSv/a)												
		Air (internal)	Air (external)	Water (internal)	Water (external)	Soil (internal)	Soil (external)	Sediment (internal)	Sediment (external)	Aquatic plants	Aquatic animals	Terrestrial plants	Terrestrial animals	Total by COPC
Farm Child-10y	Ba-140	0.00E+00	0.00E+00	0.00E+00	1.29E-10	0.00E+00	0.00E+00	4.81E-10	4.90E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.91E-07
	C-14	1.46E-06	1.17E-09	7.51E-09	1.63E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.08E-04	7.96E-05	3.89E-04
	Co-58	0.00E+00	0.00E+00	0.00E+00	5.05E-10	0.00E+00	0.00E+00	2.15E-09	2.60E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.60E-06
	Co-60	3.34E-08	8.86E-10	2.43E-09	3.05E-09	3.82E-10	2.16E-05	2.70E-08	1.29E-05	0.00E+00	0.00E+00	1.13E-07	4.10E-09	3.47E-05
	Cs-134	7.07E-10	3.15E-11	1.30E-10	5.55E-10	1.18E-11	3.38E-07	2.65E-09	6.24E-07	0.00E+00	0.00E+00	6.56E-08	1.30E-08	1.04E-06
	Cs-136	0.00E+00	0.00E+00	0.00E+00	4.25E-10	0.00E+00	0.00E+00	4.61E-10	4.75E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.76E-07
	Cs-137	7.48E-10	1.73E-11	1.27E-09	3.55E-10	1.15E-10	1.73E-06	2.89E-09	3.46E-07	0.00E+00	0.00E+00	8.18E-08	1.86E-08	2.18E-06
	Cs-138d	0.00E+00	0.00E+00	3.57E-11	0.00E+00	3.25E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.09E-07	0.00E+00	6.09E-07
	Cu-64	0.00E+00	0.00E+00	0.00E+00	1.34E-10	0.00E+00	0.00E+00	3.00E-11	5.12E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.14E-08
	Fe-59	0.00E+00	0.00E+00	0.00E+00	6.59E-10	0.00E+00	0.00E+00	7.11E-10	3.78E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.79E-07
	HTO	7.35E-06	0.00E+00	2.08E-06	8.25E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.54E-06	1.41E-07	1.62E-05
	I-131	5.04E-06	5.93E-09	4.83E-08	3.19E-10	2.16E-10	4.09E-07	2.11E-09	3.25E-08	0.00E+00	0.00E+00	1.56E-05	6.88E-07	2.18E-05
	I-132	3.56E-07	1.95E-07	3.65E-11	1.01E-10	1.63E-13	1.56E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.51E-08	0.00E+00	7.23E-07
	I-133	4.64E-06	4.42E-08	4.60E-09	3.35E-10	2.05E-11	3.43E-07	5.26E-10	6.76E-08	0.00E+00	0.00E+00	1.85E-06	4.42E-08	7.00E-06
	I-134	2.85E-07	5.28E-07	1.10E-11	1.05E-10	4.90E-14	1.60E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.54E-09	0.00E+00	9.77E-07
	I-135	1.87E-06	2.25E-07	5.96E-10	3.35E-10	2.66E-12	4.81E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.45E-07	2.80E-09	2.83E-06
	Kr-85	0.00E+00	3.79E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.79E-07
	Kr-85m	0.00E+00	1.48E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.48E-07
	Kr-87	0.00E+00	2.58E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.58E-06
	Kr-88	7.05E-07	9.90E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.06E-05
	La-140d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.55E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.55E-11
	Mn-54	0.00E+00	0.00E+00	0.00E+00	8.35E-10	0.00E+00	0.00E+00	9.53E-09	1.29E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.29E-05
	Na-24	0.00E+00	0.00E+00	0.00E+00	8.48E-10	0.00E+00	0.00E+00	3.90E-12	4.22E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.30E-08
	OBT	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.05E-06	3.68E-08	1.09E-06
	Rb-88d	0.00E+00	0.00E+00	5.32E-12	0.00E+00	2.35E-13	2.78E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.42E-08	0.00E+00	3.22E-07
	Sr-91	0.00E+00	0.00E+00	0.00E+00	1.15E-10	0.00E+00	0.00E+00	1.96E-12	2.52E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.64E-09
	Xe-131md	0.00E+00	1.27E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.27E-13
	Xe-133	0.00E+00	1.50E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.50E-06
	Xe-133dd	0.00E+00	1.55E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.55E-14
	Xe-133md	0.00E+00	1.08E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.08E-11
	Xe-135	0.00E+00	9.46E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.46E-06
	Xe-135dd	0.00E+00	9.10E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.10E-10
	Xe-135m	0.00E+00	5.99E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.99E-06
	Xe-135md	0.00E+00	5.54E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.54E-09
	Xe-138	8.59E-06	9.80E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.07E-04
	Y-91	0.00E+00	0.00E+00	0.00E+00	9.55E-15	0.00E+00	0.00E+00	5.20E-13	1.62E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.15E-12
	Zn-65	0.00E+00	0.00E+00	0.00E+00	2.46E-10	0.00E+00	0.00E+00	7.48E-11	1.42E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.46E-08
	Zn-69m	0.00E+00	0.00E+00	0.00E+00	1.74E-10	0.00E+00	0.00E+00	7.84E-12	1.05E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.07E-08
	Total by pathway	3.03E-05	1.29E-04	2.14E-06	9.17E-08	7.52E-10	2.55E-05	4.87E-08	3.09E-05	0.00E+00	0.00E+00	3.34E-04	8.06E-05	6.32E-04

Human Receptor	COPC	Radiological Dose by Pathway during Project Phases (mSv/a)												
		Air (internal)	Air (external)	Water (internal)	Water (external)	Soil (internal)	Soil (external)	Sediment (internal)	Sediment (external)	Aquatic plants	Aquatic animals	Terrestrial plants	Terrestrial animals	Total by COPC
Farm Infant-1y	Ba-140	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.66E-09	6.38E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.39E-07
	C-14	9.93E-07	1.17E-09	9.83E-09	6.71E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.73E-04	4.30E-05	2.17E-04
	Co-58	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.17E-09	3.38E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.38E-06
	Co-60	2.44E-08	1.15E-09	3.90E-09	2.30E-10	1.04E-09	2.81E-05	7.35E-08	1.67E-05	0.00E+00	0.00E+00	1.06E-07	2.62E-09	4.50E-05
	Cs-134	3.15E-10	4.10E-11	9.73E-11	5.77E-12	1.50E-11	4.40E-07	3.36E-09	8.11E-07	0.00E+00	0.00E+00	3.08E-08	3.89E-09	1.29E-06
	Cs-136	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-09	6.17E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.18E-07
	Cs-137	3.53E-10	2.25E-11	9.96E-10	2.85E-11	1.53E-10	2.25E-06	3.85E-09	4.50E-07	0.00E+00	0.00E+00	3.91E-08	6.03E-09	2.75E-06
	Cs-138d	0.00E+00	0.00E+00	8.11E-11	0.00E+00	1.25E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.73E-07	0.00E+00	8.73E-07
	Cu-64	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.11E-10	6.64E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.65E-08
	Fe-59	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.18E-09	4.91E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.93E-07
	HTO	5.07E-06	0.00E+00	2.89E-06	4.18E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.06E-06	1.07E-07	1.32E-05
	I-131	5.43E-06	7.71E-09	1.10E-07	1.39E-10	8.28E-10	5.31E-07	8.08E-09	4.22E-08	0.00E+00	0.00E+00	2.23E-05	6.51E-07	2.91E-05
	I-132	4.14E-07	2.54E-07	9.26E-11	5.42E-11	7.00E-13	2.03E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.41E-08	0.00E+00	8.95E-07
	I-133	6.35E-06	5.74E-08	1.32E-08	1.11E-10	1.00E-10	4.46E-07	2.57E-09	8.79E-08	0.00E+00	0.00E+00	3.36E-06	5.61E-08	1.04E-05
	I-134	2.89E-07	6.87E-07	2.57E-11	5.60E-11	1.94E-13	2.07E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.70E-09	0.00E+00	1.19E-06
	I-135	2.45E-06	2.92E-07	1.58E-09	1.79E-10	1.19E-11	6.25E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.09E-07	4.28E-09	3.78E-06
	Kr-85	0.00E+00	4.95E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.95E-07
	Kr-85m	0.00E+00	1.92E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.92E-07
	Kr-87	0.00E+00	3.35E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.35E-06
	Kr-88	8.54E-07	1.29E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.37E-05
	La-140d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.56E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.56E-10
	Mn-54	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.52E-08	1.68E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.68E-05
	Na-24	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.29E-11	5.48E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.48E-08
	OBT	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.09E-07	2.50E-08	6.34E-07
	Rb-88d	0.00E+00	0.00E+00	1.27E-11	0.00E+00	9.52E-13	3.61E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.65E-08	0.00E+00	4.27E-07
	Sr-91	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.25E-12	3.27E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.28E-09
	Xe-131md	0.00E+00	1.65E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.65E-13
	Xe-133	0.00E+00	1.95E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.95E-06
	Xe-133dd	0.00E+00	2.02E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.02E-14
	Xe-133md	0.00E+00	1.40E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.40E-11
	Xe-135	0.00E+00	1.23E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.23E-05
	Xe-135dd	0.00E+00	1.18E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.18E-09
	Xe-135m	0.00E+00	7.79E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.79E-06
	Xe-135md	0.00E+00	7.21E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.21E-09
	Xe-138	1.00E-05	1.27E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.37E-04
	Y-91	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.00E-12	2.10E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.10E-12
	Zn-65	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.07E-10	1.85E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.87E-08
	Zn-69m	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.86E-11	1.36E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.37E-08
	Total by pathway	3.19E-05	1.68E-04	3.03E-06	4.26E-08	2.16E-09	3.32E-05	1.28E-07	4.02E-05	0.00E+00	0.00E+00	2.06E-04	4.38E-05	5.26E-04

Human Receptor	COPC	Radiological Dose by Pathway during Project Phases (mSv/a)												
		Air (internal)	Air (external)	Water (internal)	Water (external)	Soil (internal)	Soil (external)	Sediment (internal)	Sediment (external)	Aquatic plants	Aquatic animals	Terrestrial plants	Terrestrial animals	Total by COPC
Dairy Farm Adult	Ba-140	0.00E+00	0.00E+00	1.14E-10	1.29E-10	0.00E+00	0.00E+00	1.57E-11	4.90E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.91E-07
	C-14	1.40E-07	1.61E-10	2.27E-09	2.27E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.58E-04	1.01E-04	2.59E-04
	Co-58	0.00E+00	0.00E+00	2.34E-11	5.05E-10	0.00E+00	0.00E+00	6.80E-11	2.60E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.60E-06
	Co-60	3.22E-09	1.22E-10	2.66E-10	2.63E-09	1.14E-12	2.86E-06	6.07E-10	1.29E-05	0.00E+00	0.00E+00	2.46E-08	2.52E-09	1.58E-05
	Cs-134	1.27E-10	4.34E-12	4.22E-10	5.44E-10	1.54E-13	4.47E-08	2.61E-10	6.24E-07	0.00E+00	0.00E+00	6.27E-08	4.36E-08	7.76E-07
	Cs-136	0.00E+00	0.00E+00	3.52E-11	4.25E-10	0.00E+00	0.00E+00	2.29E-11	4.75E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.75E-07
	Cs-137	1.35E-10	2.39E-12	5.51E-10	3.03E-10	1.44E-12	2.29E-07	2.73E-10	3.46E-07	0.00E+00	0.00E+00	7.48E-08	5.67E-08	7.08E-07
	Cs-138d	0.00E+00	0.00E+00	9.53E-13	0.00E+00	1.12E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.24E-07	0.00E+00	2.24E-07
	Cu-64	0.00E+00	0.00E+00	3.22E-12	1.34E-10	0.00E+00	0.00E+00	1.05E-12	5.12E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.14E-08
	Fe-59	0.00E+00	0.00E+00	5.86E-11	6.59E-10	0.00E+00	0.00E+00	1.98E-11	3.78E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.78E-07
	HTO	8.51E-07	0.00E+00	7.24E-07	1.56E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.60E-06	6.00E-07	5.79E-06
	I-131	3.03E-07	8.14E-10	1.80E-09	6.75E-11	9.08E-13	5.60E-08	6.48E-11	3.25E-08	0.00E+00	0.00E+00	4.66E-06	2.48E-05	2.99E-05
	I-132	1.91E-08	2.06E-08	1.02E-12	2.13E-12	5.84E-16	1.65E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.86E-09	0.00E+00	6.10E-08
	I-133	2.69E-07	5.90E-09	1.92E-10	1.33E-10	8.55E-14	4.57E-08	1.64E-11	6.76E-08	0.00E+00	0.00E+00	5.60E-07	1.48E-06	2.43E-06
	I-134	1.45E-08	3.74E-08	2.30E-13	1.48E-12	1.32E-16	1.13E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E-09	0.00E+00	6.47E-08
	I-135	1.08E-07	2.82E-08	1.78E-11	8.37E-12	1.02E-14	6.01E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.24E-08	3.36E-08	3.02E-07
	Kr-85	0.00E+00	5.22E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.22E-08
	Kr-85m	0.00E+00	1.77E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.77E-08
	Kr-87	0.00E+00	2.22E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.22E-07
	Kr-88	4.11E-08	1.10E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.14E-06
	La-140d	0.00E+00	0.00E+00	2.32E-11	0.00E+00	0.00E+00	0.00E+00	1.58E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.48E-11
	Mn-54	0.00E+00	0.00E+00	4.32E-11	8.35E-10	0.00E+00	0.00E+00	3.78E-10	1.29E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.29E-05
	Na-24	0.00E+00	0.00E+00	3.42E-12	8.48E-10	0.00E+00	0.00E+00	1.59E-13	4.22E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.30E-08
	OBT	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.26E-07	3.87E-08	5.64E-07
	Rb-88d	0.00E+00	0.00E+00	2.85E-13	0.00E+00	1.62E-15	4.97E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.71E-08	0.00E+00	6.68E-08
	Sr-91	0.00E+00	0.00E+00	3.42E-12	1.15E-10	0.00E+00	0.00E+00	7.73E-14	2.52E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.64E-09
	Xe-131md	0.00E+00	5.69E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.69E-14
	Xe-133	0.00E+00	2.06E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.06E-07
	Xe-133dd	0.00E+00	2.06E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.06E-14
	Xe-133md	0.00E+00	4.72E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.72E-12
	Xe-135	0.00E+00	1.22E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.22E-06
	Xe-135dd	0.00E+00	3.96E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.96E-10
	Xe-135m	0.00E+00	1.36E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.36E-07
	Xe-135md	0.00E+00	1.07E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.07E-09
	Xe-138	8.93E-08	2.02E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.11E-06
	Y-91	0.00E+00	0.00E+00	2.17E-13	9.55E-15	0.00E+00	0.00E+00	1.74E-14	1.62E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.86E-12
	Zn-65	0.00E+00	0.00E+00	9.84E-11	2.46E-10	0.00E+00	0.00E+00	3.31E-12	1.42E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.46E-08
	Zn-69m	0.00E+00	0.00E+00	5.40E-12	1.74E-10	0.00E+00	0.00E+00	2.69E-13	1.05E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.07E-08
	Total by pathway	1.84E-06	5.06E-06	7.29E-07	2.34E-08	3.75E-12	3.37E-06	1.73E-09	3.09E-05	0.00E+00	0.00E+00	1.67E-04	1.28E-04	3.37E-04

Human Receptor	COPC	Radiological Dose by Pathway during Project Phases (mSv/a)												
		Air (internal)	Air (external)	Water (internal)	Water (external)	Soil (internal)	Soil (external)	Sediment (internal)	Sediment (external)	Aquatic plants	Aquatic animals	Terrestrial plants	Terrestrial animals	Total by COPC
Dairy Farm Child-10y	Ba-140	0.00E+00	0.00E+00	1.02E-10	1.29E-10	0.00E+00	0.00E+00	4.81E-10	4.90E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.91E-07
	C-14	2.00E-07	1.61E-10	1.25E-09	2.27E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.39E-04	1.37E-04	2.76E-04
	Co-58	0.00E+00	0.00E+00	2.14E-11	5.05E-10	0.00E+00	0.00E+00	2.15E-09	2.60E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.60E-06
	Co-60	4.59E-09	1.22E-10	3.43E-10	2.63E-09	5.05E-11	2.86E-06	2.70E-08	1.29E-05	0.00E+00	0.00E+00	5.15E-08	8.85E-09	1.58E-05
	Cs-134	9.73E-11	4.34E-12	1.24E-10	5.44E-10	1.56E-12	4.47E-08	2.65E-09	6.24E-07	0.00E+00	0.00E+00	3.00E-08	3.29E-08	7.35E-07
	Cs-136	0.00E+00	0.00E+00	2.05E-11	4.25E-10	0.00E+00	0.00E+00	4.61E-10	4.75E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.76E-07
	Cs-137	1.03E-10	2.39E-12	1.69E-10	3.03E-10	1.52E-11	2.29E-07	2.89E-09	3.46E-07	0.00E+00	0.00E+00	3.73E-08	4.44E-08	6.60E-07
	Cs-138d	0.00E+00	0.00E+00	7.01E-13	0.00E+00	2.83E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.69E-07	0.00E+00	2.69E-07
	Cu-64	0.00E+00	0.00E+00	2.67E-12	1.34E-10	0.00E+00	0.00E+00	3.00E-11	5.12E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.14E-08
	Fe-59	0.00E+00	0.00E+00	6.09E-11	6.59E-10	0.00E+00	0.00E+00	7.11E-10	3.78E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.79E-07
	HTO	1.01E-06	0.00E+00	3.60E-07	1.30E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.91E-06	9.34E-07	5.23E-06
	I-131	6.91E-07	8.14E-10	1.69E-09	6.75E-11	2.95E-11	5.60E-08	2.11E-09	3.25E-08	0.00E+00	0.00E+00	7.16E-06	7.58E-05	8.37E-05
	I-132	3.76E-08	2.06E-08	8.65E-13	2.13E-12	1.72E-14	1.65E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.75E-09	0.00E+00	8.14E-08
	I-133	6.20E-07	5.90E-09	1.78E-10	1.33E-10	2.73E-12	4.57E-08	5.26E-10	6.76E-08	0.00E+00	0.00E+00	8.45E-07	4.44E-06	6.03E-06
	I-134	2.02E-08	3.74E-08	1.75E-13	1.48E-12	3.46E-15	1.13E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.98E-09	0.00E+00	7.08E-08
	I-135	2.35E-07	2.82E-08	1.68E-11	8.37E-12	3.32E-13	6.01E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.11E-07	1.02E-07	5.36E-07
	Kr-85	0.00E+00	5.22E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.22E-08
	Kr-85m	0.00E+00	1.77E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.77E-08
	Kr-87	0.00E+00	2.22E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.22E-07
	Kr-88	7.81E-08	1.10E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.18E-06
	La-140d	0.00E+00	0.00E+00	1.94E-11	0.00E+00	0.00E+00	0.00E+00	4.55E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.50E-11
	Mn-54	0.00E+00	0.00E+00	3.15E-11	8.35E-10	0.00E+00	0.00E+00	9.53E-09	1.29E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.29E-05
	Na-24	0.00E+00	0.00E+00	2.44E-12	8.48E-10	0.00E+00	0.00E+00	3.90E-12	4.22E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.30E-08
	OBT	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.61E-07	5.10E-08	5.12E-07
	Rb-88d	0.00E+00	0.00E+00	2.14E-13	0.00E+00	4.21E-14	4.97E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.10E-08	0.00E+00	7.06E-08
	Sr-91	0.00E+00	0.00E+00	2.51E-12	1.15E-10	0.00E+00	0.00E+00	1.96E-12	2.52E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.64E-09
	Xe-131md	0.00E+00	5.69E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.69E-14
	Xe-133	0.00E+00	2.06E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.06E-07
	Xe-133dd	0.00E+00	2.06E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.06E-14
	Xe-133md	0.00E+00	4.72E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.72E-12
	Xe-135	0.00E+00	1.22E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.22E-06
	Xe-135dd	0.00E+00	3.96E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.96E-10
	Xe-135m	0.00E+00	1.36E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.36E-07
	Xe-135md	0.00E+00	1.07E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.07E-09
	Xe-138	1.77E-07	2.02E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.19E-06
	Y-91	0.00E+00	0.00E+00	1.87E-13	9.55E-15	0.00E+00	0.00E+00	5.20E-13	1.62E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.33E-12
	Zn-65	0.00E+00	0.00E+00	6.43E-11	2.46E-10	0.00E+00	0.00E+00	7.48E-11	1.42E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.46E-08
	Zn-69m	0.00E+00	0.00E+00	4.56E-12	1.74E-10	0.00E+00	0.00E+00	7.84E-12	1.05E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.07E-08
	Total by pathway	3.08E-06	5.06E-06	3.64E-07	2.08E-08	1.00E-10	3.37E-06	4.87E-08	3.09E-05	0.00E+00	0.00E+00	1.51E-04	2.18E-04	4.12E-04

Human Receptor	COPC	Radiological Dose by Pathway during Project Phases (mSv/a)												
		Air (internal)	Air (external)	Water (internal)	Water (external)	Soil (internal)	Soil (external)	Sediment (internal)	Sediment (external)	Aquatic plants	Aquatic animals	Terrestrial plants	Terrestrial animals	Total by COPC
Dairy Farm Infant-1y	Ba-140	0.00E+00	0.00E+00	2.06E-10	0.00E+00	0.00E+00	0.00E+00	1.66E-09	6.38E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.39E-07
	C-14	1.37E-07	1.61E-10	1.63E-09	9.35E-15	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.24E-04	2.25E-04	3.49E-04
	Co-58	0.00E+00	0.00E+00	3.63E-11	0.00E+00	0.00E+00	0.00E+00	6.17E-09	3.38E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.38E-06
	Co-60	3.36E-09	1.59E-10	5.50E-10	6.09E-12	1.38E-10	3.72E-06	7.35E-08	1.67E-05	0.00E+00	0.00E+00	6.10E-08	1.86E-08	2.06E-05
	Cs-134	4.33E-11	5.64E-12	9.26E-11	1.53E-13	1.98E-12	5.82E-08	3.36E-09	8.11E-07	0.00E+00	0.00E+00	1.69E-08	3.20E-08	9.21E-07
	Cs-136	0.00E+00	0.00E+00	2.90E-11	0.00E+00	0.00E+00	0.00E+00	1.10E-09	6.17E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.18E-07
	Cs-137	4.86E-11	3.10E-12	1.32E-10	7.54E-13	2.03E-11	2.98E-07	3.85E-09	4.50E-07	0.00E+00	0.00E+00	2.19E-08	4.50E-08	8.19E-07
	Cs-138d	0.00E+00	0.00E+00	1.59E-12	0.00E+00	1.09E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.64E-07	0.00E+00	4.64E-07
	Cu-64	0.00E+00	0.00E+00	5.79E-12	0.00E+00	0.00E+00	0.00E+00	1.11E-10	6.64E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.65E-08
	Fe-59	0.00E+00	0.00E+00	1.10E-10	0.00E+00	0.00E+00	0.00E+00	2.18E-09	4.91E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.93E-07
	HTO	6.98E-07	0.00E+00	5.00E-07	5.52E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.95E-06	1.90E-06	6.05E-06
	I-131	7.45E-07	1.06E-09	3.83E-09	3.80E-12	1.13E-10	7.28E-08	8.08E-09	4.22E-08	0.00E+00	0.00E+00	1.22E-05	2.52E-04	2.66E-04
	I-132	4.36E-08	2.68E-08	2.19E-12	1.14E-12	7.37E-14	2.14E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.30E-08	0.00E+00	1.05E-07
	I-133	8.48E-07	7.67E-09	5.11E-10	2.96E-12	1.33E-11	5.94E-08	2.57E-09	8.79E-08	0.00E+00	0.00E+00	1.84E-06	1.88E-05	2.17E-05
	I-134	2.04E-08	4.86E-08	4.08E-13	7.92E-13	1.37E-14	1.47E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.52E-09	0.00E+00	8.73E-08
	I-135	3.07E-07	3.66E-08	4.44E-11	4.48E-12	1.49E-12	7.81E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.22E-07	3.96E-07	1.04E-06
	Kr-85	0.00E+00	6.81E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.81E-08
	Kr-85m	0.00E+00	2.31E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.31E-08
	Kr-87	0.00E+00	2.89E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.89E-07
	Kr-88	9.47E-08	1.43E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.52E-06
	La-140d	0.00E+00	0.00E+00	3.93E-11	0.00E+00	0.00E+00	0.00E+00	1.56E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.96E-10
	Mn-54	0.00E+00	0.00E+00	4.92E-11	0.00E+00	0.00E+00	0.00E+00	2.52E-08	1.68E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.68E-05
	Na-24	0.00E+00	0.00E+00	4.77E-12	0.00E+00	0.00E+00	0.00E+00	1.29E-11	5.48E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.48E-08
	OBT	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.26E-07	8.48E-08	5.11E-07
	Rb-88d	0.00E+00	0.00E+00	5.11E-13	0.00E+00	1.70E-13	6.45E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.75E-08	0.00E+00	1.02E-07
	Sr-91	0.00E+00	0.00E+00	5.48E-12	0.00E+00	0.00E+00	0.00E+00	7.25E-12	3.27E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.29E-09
	Xe-131md	0.00E+00	7.40E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.40E-14
	Xe-133	0.00E+00	2.67E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.67E-07
	Xe-133dd	0.00E+00	2.68E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.68E-14
	Xe-133md	0.00E+00	6.14E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.14E-12
	Xe-135	0.00E+00	1.58E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.58E-06
	Xe-135dd	0.00E+00	5.14E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.14E-10
	Xe-135m	0.00E+00	1.77E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.77E-07
	Xe-135md	0.00E+00	1.39E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.39E-09
	Xe-138	2.06E-07	2.62E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.83E-06
	Y-91	0.00E+00	0.00E+00	4.25E-13	0.00E+00	0.00E+00	0.00E+00	2.00E-12	2.10E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.52E-12
	Zn-65	0.00E+00	0.00E+00	1.05E-10	0.00E+00	0.00E+00	0.00E+00	2.07E-10	1.85E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.88E-08
	Zn-69m	0.00E+00	0.00E+00	9.81E-12	0.00E+00	0.00E+00	0.00E+00	2.86E-11	1.36E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.37E-08
	Total by pathway	3.10E-06	6.58E-06	5.07E-07	5.54E-09	2.89E-10	4.38E-06	1.28E-07	4.02E-05	0.00E+00	0.00E+00	1.42E-04	4.99E-04	6.96E-04

Human Receptor	COPC	Radiological Dose by Pathway during Project Phases (mSv/a): Air (internal)	Air (external)	Water (internal)	Water (external)	Soil (internal)	Soil (external)	Sediment (internal)	Sediment (external)	Aquatic plants	Aquatic animals	Terrestrial plants	Terrestrial animals	Total by COPC
Rural Resident Adult +worker	Ba-140	0.00E+00	0.00E+00	4.40E-10	1.33E-10	7.15E-16	2.74E-09	1.54E-11	4.81E-07	0.00E+00	0.00E+00	1.49E-13	4.77E-15	4.85E-07
	C-14	5.19E-07	5.97E-10	5.63E-09	7.64E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.34E-04	6.09E-07	1.35E-04
	Co-58	0.00E+00	0.00E+00	9.01E-11	5.21E-10	8.13E-16	3.78E-09	6.67E-11	2.55E-06	0.00E+00	0.00E+00	2.84E-13	1.94E-16	2.55E-06
	Co-60	1.19E-08	4.51E-10	9.76E-10	2.76E-09	2.58E-12	6.49E-06	5.96E-10	1.26E-05	0.00E+00	0.00E+00	1.87E-08	6.91E-11	1.92E-05
	Cs-134	4.71E-10	1.61E-11	1.63E-09	5.63E-10	4.73E-13	1.37E-07	2.57E-10	6.12E-07	0.00E+00	0.00E+00	4.80E-08	6.52E-11	8.00E-07
	Cs-136	0.00E+00	0.00E+00	1.35E-10	4.38E-10	2.28E-16	5.73E-10	2.24E-11	4.66E-07	0.00E+00	0.00E+00	9.33E-14	6.92E-16	4.67E-07
	Cs-137	4.98E-10	8.83E-12	2.15E-09	3.21E-10	4.42E-12	7.02E-07	2.68E-10	3.40E-07	0.00E+00	0.00E+00	5.77E-08	3.70E-10	1.10E-06
	Cs-138d	0.00E+00	0.00E+00	3.91E-12	0.00E+00	3.46E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.77E-07	0.00E+00	1.77E-07
	Cu-64	0.00E+00	0.00E+00	1.24E-11	1.36E-10	8.35E-19	4.84E-12	1.03E-12	5.03E-08	0.00E+00	0.00E+00	4.94E-16	4.93E-18	5.05E-08
	Fe-59	0.00E+00	0.00E+00	2.25E-10	6.79E-10	1.28E-15	2.91E-09	1.94E-11	3.71E-07	0.00E+00	0.00E+00	4.90E-14	1.63E-14	3.74E-07
	HTO	3.15E-06	0.00E+00	2.11E-06	5.47E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.93E-06	6.13E-08	8.30E-06
	I-131	1.12E-06	3.02E-09	8.62E-09	1.24E-10	3.30E-12	2.03E-07	6.36E-11	3.19E-08	0.00E+00	0.00E+00	3.79E-06	2.74E-07	5.44E-06
	I-132	9.43E-08	1.02E-07	6.66E-12	2.49E-11	2.82E-15	7.95E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.08E-09	0.00E+00	2.79E-07
	I-133	1.03E-06	2.26E-08	9.20E-10	1.80E-10	3.20E-13	1.71E-07	1.61E-11	6.63E-08	0.00E+00	0.00E+00	4.57E-07	1.95E-08	1.76E-06
	I-134	1.10E-07	2.84E-07	2.32E-12	2.66E-11	9.79E-16	8.38E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.39E-09	0.00E+00	4.79E-07
	I-135	4.42E-07	1.15E-07	9.69E-11	8.10E-11	4.10E-14	2.41E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.95E-08	1.62E-09	8.60E-07
	Kr-85	0.00E+00	1.93E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.93E-07
	Kr-85m	0.00E+00	7.62E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.62E-08
	Kr-87	0.00E+00	1.36E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.36E-06
	Kr-88	1.92E-07	5.13E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.32E-06
	La-140d	0.00E+00	0.00E+00	8.94E-11	0.00E+00	5.69E-16	0.00E+00	1.55E-12	0.00E+00	0.00E+00	0.00E+00	4.21E-14	3.73E-17	9.10E-11
	Mn-54	0.00E+00	0.00E+00	1.66E-10	8.62E-10	6.57E-15	2.73E-08	3.71E-10	1.27E-05	0.00E+00	0.00E+00	1.71E-11	1.94E-15	1.27E-05
	Na-24	0.00E+00	0.00E+00	1.32E-11	8.62E-10	1.05E-18	3.25E-11	1.56E-13	4.14E-08	0.00E+00	0.00E+00	9.33E-16	3.65E-17	4.23E-08
	OBT	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.39E-07	1.24E-08	4.51E-07
	Rb-88d	0.00E+00	0.00E+00	5.28E-13	0.00E+00	2.30E-15	7.03E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.23E-08	0.00E+00	8.27E-08
	Sr-91	0.00E+00	0.00E+00	1.31E-11	1.16E-10	6.64E-19	1.43E-12	7.58E-14	2.47E-09	0.00E+00	0.00E+00	4.27E-15	2.67E-18	2.60E-09
	Xe-131md	0.00E+00	5.30E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.30E-14
	Xe-133	0.00E+00	7.65E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.65E-07
	Xe-133dd	0.00E+00	5.24E-15	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.24E-15
	Xe-133md	0.00E+00	4.49E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.49E-12
	Xe-135	0.00E+00	4.84E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.84E-06
	Xe-135dd	0.00E+00	3.78E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.78E-10
	Xe-135m	0.00E+00	3.54E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.54E-06
	Xe-135md	0.00E+00	2.56E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.56E-09
	Xe-138	2.58E-06	5.84E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.10E-05
	Y-91	0.00E+00	0.00E+00	8.36E-13	1.00E-14	8.68E-18	1.00E-12	1.71E-14	1.59E-12	0.00E+00	0.00E+00	1.43E-15	2.43E-19	3.45E-12
	Zn-65	0.00E+00	0.00E+00	3.78E-10	2.53E-10	1.17E-14	6.06E-09	3.25E-12	1.40E-08	0.00E+00	0.00E+00	1.13E-10	1.12E-13	2.08E-08
	Zn-69m	0.00E+00	0.00E+00	2.08E-11	1.76E-10	1.52E-18	7.08E-12	2.64E-13	1.03E-08	0.00E+00	0.00E+00	1.46E-14	1.46E-17	1.05E-08
	Total by pathway	9.25E-06	7.48E-05	2.13E-06	6.30E-08	1.12E-11	8.23E-06	1.70E-09	3.03E-05	0.00E+00	0.00E+00	1.42E-04	9.78E-07	2.68E-04

Human Receptor	COPC	Radiological Dose by Pathway during Project Phases (mSv/a)												
		Air (internal)	Air (external)	Water (internal)	Water (external)	Soil (internal)	Soil (external)	Sediment (internal)	Sediment (external)	Aquatic plants	Aquatic animals	Terrestrial plants	Terrestrial animals	Total by COPC
Rural Resident Child-10y	Ba-140	0.00E+00	0.00E+00	2.71E-10	1.35E-10	2.23E-14	2.79E-09	4.81E-10	4.90E-07	0.00E+00	0.00E+00	2.14E-13	5.24E-15	4.94E-07
	C-14	7.32E-07	5.90E-10	3.15E-09	7.79E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E-04	5.37E-07	1.21E-04
	Co-58	0.00E+00	0.00E+00	5.72E-11	5.31E-10	2.62E-14	3.85E-09	2.15E-09	2.60E-06	0.00E+00	0.00E+00	4.19E-13	2.19E-16	2.60E-06
	Co-60	1.68E-08	4.46E-10	9.43E-10	2.82E-09	1.11E-10	6.28E-06	2.70E-08	1.29E-05	0.00E+00	0.00E+00	3.98E-08	2.09E-10	1.92E-05
	Cs-134	3.55E-10	1.59E-11	3.36E-10	5.74E-10	4.70E-12	1.34E-07	2.65E-09	6.24E-07	0.00E+00	0.00E+00	2.33E-08	2.77E-11	7.85E-07
	Cs-136	0.00E+00	0.00E+00	5.47E-11	4.47E-10	4.68E-15	5.84E-10	4.61E-10	4.75E-07	0.00E+00	0.00E+00	8.79E-14	5.00E-16	4.76E-07
	Cs-137	3.76E-10	8.71E-12	5.08E-10	3.27E-10	4.59E-11	6.88E-07	2.89E-09	3.46E-07	0.00E+00	0.00E+00	2.91E-08	1.44E-10	1.07E-06
	Cs-138d	0.00E+00	0.00E+00	2.93E-12	0.00E+00	8.45E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.15E-07	0.00E+00	2.15E-07
	Cu-64	0.00E+00	0.00E+00	7.11E-12	1.39E-10	2.44E-17	4.93E-12	3.00E-11	5.12E-08	0.00E+00	0.00E+00	6.61E-16	5.05E-18	5.14E-08
	Fe-59	0.00E+00	0.00E+00	1.62E-10	6.92E-10	4.68E-14	2.96E-09	7.11E-10	3.78E-07	0.00E+00	0.00E+00	8.21E-14	2.10E-14	3.82E-07
	HTO	3.70E-06	0.00E+00	1.07E-06	4.65E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.40E-06	3.84E-08	7.24E-06
	I-131	2.53E-06	2.98E-09	8.01E-09	1.27E-10	1.06E-10	2.01E-07	2.11E-09	3.25E-08	0.00E+00	0.00E+00	5.90E-06	7.23E-07	9.40E-06
	I-132	1.83E-07	1.00E-07	5.78E-12	2.54E-11	8.18E-14	7.85E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.73E-09	0.00E+00	3.68E-07
	I-133	2.34E-06	2.23E-08	8.18E-10	1.83E-10	1.01E-11	1.69E-07	5.26E-10	6.76E-08	0.00E+00	0.00E+00	6.99E-07	4.63E-08	3.35E-06
	I-134	1.52E-07	2.81E-07	1.80E-12	2.71E-11	2.55E-14	8.29E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.74E-09	0.00E+00	5.18E-07
	I-135	9.49E-07	1.14E-07	9.29E-11	8.25E-11	1.32E-12	2.38E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.26E-08	2.43E-09	1.40E-06
	Kr-85	0.00E+00	1.91E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.91E-07
	Kr-85m	0.00E+00	7.53E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.53E-08
	Kr-87	0.00E+00	1.35E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.35E-06
	Kr-88	3.61E-07	5.07E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.43E-06
	La-140d	0.00E+00	0.00E+00	5.18E-11	0.00E+00	1.67E-14	0.00E+00	4.55E-11	0.00E+00	0.00E+00	0.00E+00	5.68E-14	3.86E-17	9.74E-11
	Mn-54	0.00E+00	0.00E+00	8.42E-11	8.78E-10	1.69E-13	2.78E-08	9.53E-09	1.29E-05	0.00E+00	0.00E+00	2.01E-11	1.75E-15	1.30E-05
	Na-24	0.00E+00	0.00E+00	6.50E-12	8.78E-10	2.63E-17	3.31E-11	3.90E-12	4.22E-08	0.00E+00	0.00E+00	1.07E-15	3.22E-17	4.31E-08
	OBT	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.90E-07	8.51E-09	3.99E-07
	Rb-88d	0.00E+00	0.00E+00	4.04E-13	0.00E+00	5.68E-14	6.70E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.53E-08	0.00E+00	8.24E-08
	Sr-91	0.00E+00	0.00E+00	6.70E-12	1.18E-10	1.72E-17	1.45E-12	1.96E-12	2.52E-09	0.00E+00	0.00E+00	5.06E-15	2.42E-18	2.65E-09
	Xe-131md	0.00E+00	5.15E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.15E-14
	Xe-133	0.00E+00	7.55E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.55E-07
	Xe-133dd	0.00E+00	4.97E-15	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.97E-15
	Xe-133md	0.00E+00	4.36E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.36E-12
	Xe-135	0.00E+00	4.78E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.78E-06
	Xe-135dd	0.00E+00	3.68E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.68E-10
	Xe-135m	0.00E+00	3.52E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.52E-06
	Xe-135md	0.00E+00	2.51E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.51E-09
	Xe-138	5.10E-06	5.82E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.33E-05
	Y-91	0.00E+00	0.00E+00	5.00E-13	1.02E-14	2.64E-16	1.02E-12	5.20E-13	1.62E-12	0.00E+00	0.00E+00	1.98E-15	2.59E-19	3.67E-12
	Zn-65	0.00E+00	0.00E+00	1.72E-10	2.58E-10	2.69E-13	6.17E-09	7.48E-11	1.42E-08	0.00E+00	0.00E+00	1.19E-10	9.08E-14	2.10E-08
	Zn-69m	0.00E+00	0.00E+00	1.22E-11	1.80E-10	4.53E-17	7.21E-12	7.84E-12	1.05E-08	0.00E+00	0.00E+00	1.99E-14	1.53E-17	1.07E-08
	Total by pathway	1.61E-05	7.45E-05	1.08E-06	5.49E-08	2.81E-10	7.99E-06	4.87E-08	3.09E-05	0.00E+00	0.00E+00	1.30E-04	1.36E-06	2.62E-04

Human Receptor	COPC	Radiological Dose by Pathway during Project Phases (mSv/a)												
		Air (internal)	Air (external)	Water (internal)	Water (external)	Soil (internal)	Soil (external)	Sediment (internal)	Sediment (external)	Aquatic plants	Aquatic animals	Terrestrial plants	Terrestrial animals	Total by COPC
Rural Resident Infant-1y	Ba-140	0.00E+00	0.00E+00	5.51E-10	2.17E-12	7.69E-14	3.63E-09	1.66E-09	6.38E-07	0.00E+00	0.00E+00	2.65E-13	9.93E-15	6.43E-07
	C-14	4.99E-07	5.90E-10	4.12E-09	3.21E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.04E-04	3.94E-07	1.05E-04
	Co-58	0.00E+00	0.00E+00	9.69E-11	8.63E-12	7.51E-14	5.01E-09	6.17E-09	3.38E-06	0.00E+00	0.00E+00	4.32E-13	3.47E-16	3.39E-06
	Co-60	1.23E-08	5.79E-10	1.52E-09	7.81E-11	3.02E-10	8.17E-06	7.35E-08	1.67E-05	0.00E+00	0.00E+00	4.57E-08	5.41E-11	2.50E-05
	Cs-134	1.58E-10	2.06E-11	2.51E-10	1.04E-11	5.95E-12	1.75E-07	3.36E-09	8.11E-07	0.00E+00	0.00E+00	1.27E-08	1.45E-11	1.00E-06
	Cs-136	0.00E+00	0.00E+00	7.74E-11	7.16E-12	1.12E-14	7.59E-10	1.10E-09	6.17E-07	0.00E+00	0.00E+00	7.59E-14	6.59E-16	6.19E-07
	Cs-137	1.77E-10	1.13E-11	3.99E-10	1.08E-11	6.11E-11	8.97E-07	3.85E-09	4.50E-07	0.00E+00	0.00E+00	1.65E-08	1.01E-10	1.37E-06
	Cs-138d	0.00E+00	0.00E+00	6.65E-12	0.00E+00	3.25E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.56E-07	0.00E+00	3.56E-07
	Cu-64	0.00E+00	0.00E+00	1.55E-11	1.50E-12	8.97E-17	6.40E-12	1.11E-10	6.64E-08	0.00E+00	0.00E+00	8.76E-16	1.02E-17	6.65E-08
	Fe-59	0.00E+00	0.00E+00	2.94E-10	1.12E-11	1.44E-13	3.85E-09	2.18E-09	4.91E-07	0.00E+00	0.00E+00	9.08E-14	3.54E-14	4.97E-07
	HTO	2.55E-06	0.00E+00	1.48E-06	2.30E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.34E-06	4.85E-08	6.44E-06
	I-131	2.73E-06	3.88E-09	1.82E-08	3.49E-11	4.07E-10	2.61E-07	8.08E-09	4.22E-08	0.00E+00	0.00E+00	9.67E-06	3.41E-08	1.28E-05
	I-132	2.13E-07	1.30E-07	1.46E-11	1.36E-11	3.51E-13	1.02E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.05E-08	0.00E+00	4.56E-07
	I-133	3.20E-06	2.90E-08	2.36E-09	2.89E-11	4.92E-11	2.19E-07	2.57E-09	8.79E-08	0.00E+00	0.00E+00	1.46E-06	1.16E-08	5.01E-06
	I-134	1.54E-07	3.66E-07	4.20E-12	1.45E-11	1.01E-13	1.08E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.94E-09	0.00E+00	6.30E-07
	I-135	1.24E-06	1.48E-07	2.46E-10	4.42E-11	5.90E-12	3.09E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.77E-07	3.69E-09	1.88E-06
	Kr-85	0.00E+00	2.49E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.49E-07
	Kr-85m	0.00E+00	9.79E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.79E-08
	Kr-87	0.00E+00	1.75E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-06
	Kr-88	4.38E-07	6.59E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.02E-06
	La-140d	0.00E+00	0.00E+00	1.05E-10	0.00E+00	5.75E-14	0.00E+00	1.56E-10	0.00E+00	0.00E+00	0.00E+00	7.02E-14	7.29E-17	2.61E-10
	Mn-54	0.00E+00	0.00E+00	1.31E-10	1.44E-11	4.46E-13	3.61E-08	2.52E-08	1.68E-05	0.00E+00	0.00E+00	1.91E-11	2.54E-15	1.69E-05
	Na-24	0.00E+00	0.00E+00	1.27E-11	1.01E-11	8.72E-17	4.31E-11	1.29E-11	5.48E-08	0.00E+00	0.00E+00	1.28E-15	5.87E-17	5.49E-08
	OBT	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.49E-07	1.04E-08	3.59E-07
	Rb-88d	0.00E+00	0.00E+00	9.65E-13	0.00E+00	2.30E-13	8.70E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.68E-08	0.00E+00	1.14E-07
	Sr-91	0.00E+00	0.00E+00	1.46E-11	1.11E-12	6.35E-17	1.89E-12	7.25E-12	3.27E-09	0.00E+00	0.00E+00	6.73E-15	4.93E-18	3.30E-09
	Xe-131md	0.00E+00	6.70E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.70E-14
	Xe-133	0.00E+00	9.82E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.82E-07
	Xe-133dd	0.00E+00	6.46E-15	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.46E-15
	Xe-133md	0.00E+00	5.67E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.67E-12
	Xe-135	0.00E+00	6.22E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.22E-06
	Xe-135dd	0.00E+00	4.78E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.78E-10
	Xe-135m	0.00E+00	4.58E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.58E-06
	Xe-135md	0.00E+00	3.26E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.26E-09
	Xe-138	5.94E-06	7.56E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.15E-05
	Y-91	0.00E+00	0.00E+00	1.13E-12	1.79E-16	1.01E-15	1.33E-12	2.00E-12	2.10E-12	0.00E+00	0.00E+00	2.74E-15	5.48E-19	6.56E-12
	Zn-65	0.00E+00	0.00E+00	2.81E-10	4.21E-12	7.47E-13	8.02E-09	2.07E-10	1.85E-08	0.00E+00	0.00E+00	1.18E-10	1.39E-13	2.71E-08
	Zn-69m	0.00E+00	0.00E+00	2.61E-11	2.01E-12	1.65E-16	9.38E-12	2.86E-11	1.36E-08	0.00E+00	0.00E+00	2.61E-14	3.07E-17	1.37E-08
	Total by pathway	1.70E-05	9.68E-05	1.51E-06	2.33E-08	8.37E-10	1.04E-05	1.28E-07	4.02E-05	0.00E+00	0.00E+00	1.18E-04	5.03E-07	2.85E-04

Human Receptor	COPC	Radiological Dose by Pathway during Project Phases (mSv/a)												
		Air (internal)	Air (external)	Water (internal)	Water (external)	Soil (internal)	Soil (external)	Sediment (internal)	Sediment (external)	Aquatic plants	Aquatic animals	Terrestrial plants	Terrestrial animals	Total by COPC
Sport Fisher Adult	Ba-140	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.50E-09	0.00E+00	0.00E+00	1.50E-09
	C-14	2.52E-08	2.90E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.52E-08
	Co-58	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.72E-08	0.00E+00	0.00E+00	1.72E-08
	Co-60	5.77E-10	2.19E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.53E-07	0.00E+00	0.00E+00	1.54E-07
	Cs-134	2.29E-11	7.79E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.94E-05	0.00E+00	0.00E+00	1.94E-05
	Cs-136	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.73E-06	0.00E+00	0.00E+00	1.73E-06
	Cs-137	2.41E-11	4.28E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.02E-05	0.00E+00	0.00E+00	2.02E-05
	Cs-138d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Cu-64	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.04E-08	0.00E+00	0.00E+00	3.04E-08
	Fe-59	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.92E-07	0.00E+00	0.00E+00	1.92E-07
	HTO	1.53E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.49E-08	0.00E+00	0.00E+00	1.78E-07
	I-131	5.46E-08	1.47E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.84E-08	0.00E+00	0.00E+00	7.31E-08
	I-132	4.75E-09	5.12E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.87E-09
	I-133	5.01E-08	1.10E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.20E-09	0.00E+00	0.00E+00	5.74E-08
	I-134	5.87E-09	1.52E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.10E-08
	I-135	2.18E-08	5.68E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.74E-08
	Kr-85	0.00E+00	9.37E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.37E-09
	Kr-85m	0.00E+00	3.77E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.77E-09
	Kr-87	0.00E+00	7.08E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.08E-08
	Kr-88	9.60E-09	2.57E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.66E-07
	La-140d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Mn-54	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.40E-07	0.00E+00	0.00E+00	1.40E-07
	Na-24	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.68E-09	0.00E+00	0.00E+00	8.68E-09
	OBT	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.07E-08	0.00E+00	0.00E+00	1.07E-08
	Rb-88d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Sr-91	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.29E-10	0.00E+00	0.00E+00	3.29E-10
	Xe-131md	0.00E+00	1.56E-15	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.56E-15
	Xe-133	0.00E+00	3.71E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.71E-08
	Xe-133dd	0.00E+00	9.04E-17	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.04E-17
	Xe-133md	0.00E+00	1.33E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.33E-13
	Xe-135	0.00E+00	2.37E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.37E-07
	Xe-135dd	0.00E+00	1.11E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.11E-11
	Xe-135m	0.00E+00	2.32E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.32E-07
	Xe-135md	0.00E+00	9.08E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.08E-11
	Xe-138	1.73E-07	3.90E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.08E-06
	Y-91	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Zn-65	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.66E-06	0.00E+00	0.00E+00	6.66E-06
	Zn-69m	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.75E-07	0.00E+00	0.00E+00	8.75E-07
	Total by pathway	4.98E-07	4.78E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.94E-05	0.00E+00	0.00E+00	5.47E-05

Human Receptor	COPC	Radiological Dose by Pathway during Project Phases (mSv/a)												
		Air (internal)	Air (external)	Water (internal)	Water (external)	Soil (internal)	Soil (external)	Sediment (internal)	Sediment (external)	Aquatic plants	Aquatic animals	Terrestrial plants	Terrestrial animals	Total by COPC
Sport Fisher Child-10y	Ba-140	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.35E-09	0.00E+00	0.00E+00	2.35E-09
	C-14	3.60E-08	2.90E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.60E-08
	Co-58	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.78E-08	0.00E+00	0.00E+00	2.78E-08
	Co-60	8.24E-10	2.19E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.48E-07	0.00E+00	0.00E+00	3.49E-07
	Cs-134	1.75E-11	7.79E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.00E-05	0.00E+00	0.00E+00	1.00E-05
	Cs-136	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.78E-06	0.00E+00	0.00E+00	1.78E-06
	Cs-137	1.85E-11	4.28E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.09E-05	0.00E+00	0.00E+00	1.09E-05
	Cs-138d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Cu-64	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.44E-08	0.00E+00	0.00E+00	4.44E-08
	Fe-59	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.52E-07	0.00E+00	0.00E+00	3.52E-07
	HTO	1.82E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.19E-08	0.00E+00	0.00E+00	2.03E-07
	I-131	1.25E-07	1.47E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.05E-08	0.00E+00	0.00E+00	1.55E-07
	I-132	9.33E-09	5.12E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.45E-08
	I-133	1.15E-07	1.10E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.01E-08	0.00E+00	0.00E+00	1.27E-07
	I-134	8.18E-09	1.52E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.34E-08
	I-135	4.72E-08	5.68E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.29E-08
	Kr-85	0.00E+00	9.37E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.37E-09
	Kr-85m	0.00E+00	3.77E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.77E-09
	Kr-87	0.00E+00	7.08E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.08E-08
	Kr-88	1.83E-08	2.57E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.75E-07
	La-140d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Mn-54	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.81E-07	0.00E+00	0.00E+00	1.81E-07
	Na-24	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.09E-08	0.00E+00	0.00E+00	1.09E-08
	OBT	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.03E-08	0.00E+00	0.00E+00	1.03E-08
	Rb-88d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Sr-91	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.27E-10	0.00E+00	0.00E+00	4.27E-10
	Xe-131md	0.00E+00	1.56E-15	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.56E-15
	Xe-133	0.00E+00	3.71E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.71E-08
	Xe-133dd	0.00E+00	9.04E-17	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.04E-17
	Xe-133md	0.00E+00	1.33E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.33E-13
	Xe-135	0.00E+00	2.37E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.37E-07
	Xe-135dd	0.00E+00	1.11E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.11E-11
	Xe-135m	0.00E+00	2.32E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.32E-07
	Xe-135md	0.00E+00	9.08E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.08E-11
	Xe-138	3.42E-07	3.90E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.25E-06
	Y-91	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Zn-65	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.68E-06	0.00E+00	0.00E+00	7.68E-06
	Zn-69m	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.30E-06	0.00E+00	0.00E+00	1.30E-06
	Total by pathway	8.84E-07	4.78E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.28E-05	0.00E+00	0.00E+00	3.84E-05

Human Receptor	COPC	Radiological Dose by Pathway during Project Phases (mSv/a)												
		Air (internal)	Air (external)	Water (internal)	Water (external)	Soil (internal)	Soil (external)	Sediment (internal)	Sediment (external)	Aquatic plants	Aquatic animals	Terrestrial plants	Terrestrial animals	Total by COPC
Sport Fisher Infant-1y	Ba-140	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.54E-09	0.00E+00	0.00E+00	2.54E-09
	C-14	2.45E-08	2.90E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.46E-08
	Co-58	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.51E-08	0.00E+00	0.00E+00	2.51E-08
	Co-60	6.04E-10	2.85E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.98E-07	0.00E+00	0.00E+00	2.99E-07
	Cs-134	7.78E-12	1.01E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.99E-06	0.00E+00	0.00E+00	3.99E-06
	Cs-136	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.34E-06	0.00E+00	0.00E+00	1.34E-06
	Cs-137	8.72E-12	5.56E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.57E-06	0.00E+00	0.00E+00	4.57E-06
	Cs-138d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Cu-64	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.14E-08	0.00E+00	0.00E+00	5.14E-08
	Fe-59	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.40E-07	0.00E+00	0.00E+00	3.40E-07
	HTO	1.25E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.61E-08	0.00E+00	0.00E+00	1.41E-07
	I-131	1.34E-07	1.91E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.68E-08	0.00E+00	0.00E+00	1.71E-07
	I-132	1.08E-08	6.65E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-08
	I-133	1.58E-07	1.43E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.55E-08	0.00E+00	0.00E+00	1.75E-07
	I-134	8.30E-09	1.97E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.80E-08
	I-135	6.18E-08	7.38E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.92E-08
	Kr-85	0.00E+00	1.22E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.22E-08
	Kr-85m	0.00E+00	4.90E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.90E-09
	Kr-87	0.00E+00	9.20E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.20E-08
	Kr-88	2.22E-08	3.33E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.56E-07
	La-140d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Mn-54	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.50E-07	0.00E+00	0.00E+00	1.50E-07
	Na-24	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.14E-08	0.00E+00	0.00E+00	1.14E-08
	OBT	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.39E-09	0.00E+00	0.00E+00	7.39E-09
	Rb-88d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Sr-91	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.96E-10	0.00E+00	0.00E+00	4.96E-10
	Xe-131md	0.00E+00	2.03E-15	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.03E-15
	Xe-133	0.00E+00	4.83E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.83E-08
	Xe-133dd	0.00E+00	1.18E-16	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.18E-16
	Xe-133md	0.00E+00	1.72E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.72E-13
	Xe-135	0.00E+00	3.08E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.08E-07
	Xe-135dd	0.00E+00	1.44E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.44E-11
	Xe-135m	0.00E+00	3.01E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.01E-07
	Xe-135md	0.00E+00	1.18E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.18E-10
	Xe-138	3.98E-07	5.07E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.47E-06
	Y-91	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Zn-65	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.69E-06	0.00E+00	0.00E+00	6.69E-06
	Zn-69m	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.49E-06	0.00E+00	0.00E+00	1.49E-06
	Total by pathway	9.44E-07	6.21E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.90E-05	0.00E+00	0.00E+00	2.62E-05

Human Receptor	COPC	Radiological Dose by Pathway during Project Phases (mSv/a)												
		Air (internal)	Air (external)	Water (internal)	Water (external)	Soil (internal)	Soil (external)	Sediment (internal)	Sediment (external)	Aquatic plants	Aquatic animals	Terrestrial plants	Terrestrial animals	Total by COPC
Camper Adult	Ba-140	0.00E+00	0.00E+00	3.48E-09	2.02E-10	0.00E+00	0.00E+00	1.57E-11	4.90E-07	0.00E+00	6.95E-11	0.00E+00	0.00E+00	4.94E-07
	C-14	2.17E-07	2.49E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.18E-06	8.78E-05	2.61E-07	9.04E-05
	Co-58	0.00E+00	0.00E+00	7.14E-10	7.97E-10	0.00E+00	0.00E+00	6.80E-11	2.60E-06	0.00E+00	8.14E-10	0.00E+00	0.00E+00	2.60E-06
	Co-60	4.97E-09	1.89E-10	6.40E-09	4.14E-09	1.83E-12	4.62E-06	6.07E-10	1.29E-05	0.00E+00	7.35E-09	1.32E-08	1.21E-11	1.75E-05
	Cs-134	1.97E-10	6.71E-12	1.25E-08	8.60E-10	2.49E-13	7.23E-08	2.61E-10	6.24E-07	0.00E+00	9.25E-07	3.31E-08	3.06E-11	1.67E-06
	Cs-136	0.00E+00	0.00E+00	1.07E-09	6.67E-10	0.00E+00	0.00E+00	2.29E-11	4.75E-07	0.00E+00	8.02E-08	0.00E+00	0.00E+00	5.57E-07
	Cs-137	2.08E-10	3.69E-12	1.30E-08	4.76E-10	2.33E-12	3.69E-07	2.73E-10	3.46E-07	0.00E+00	9.68E-07	3.98E-08	1.94E-10	1.74E-06
	Cs-138d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.44E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.22E-07	0.00E+00	1.22E-07
	Cu-64	0.00E+00	0.00E+00	8.66E-11	1.79E-10	0.00E+00	0.00E+00	1.05E-12	5.12E-08	0.00E+00	8.53E-10	0.00E+00	0.00E+00	5.24E-08
	Fe-59	0.00E+00	0.00E+00	1.78E-09	1.04E-09	0.00E+00	0.00E+00	1.98E-11	3.78E-07	0.00E+00	9.05E-09	0.00E+00	0.00E+00	3.89E-07
	HTO	1.32E-06	0.00E+00	7.49E-08	4.86E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.47E-08	1.99E-06	2.99E-08	3.43E-06
	I-131	4.69E-07	1.26E-09	6.44E-09	9.42E-11	1.41E-12	8.68E-08	6.48E-11	3.25E-08	0.00E+00	5.03E-09	2.45E-06	7.41E-09	3.06E-06
	I-132	3.38E-08	3.64E-08	0.00E+00	0.00E+00	1.03E-15	2.91E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.62E-09	0.00E+00	1.02E-07
	I-133	4.22E-07	9.26E-09	1.21E-09	1.80E-10	1.34E-13	7.18E-08	1.64E-11	6.76E-08	0.00E+00	7.36E-10	2.95E-07	1.99E-09	8.70E-07
	I-134	3.13E-08	8.10E-08	0.00E+00	0.00E+00	2.86E-16	2.45E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.84E-10	0.00E+00	1.38E-07
	I-135	1.75E-07	4.56E-08	0.00E+00	0.00E+00	1.66E-14	9.76E-08	0.00E+00	0.00E+00	0.00E+00	6.47E-11	3.84E-08	6.73E-10	3.57E-07
	Kr-85	0.00E+00	8.07E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.07E-08
	Kr-85m	0.00E+00	2.94E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.94E-08
	Kr-87	0.00E+00	4.35E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.35E-07
	Kr-88	7.07E-08	1.89E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.96E-06
	La-140d	0.00E+00	0.00E+00	7.85E-10	0.00E+00	0.00E+00	0.00E+00	1.58E-12	0.00E+00	0.00E+00	1.33E-10	0.00E+00	0.00E+00	9.19E-10
	Mn-54	0.00E+00	0.00E+00	1.32E-09	1.32E-09	0.00E+00	0.00E+00	3.78E-10	1.29E-05	0.00E+00	6.66E-09	0.00E+00	0.00E+00	1.29E-05
	Na-24	0.00E+00	0.00E+00	9.39E-11	1.16E-09	0.00E+00	0.00E+00	1.59E-13	4.22E-08	0.00E+00	2.64E-10	0.00E+00	0.00E+00	4.37E-08
	OBT	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.06E-08	3.02E-07	6.02E-09	3.18E-07
	Rb-88d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.50E-15	7.67E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.69E-09	0.00E+00	8.54E-08
	Sr-91	0.00E+00	0.00E+00	8.83E-11	1.47E-10	0.00E+00	0.00E+00	7.73E-14	2.52E-09	0.00E+00	7.75E-12	0.00E+00	0.00E+00	2.76E-09
	Xe-131md	0.00E+00	5.76E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.76E-14
	Xe-133	0.00E+00	3.19E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.19E-07
	Xe-133dd	0.00E+00	1.46E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.46E-14
	Xe-133md	0.00E+00	4.82E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.82E-12
	Xe-135	0.00E+00	1.94E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.94E-06
	Xe-135dd	0.00E+00	4.09E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.09E-10
	Xe-135m	0.00E+00	5.38E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.38E-07
	Xe-135md	0.00E+00	1.54E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.54E-09
	Xe-138	3.73E-07	8.42E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.79E-06
	Y-91	0.00E+00	0.00E+00	7.02E-12	1.79E-14	0.00E+00	0.00E+00	1.74E-14	1.62E-12	0.00E+00	1.96E-12	0.00E+00	0.00E+00	1.06E-11
	Zn-65	0.00E+00	0.00E+00	3.00E-09	3.88E-10	0.00E+00	0.00E+00	3.31E-12	1.42E-08	0.00E+00	3.16E-07	0.00E+00	0.00E+00	3.33E-07
	Zn-69m	0.00E+00	0.00E+00	1.47E-10	2.34E-10	0.00E+00	0.00E+00	2.69E-13	1.05E-08	0.00E+00	2.56E-08	0.00E+00	0.00E+00	3.65E-08
	Total by pathway	3.11E-06	1.38E-05	1.27E-07	1.67E-08	6.00E-12	5.44E-06	1.73E-09	3.09E-05	0.00E+00	4.56E-06	9.30E-05	3.07E-07	1.51E-04

Human Receptor	COPC	Radiological Dose by Pathway during Project Phases (mSv/a)												
		Air (internal)	Air (external)	Water (internal)	Water (external)	Soil (internal)	Soil (external)	Sediment (internal)	Sediment (external)	Aquatic plants	Aquatic animals	Terrestrial plants	Terrestrial animals	Total by COPC
Camper Child-10y	Ba-140	0.00E+00	0.00E+00	3.09E-09	2.02E-10	0.00E+00	0.00E+00	4.81E-10	4.90E-07	0.00E+00	1.09E-10	0.00E+00	0.00E+00	4.94E-07
	C-14	3.10E-07	2.49E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.11E-06	7.73E-05	1.71E-07	7.99E-05
	Co-58	0.00E+00	0.00E+00	6.53E-10	7.97E-10	0.00E+00	0.00E+00	2.15E-09	2.60E-06	0.00E+00	1.31E-09	0.00E+00	0.00E+00	2.60E-06
	Co-60	7.09E-09	1.89E-10	8.25E-09	4.14E-09	8.16E-11	4.62E-06	2.70E-08	1.29E-05	0.00E+00	1.67E-08	2.74E-08	1.86E-11	1.76E-05
	Cs-134	1.50E-10	6.71E-12	3.66E-09	8.60E-10	2.53E-12	7.23E-08	2.65E-09	6.24E-07	0.00E+00	4.79E-07	1.57E-08	1.07E-11	1.20E-06
	Cs-136	0.00E+00	0.00E+00	6.23E-10	6.67E-10	0.00E+00	0.00E+00	4.61E-10	4.75E-07	0.00E+00	8.27E-08	0.00E+00	0.00E+00	5.59E-07
	Cs-137	1.59E-10	3.69E-12	4.00E-09	4.76E-10	2.46E-11	3.69E-07	2.89E-09	3.46E-07	0.00E+00	5.23E-07	1.97E-08	7.08E-11	1.27E-06
	Cs-138d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.20E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.46E-07	0.00E+00	1.46E-07
	Cu-64	0.00E+00	0.00E+00	7.18E-11	1.79E-10	0.00E+00	0.00E+00	3.00E-11	5.12E-08	0.00E+00	1.25E-09	0.00E+00	0.00E+00	5.28E-08
	Fe-59	0.00E+00	0.00E+00	1.85E-09	1.04E-09	0.00E+00	0.00E+00	7.11E-10	3.78E-07	0.00E+00	1.66E-08	0.00E+00	0.00E+00	3.98E-07
	HTO	1.56E-06	0.00E+00	3.73E-08	4.05E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.17E-08	1.60E-06	1.78E-08	3.24E-06
	I-131	1.07E-06	1.26E-09	6.06E-09	9.42E-11	4.58E-11	8.68E-08	2.11E-09	3.25E-08	0.00E+00	8.35E-09	3.74E-06	8.33E-09	4.96E-06
	I-132	6.63E-08	3.64E-08	0.00E+00	0.00E+00	3.04E-14	2.91E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.62E-09	0.00E+00	1.35E-07
	I-133	9.73E-07	9.26E-09	1.12E-09	1.80E-10	4.30E-12	7.18E-08	5.26E-10	6.76E-08	0.00E+00	1.20E-09	4.43E-07	2.21E-09	1.57E-06
	I-134	4.37E-08	8.10E-08	0.00E+00	0.00E+00	7.52E-15	2.45E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.09E-09	0.00E+00	1.50E-07
	I-135	3.80E-07	4.56E-08	0.00E+00	0.00E+00	5.40E-13	9.76E-08	0.00E+00	0.00E+00	0.00E+00	1.08E-10	5.87E-08	7.57E-10	5.83E-07
	Kr-85	0.00E+00	8.07E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.07E-08
	Kr-85m	0.00E+00	2.94E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.94E-08
	Kr-87	0.00E+00	4.35E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.35E-07
	Kr-88	1.35E-07	1.89E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.02E-06
	La-140d	0.00E+00	0.00E+00	6.56E-10	0.00E+00	0.00E+00	0.00E+00	4.55E-11	0.00E+00	0.00E+00	1.96E-10	0.00E+00	0.00E+00	8.97E-10
	Mn-54	0.00E+00	0.00E+00	9.61E-10	1.32E-09	0.00E+00	0.00E+00	9.53E-09	1.29E-05	0.00E+00	8.56E-09	0.00E+00	0.00E+00	1.29E-05
	Na-24	0.00E+00	0.00E+00	6.70E-11	1.16E-09	0.00E+00	0.00E+00	3.90E-12	4.22E-08	0.00E+00	3.33E-10	0.00E+00	0.00E+00	4.37E-08
	OBT	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.02E-08	2.64E-07	3.92E-09	2.78E-07
	Rb-88d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.50E-14	7.67E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.06E-08	0.00E+00	8.73E-08
	Sr-91	0.00E+00	0.00E+00	6.49E-11	1.47E-10	0.00E+00	0.00E+00	1.96E-12	2.52E-09	0.00E+00	1.01E-11	0.00E+00	0.00E+00	2.74E-09
	Xe-131md	0.00E+00	5.76E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.76E-14
	Xe-133	0.00E+00	3.19E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.19E-07
	Xe-133dd	0.00E+00	1.46E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.46E-14
	Xe-133md	0.00E+00	4.82E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.82E-12
	Xe-135	0.00E+00	1.94E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.94E-06
	Xe-135dd	0.00E+00	4.09E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.09E-10
	Xe-135m	0.00E+00	5.38E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.38E-07
	Xe-135md	0.00E+00	1.54E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.54E-09
	Xe-138	7.38E-07	8.42E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.16E-06
	Y-91	0.00E+00	0.00E+00	6.06E-12	1.79E-14	0.00E+00	0.00E+00	5.20E-13	1.62E-12	0.00E+00	2.98E-12	0.00E+00	0.00E+00	1.12E-11
	Zn-65	0.00E+00	0.00E+00	1.96E-09	3.88E-10	0.00E+00	0.00E+00	7.48E-11	1.42E-08	0.00E+00	3.64E-07	0.00E+00	0.00E+00	3.81E-07
	Zn-69m	0.00E+00	0.00E+00	1.24E-10	2.34E-10	0.00E+00	0.00E+00	7.84E-12	1.05E-08	0.00E+00	3.82E-08	0.00E+00	0.00E+00	4.91E-08
	Total by pathway	5.29E-06	1.38E-05	7.05E-08	1.59E-08	1.60E-10	5.44E-06	4.87E-08	3.09E-05	0.00E+00	3.68E-06	8.36E-05	2.04E-07	1.43E-04

Human Receptor	COPC	Radiological Dose by Pathway during Project Phases (mSv/a)												
		Air (internal)	Air (external)	Water (internal)	Water (external)	Soil (internal)	Soil (external)	Sediment (internal)	Sediment (external)	Aquatic plants	Aquatic animals	Terrestrial plants	Terrestrial animals	Total by COPC
Camper Infant-1y	Ba-140	0.00E+00	0.00E+00	6.27E-09	2.46E-11	0.00E+00	0.00E+00	1.66E-09	6.38E-07	0.00E+00	1.18E-10	0.00E+00	0.00E+00	6.46E-07
	C-14	2.11E-07	2.49E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.47E-06	6.55E-05	2.15E-07	6.74E-05
	Co-58	0.00E+00	0.00E+00	1.11E-09	9.85E-11	0.00E+00	0.00E+00	6.17E-09	3.38E-06	0.00E+00	1.18E-09	0.00E+00	0.00E+00	3.38E-06
	Co-60	5.20E-09	2.45E-10	1.33E-08	5.13E-10	2.22E-10	6.00E-06	7.35E-08	1.67E-05	0.00E+00	1.43E-08	3.04E-08	2.87E-11	2.29E-05
	Cs-134	6.70E-11	8.72E-12	2.74E-09	1.06E-10	3.20E-12	9.40E-08	3.36E-09	8.11E-07	0.00E+00	1.91E-07	8.30E-09	7.69E-12	1.11E-06
	Cs-136	0.00E+00	0.00E+00	8.81E-10	8.14E-11	0.00E+00	0.00E+00	1.10E-09	6.17E-07	0.00E+00	6.22E-08	0.00E+00	0.00E+00	6.82E-07
	Cs-137	7.51E-11	4.79E-12	3.14E-09	5.90E-11	3.28E-11	4.81E-07	3.85E-09	4.50E-07	0.00E+00	2.19E-07	1.08E-08	5.34E-11	1.17E-06
	Cs-138d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.39E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.34E-07	0.00E+00	2.34E-07
	Cu-64	0.00E+00	0.00E+00	1.56E-10	1.51E-11	0.00E+00	0.00E+00	1.11E-10	6.64E-08	0.00E+00	1.44E-09	0.00E+00	0.00E+00	6.81E-08
	Fe-59	0.00E+00	0.00E+00	3.36E-09	1.28E-10	0.00E+00	0.00E+00	2.18E-09	4.91E-07	0.00E+00	1.60E-08	0.00E+00	0.00E+00	5.13E-07
	HTO	1.08E-06	0.00E+00	5.17E-08	5.53E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.60E-08	1.51E-06	2.37E-08	2.69E-06
	I-131	1.15E-06	1.64E-09	1.37E-08	1.14E-11	1.76E-10	1.13E-07	8.08E-09	4.22E-08	0.00E+00	1.01E-08	5.98E-06	1.81E-08	7.34E-06
	I-132	7.71E-08	4.73E-08	0.00E+00	0.00E+00	1.30E-13	3.79E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.47E-09	0.00E+00	1.69E-07
	I-133	1.33E-06	1.20E-08	3.23E-09	1.78E-11	2.10E-11	9.34E-08	2.57E-09	8.79E-08	0.00E+00	1.84E-09	9.01E-07	6.10E-09	2.44E-06
	I-134	4.43E-08	1.05E-07	0.00E+00	0.00E+00	2.98E-14	3.18E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-09	0.00E+00	1.83E-07
	I-135	4.97E-07	5.93E-08	0.00E+00	0.00E+00	2.42E-12	1.27E-07	0.00E+00	0.00E+00	0.00E+00	1.52E-10	1.10E-07	1.93E-09	7.95E-07
	Kr-85	0.00E+00	1.05E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.05E-07
	Kr-85m	0.00E+00	3.82E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.82E-08
	Kr-87	0.00E+00	5.65E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.65E-07
	Kr-88	1.63E-07	2.46E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.62E-06
	La-140d	0.00E+00	0.00E+00	1.33E-09	0.00E+00	0.00E+00	0.00E+00	1.56E-10	0.00E+00	0.00E+00	2.11E-10	0.00E+00	0.00E+00	1.70E-09
	Mn-54	0.00E+00	0.00E+00	1.50E-09	1.63E-10	0.00E+00	0.00E+00	2.52E-08	1.68E-05	0.00E+00	7.12E-09	0.00E+00	0.00E+00	1.68E-05
	Na-24	0.00E+00	0.00E+00	1.31E-10	1.04E-10	0.00E+00	0.00E+00	1.29E-11	5.48E-08	0.00E+00	3.46E-10	0.00E+00	0.00E+00	5.54E-08
	OBT	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.33E-09	2.31E-07	5.08E-09	2.43E-07
	Rb-88d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.63E-13	9.97E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.78E-08	0.00E+00	1.18E-07
	Sr-91	0.00E+00	0.00E+00	1.41E-10	1.07E-11	0.00E+00	0.00E+00	7.25E-12	3.27E-09	0.00E+00	1.17E-11	0.00E+00	0.00E+00	3.44E-09
	Xe-131md	0.00E+00	7.49E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.49E-14
	Xe-133	0.00E+00	4.14E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.14E-07
	Xe-133dd	0.00E+00	1.89E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.89E-14
	Xe-133md	0.00E+00	6.26E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.26E-12
	Xe-135	0.00E+00	2.53E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.53E-06
	Xe-135dd	0.00E+00	5.31E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.31E-10
	Xe-135m	0.00E+00	6.99E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.99E-07
	Xe-135md	0.00E+00	2.00E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.00E-09
	Xe-138	8.59E-07	1.09E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.18E-05
	Y-91	0.00E+00	0.00E+00	1.37E-11	2.17E-15	0.00E+00	0.00E+00	2.00E-12	2.10E-12	0.00E+00	3.59E-12	0.00E+00	0.00E+00	2.14E-11
	Zn-65	0.00E+00	0.00E+00	3.21E-09	4.80E-11	0.00E+00	0.00E+00	2.07E-10	1.85E-08	0.00E+00	3.17E-07	0.00E+00	0.00E+00	3.39E-07
	Zn-69m	0.00E+00	0.00E+00	2.67E-10	2.05E-11	0.00E+00	0.00E+00	2.86E-11	1.36E-08	0.00E+00	4.37E-08	0.00E+00	0.00E+00	5.77E-08
	Total by pathway	5.42E-06	1.80E-05	1.06E-07	1.95E-09	4.60E-10	7.08E-06	1.28E-07	4.02E-05	0.00E+00	2.38E-06	7.46E-05	2.70E-07	1.48E-04

Human Receptor	COPC	Radiological Dose by Pathway during Project Phases (mSv/a)												
		Air (internal)	Air (external)	Water (internal)	Water (external)	Soil (internal)	Soil (external)	Sediment (internal)	Sediment (external)	Aquatic plants	Aquatic animals	Terrestrial plants	Terrestrial animals	Total by COPC
Harvester Adult +worker	Ba-140	0.00E+00	0.00E+00	4.15E-10	1.28E-10	0.00E+00	0.00E+00	1.55E-11	4.86E-07	0.00E+00	8.17E-10	0.00E+00	0.00E+00	4.87E-07
	C-14	1.02E-06	1.17E-09	1.35E-08	1.61E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.15E-05	4.89E-05	6.14E-05
	Co-58	0.00E+00	0.00E+00	8.51E-11	5.01E-10	0.00E+00	0.00E+00	6.74E-11	2.57E-06	0.00E+00	9.40E-09	0.00E+00	0.00E+00	2.58E-06
	Co-60	2.33E-08	8.85E-10	2.63E-09	3.02E-09	8.57E-12	2.16E-05	6.02E-10	1.27E-05	0.00E+00	8.36E-08	2.79E-09	1.54E-07	3.46E-05
	Cs-134	9.24E-10	3.15E-11	1.93E-09	5.50E-10	1.17E-12	3.38E-07	2.59E-10	6.18E-07	0.00E+00	1.06E-05	7.86E-09	1.87E-07	1.17E-05
	Cs-136	0.00E+00	0.00E+00	1.27E-10	4.21E-10	0.00E+00	0.00E+00	2.26E-11	4.70E-07	0.00E+00	9.42E-07	0.00E+00	0.00E+00	1.41E-06
	Cs-137	9.76E-10	1.73E-11	5.66E-09	3.51E-10	1.09E-11	1.73E-06	2.71E-10	3.43E-07	0.00E+00	1.10E-05	9.00E-09	2.21E-07	1.33E-05
	Cs-138d	0.00E+00	0.00E+00	4.81E-11	0.00E+00	1.28E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.93E-08	5.28E-09	3.46E-08
	Cu-64	0.00E+00	0.00E+00	1.06E-11	1.33E-10	0.00E+00	0.00E+00	1.04E-12	5.08E-08	0.00E+00	1.66E-08	0.00E+00	0.00E+00	6.75E-08
	Fe-59	0.00E+00	0.00E+00	2.13E-10	6.53E-10	0.00E+00	0.00E+00	1.96E-11	3.74E-07	0.00E+00	1.05E-07	0.00E+00	0.00E+00	4.80E-07
	HTO	6.18E-06	0.00E+00	4.15E-06	9.81E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.36E-08	3.94E-07	1.82E-07	1.10E-05
	I-131	2.20E-06	5.92E-09	5.17E-08	3.17E-10	6.63E-12	4.08E-07	6.42E-11	3.22E-08	0.00E+00	1.00E-08	5.87E-07	6.11E-06	9.41E-06
	I-132	1.81E-07	1.95E-07	4.25E-11	1.00E-10	5.53E-15	1.56E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.27E-10	6.07E-12	5.33E-07
	I-133	2.01E-06	4.41E-08	5.07E-09	3.32E-10	6.40E-13	3.42E-07	1.63E-11	6.70E-08	0.00E+00	3.38E-09	7.06E-08	3.74E-07	2.92E-06
	I-134	2.04E-07	5.27E-07	1.43E-11	1.04E-10	1.86E-15	1.59E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.11E-10	4.62E-12	8.91E-07
	I-135	8.61E-07	2.25E-07	6.27E-10	3.32E-10	8.16E-14	4.80E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.19E-09	8.82E-09	1.58E-06
	Kr-85	0.00E+00	3.79E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.79E-07
	Kr-85m	0.00E+00	1.48E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.48E-07
	Kr-87	0.00E+00	2.57E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.57E-06
	Kr-88	3.70E-07	9.88E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.03E-05
	La-140d	0.00E+00	0.00E+00	9.20E-11	0.00E+00	0.00E+00	0.00E+00	1.56E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.36E-11
	Mn-54	0.00E+00	0.00E+00	1.57E-10	8.28E-10	0.00E+00	0.00E+00	3.75E-10	1.28E-05	0.00E+00	7.66E-08	0.00E+00	0.00E+00	1.29E-05
	Na-24	0.00E+00	0.00E+00	1.14E-11	8.41E-10	0.00E+00	0.00E+00	1.57E-13	4.18E-08	0.00E+00	4.74E-09	0.00E+00	0.00E+00	4.74E-08
	OBT	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.83E-09	3.95E-08	3.26E-08	7.79E-08
	Rb-88d	0.00E+00	0.00E+00	7.00E-12	0.00E+00	9.05E-15	2.77E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.08E-09	2.44E-10	2.80E-07
	Sr-91	0.00E+00	0.00E+00	1.08E-11	1.14E-10	0.00E+00	0.00E+00	7.65E-14	2.50E-09	0.00E+00	1.80E-10	0.00E+00	0.00E+00	2.80E-09
	Xe-131md	0.00E+00	1.27E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.27E-13
	Xe-133	0.00E+00	1.50E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.50E-06
	Xe-133dd	0.00E+00	1.56E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.56E-14
	Xe-133md	0.00E+00	1.08E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.08E-11
	Xe-135	0.00E+00	9.45E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.45E-06
	Xe-135dd	0.00E+00	9.10E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.10E-10
	Xe-135m	0.00E+00	5.97E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.97E-06
	Xe-135md	0.00E+00	5.54E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.54E-09
	Xe-138	4.33E-06	9.78E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.02E-04
	Y-91	0.00E+00	0.00E+00	8.29E-13	9.46E-15	0.00E+00	0.00E+00	1.73E-14	1.60E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.46E-12
	Zn-65	0.00E+00	0.00E+00	3.58E-10	2.44E-10	0.00E+00	0.00E+00	3.28E-12	1.41E-08	0.00E+00	3.63E-06	0.00E+00	0.00E+00	3.65E-06
	Zn-69m	0.00E+00	0.00E+00	1.79E-11	1.72E-10	0.00E+00	0.00E+00	2.66E-13	1.04E-08	0.00E+00	4.77E-07	0.00E+00	0.00E+00	4.88E-07
	Total by pathway	1.74E-05	1.29E-04	4.23E-06	1.07E-07	2.81E-11	2.55E-05	1.72E-09	3.06E-05	0.00E+00	2.70E-05	1.26E-05	5.62E-05	3.02E-04

Human Receptor	COPC	Radiological Dose by Pathway during Project Phases (mSv/a)												
		Air (internal)	Air (external)	Water (internal)	Water (external)	Soil (internal)	Soil (external)	Sediment (internal)	Sediment (external)	Aquatic plants	Aquatic animals	Terrestrial plants	Terrestrial animals	Total by COPC
Harvester Child-10y	Ba-140	0.00E+00	0.00E+00	0.00E+00	1.29E-10	0.00E+00	0.00E+00	4.81E-10	4.90E-07	0.00E+00	1.29E-09	0.00E+00	0.00E+00	4.92E-07
	C-14	1.46E-06	1.17E-09	7.51E-09	1.63E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.65E-06	3.13E-05	4.14E-05
	Co-58	0.00E+00	0.00E+00	0.00E+00	5.05E-10	0.00E+00	0.00E+00	2.15E-09	2.60E-06	0.00E+00	1.53E-08	0.00E+00	0.00E+00	2.62E-06
	Co-60	3.34E-08	8.86E-10	2.43E-09	3.05E-09	3.82E-10	2.16E-05	2.70E-08	1.29E-05	0.00E+00	1.92E-07	4.92E-09	3.38E-07	3.51E-05
	Cs-134	7.07E-10	3.15E-11	1.30E-10	5.55E-10	1.18E-11	3.38E-07	2.65E-09	6.24E-07	0.00E+00	5.51E-06	3.16E-09	4.42E-08	6.53E-06
	Cs-136	0.00E+00	0.00E+00	0.00E+00	4.25E-10	0.00E+00	0.00E+00	4.61E-10	4.75E-07	0.00E+00	9.79E-07	0.00E+00	0.00E+00	1.46E-06
	Cs-137	7.48E-10	1.73E-11	1.27E-09	3.55E-10	1.15E-10	1.73E-06	2.89E-09	3.46E-07	0.00E+00	6.02E-06	3.78E-09	5.40E-08	8.16E-06
	Cs-138d	0.00E+00	0.00E+00	3.57E-11	0.00E+00	3.25E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.96E-08	6.52E-09	3.61E-08
	Cu-64	0.00E+00	0.00E+00	0.00E+00	1.34E-10	0.00E+00	0.00E+00	3.00E-11	5.12E-08	0.00E+00	2.45E-08	0.00E+00	0.00E+00	7.59E-08
	Fe-59	0.00E+00	0.00E+00	0.00E+00	6.59E-10	0.00E+00	0.00E+00	7.11E-10	3.78E-07	0.00E+00	1.94E-07	0.00E+00	0.00E+00	5.73E-07
	HTO	7.35E-06	0.00E+00	2.08E-06	8.25E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E-08	2.69E-07	1.03E-07	9.90E-06
	I-131	5.04E-06	5.93E-09	4.83E-08	3.19E-10	2.16E-10	4.09E-07	2.11E-09	3.25E-08	0.00E+00	1.68E-08	7.57E-07	4.96E-06	1.13E-05
	I-132	3.56E-07	1.95E-07	3.65E-11	1.01E-10	1.63E-13	1.56E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.32E-10	9.04E-12	7.08E-07
	I-133	4.64E-06	4.42E-08	4.60E-09	3.35E-10	2.05E-11	3.43E-07	5.26E-10	6.76E-08	0.00E+00	5.58E-09	8.96E-08	2.99E-07	5.50E-06
	I-134	2.85E-07	5.28E-07	1.10E-11	1.05E-10	4.90E-14	1.60E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.20E-10	6.16E-12	9.73E-07
	I-135	1.87E-06	2.25E-07	5.96E-10	3.35E-10	2.66E-12	4.81E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.19E-08	7.16E-09	2.60E-06
	Kr-85	0.00E+00	3.79E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.79E-07
	Kr-85m	0.00E+00	1.48E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.48E-07
	Kr-87	0.00E+00	2.58E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.58E-06
	Kr-88	7.05E-07	9.90E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.06E-05
	La-140d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.55E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.55E-11
	Mn-54	0.00E+00	0.00E+00	0.00E+00	8.35E-10	0.00E+00	0.00E+00	9.53E-09	1.29E-05	0.00E+00	9.94E-08	0.00E+00	0.00E+00	1.30E-05
	Na-24	0.00E+00	0.00E+00	0.00E+00	8.48E-10	0.00E+00	0.00E+00	3.90E-12	4.22E-08	0.00E+00	6.01E-09	0.00E+00	0.00E+00	4.90E-08
	OBT	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.66E-09	2.95E-08	1.99E-08	5.51E-08
	Rb-88d	0.00E+00	0.00E+00	5.32E-12	0.00E+00	2.35E-13	2.78E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.14E-09	3.05E-10	2.80E-07
	Sr-91	0.00E+00	0.00E+00	0.00E+00	1.15E-10	0.00E+00	0.00E+00	1.96E-12	2.52E-09	0.00E+00	2.35E-10	0.00E+00	0.00E+00	2.87E-09
	Xe-131md	0.00E+00	1.27E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.27E-13
	Xe-133	0.00E+00	1.50E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.50E-06
	Xe-133dd	0.00E+00	1.55E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.55E-14
	Xe-133md	0.00E+00	1.08E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.08E-11
	Xe-135	0.00E+00	9.46E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.46E-06
	Xe-135dd	0.00E+00	9.10E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.10E-10
	Xe-135m	0.00E+00	5.99E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.99E-06
	Xe-135md	0.00E+00	5.54E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.54E-09
	Xe-138	8.59E-06	9.80E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.07E-04
	Y-91	0.00E+00	0.00E+00	0.00E+00	9.55E-15	0.00E+00	0.00E+00	5.20E-13	1.62E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.15E-12
	Zn-65	0.00E+00	0.00E+00	0.00E+00	2.46E-10	0.00E+00	0.00E+00	7.48E-11	1.42E-08	0.00E+00	4.23E-06	0.00E+00	0.00E+00	4.24E-06
	Zn-69m	0.00E+00	0.00E+00	0.00E+00	1.74E-10	0.00E+00	0.00E+00	7.84E-12	1.05E-08	0.00E+00	7.17E-07	0.00E+00	0.00E+00	7.28E-07
	Total by pathway	3.03E-05	1.29E-04	2.14E-06	9.17E-08	7.52E-10	2.55E-05	4.87E-08	3.09E-05	0.00E+00	1.80E-05	9.85E-06	3.71E-05	2.83E-04

Human Receptor	COPC	Radiological Dose by Pathway during Project Phases (mSv/a)												
		Air (internal)	Air (external)	Water (internal)	Water (external)	Soil (internal)	Soil (external)	Sediment (internal)	Sediment (external)	Aquatic plants	Aquatic animals	Terrestrial plants	Terrestrial animals	Total by COPC
Harvester Infant-1y	Ba-140	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.66E-09	6.38E-07	0.00E+00	1.40E-09	0.00E+00	0.00E+00	6.41E-07
	C-14	9.93E-07	1.17E-09	9.83E-09	6.71E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.29E-07	2.23E-05	2.40E-05
	Co-58	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.17E-09	3.38E-06	0.00E+00	1.38E-08	0.00E+00	0.00E+00	3.40E-06
	Co-60	2.44E-08	1.15E-09	3.90E-09	2.30E-10	1.04E-09	2.81E-05	7.35E-08	1.67E-05	0.00E+00	1.64E-07	4.40E-10	3.01E-07	4.54E-05
	Cs-134	3.15E-10	4.10E-11	9.73E-11	5.77E-12	1.50E-11	4.40E-07	3.36E-09	8.11E-07	0.00E+00	2.20E-06	1.32E-10	1.82E-08	3.47E-06
	Cs-136	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-09	6.17E-07	0.00E+00	7.37E-07	0.00E+00	0.00E+00	1.36E-06
	Cs-137	3.53E-10	2.25E-11	9.96E-10	2.85E-11	1.53E-10	2.25E-06	3.85E-09	4.50E-07	0.00E+00	2.52E-06	1.65E-10	2.34E-08	5.25E-06
	Cs-138d	0.00E+00	0.00E+00	8.11E-11	0.00E+00	1.25E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.73E-09	8.40E-09	1.22E-08
	Cu-64	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.11E-10	6.64E-08	0.00E+00	2.83E-08	0.00E+00	0.00E+00	9.48E-08
	Fe-59	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.18E-09	4.91E-07	0.00E+00	1.87E-07	0.00E+00	0.00E+00	6.80E-07
	HTO	5.07E-06	0.00E+00	2.89E-06	4.18E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.88E-09	2.07E-08	7.73E-08	8.11E-06
	I-131	5.43E-06	7.71E-09	1.10E-07	1.39E-10	8.28E-10	5.31E-07	8.08E-09	4.22E-08	0.00E+00	2.03E-08	9.53E-08	5.63E-06	1.19E-05
	I-132	4.14E-07	2.54E-07	9.26E-11	5.42E-11	7.00E-13	2.03E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.03E-10	1.27E-11	8.71E-07
	I-133	6.35E-06	5.74E-08	1.32E-08	1.11E-10	1.00E-10	4.46E-07	2.57E-09	8.79E-08	0.00E+00	8.55E-09	1.43E-08	4.31E-07	7.41E-06
	I-134	2.89E-07	6.87E-07	2.57E-11	5.60E-11	1.94E-13	2.07E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.86E-11	7.97E-12	1.18E-06
	I-135	2.45E-06	2.92E-07	1.58E-09	1.79E-10	1.19E-11	6.25E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-09	9.51E-09	3.38E-06
	Kr-85	0.00E+00	4.95E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.95E-07
	Kr-85m	0.00E+00	1.92E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.92E-07
	Kr-87	0.00E+00	3.35E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.35E-06
	Kr-88	8.54E-07	1.29E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.37E-05
	La-140d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.56E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.56E-10
	Mn-54	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.52E-08	1.68E-05	0.00E+00	8.26E-08	0.00E+00	0.00E+00	1.69E-05
	Na-24	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.29E-11	5.48E-08	0.00E+00	6.26E-09	0.00E+00	0.00E+00	6.11E-08
	OBT	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.07E-09	2.22E-09	1.45E-08	2.07E-08
	Rb-88d	0.00E+00	0.00E+00	1.27E-11	0.00E+00	9.52E-13	3.61E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.84E-10	4.15E-10	3.61E-07
	Sr-91	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.25E-12	3.27E-09	0.00E+00	2.73E-10	0.00E+00	0.00E+00	3.55E-09
	Xe-131md	0.00E+00	1.65E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.65E-13
	Xe-133	0.00E+00	1.95E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.95E-06
	Xe-133dd	0.00E+00	2.02E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.02E-14
	Xe-133md	0.00E+00	1.40E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.40E-11
	Xe-135	0.00E+00	1.23E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.23E-05
	Xe-135dd	0.00E+00	1.18E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.18E-09
	Xe-135m	0.00E+00	7.79E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.79E-06
	Xe-135md	0.00E+00	7.21E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.21E-09
	Xe-138	1.00E-05	1.27E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.37E-04
	Y-91	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.00E-12	2.10E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.10E-12
	Zn-65	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.07E-10	1.85E-08	0.00E+00	3.68E-06	0.00E+00	0.00E+00	3.70E-06
	Zn-69m	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.86E-11	1.36E-08	0.00E+00	8.21E-07	0.00E+00	0.00E+00	8.35E-07
	Total by pathway	3.19E-05	1.68E-04	3.03E-06	4.26E-08	2.16E-09	3.32E-05	1.28E-07	4.02E-05	0.00E+00	1.05E-05	7.68E-07	2.88E-05	3.16E-04

Human Receptor	COPC	Radiological Dose by Pathway during Project Phases (mSv/a)												
		Air (internal)	Air (external)	Water (internal)	Water (external)	Soil (internal)	Soil (external)	Sediment (internal)	Sediment (external)	Aquatic plants	Aquatic animals	Terrestrial plants	Terrestrial animals	Total by COPC
Industrial Commercial Adult +worker	Ba-140	0.00E+00	0.00E+00	3.35E-09	7.57E-11	1.91E-16	7.30E-10	4.10E-12	1.28E-07	0.00E+00	0.00E+00	6.94E-12	0.00E+00	1.33E-07
	C-14	2.67E-07	3.07E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.36E-05	3.13E-06	3.70E-05
	Co-58	0.00E+00	0.00E+00	6.86E-10	3.00E-10	2.17E-16	1.01E-09	1.78E-11	6.80E-07	0.00E+00	0.00E+00	2.92E-12	0.00E+00	6.82E-07
	Co-60	6.12E-09	2.32E-10	6.15E-09	1.56E-09	2.02E-12	5.08E-06	1.59E-10	3.37E-06	0.00E+00	0.00E+00	5.10E-09	5.21E-11	8.46E-06
	Cs-134	2.42E-10	8.26E-12	1.20E-08	3.23E-10	3.07E-13	8.89E-08	6.84E-11	1.63E-07	0.00E+00	0.00E+00	1.35E-08	9.08E-10	2.79E-07
	Cs-136	0.00E+00	0.00E+00	1.03E-09	2.50E-10	6.07E-17	1.53E-10	5.98E-12	1.24E-07	0.00E+00	0.00E+00	2.17E-11	0.00E+00	1.26E-07
	Cs-137	2.56E-10	4.54E-12	1.25E-08	1.79E-10	2.87E-12	4.55E-07	7.16E-11	9.06E-08	0.00E+00	0.00E+00	1.61E-08	1.27E-09	5.76E-07
	Cs-138d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.97E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.79E-08	0.00E+00	4.79E-08
	Cu-64	0.00E+00	0.00E+00	9.42E-11	6.42E-11	2.23E-19	1.29E-12	2.74E-13	1.34E-08	0.00E+00	0.00E+00	1.16E-13	0.00E+00	1.36E-08
	Fe-59	0.00E+00	0.00E+00	1.72E-09	3.90E-10	3.41E-16	7.75E-10	5.18E-12	9.89E-08	0.00E+00	0.00E+00	6.39E-12	0.00E+00	1.02E-07
	HTO	1.62E-06	0.00E+00	7.19E-08	1.86E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.46E-07	6.87E-09	2.45E-06
	I-131	5.78E-07	1.55E-09	6.23E-09	3.53E-11	1.73E-12	1.06E-07	1.70E-11	8.51E-09	0.00E+00	0.00E+00	9.77E-07	1.58E-08	1.69E-06
	I-132	4.61E-08	4.96E-08	0.00E+00	0.00E+00	1.40E-15	3.95E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.04E-09	0.00E+00	1.36E-07
	I-133	5.25E-07	1.15E-08	1.25E-09	6.58E-11	1.66E-13	8.89E-08	4.31E-12	1.77E-08	0.00E+00	0.00E+00	1.17E-07	1.05E-09	7.63E-07
	I-134	4.96E-08	1.28E-07	0.00E+00	0.00E+00	4.50E-16	3.85E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.48E-10	0.00E+00	2.17E-07
	I-135	2.23E-07	5.83E-08	0.00E+00	0.00E+00	2.11E-14	1.24E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.53E-08	7.20E-11	4.21E-07
	Kr-85	0.00E+00	9.94E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.94E-08
	Kr-85m	0.00E+00	3.82E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.82E-08
	Kr-87	0.00E+00	6.40E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.40E-07
	Kr-88	9.46E-08	2.53E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.62E-06
	La-140d	0.00E+00	0.00E+00	6.81E-10	0.00E+00	1.52E-16	0.00E+00	4.13E-13	0.00E+00	0.00E+00	0.00E+00	2.65E-13	0.00E+00	6.81E-10
	Mn-54	0.00E+00	0.00E+00	1.27E-09	4.96E-10	1.75E-15	7.27E-09	9.91E-11	3.38E-06	0.00E+00	0.00E+00	6.54E-11	0.00E+00	3.39E-06
	Na-24	0.00E+00	0.00E+00	1.00E-10	4.18E-10	2.80E-19	8.67E-12	4.15E-14	1.10E-08	0.00E+00	0.00E+00	1.46E-13	0.00E+00	1.16E-08
	OBT	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-07	1.42E-09	1.12E-07
	Rb-88d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.29E-15	7.01E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.44E-09	0.00E+00	7.36E-08
	Sr-91	0.00E+00	0.00E+00	1.00E-10	5.16E-11	1.77E-19	3.81E-13	2.02E-14	6.60E-10	0.00E+00	0.00E+00	9.37E-14	0.00E+00	8.12E-10
	Xe-131md	0.00E+00	4.19E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.19E-14
	Xe-133	0.00E+00	3.93E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.93E-07
	Xe-133dd	0.00E+00	6.43E-15	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.43E-15
	Xe-133md	0.00E+00	3.53E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.53E-12
	Xe-135	0.00E+00	2.46E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.46E-06
	Xe-135dd	0.00E+00	3.00E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.00E-10
	Xe-135m	0.00E+00	1.27E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.27E-06
	Xe-135md	0.00E+00	1.61E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.61E-09
	Xe-138	9.09E-07	2.05E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.14E-05
	Y-91	0.00E+00	0.00E+00	6.37E-12	7.02E-15	2.32E-18	2.67E-13	4.57E-15	4.23E-13	0.00E+00	0.00E+00	2.58E-14	0.00E+00	7.10E-12
	Zn-65	0.00E+00	0.00E+00	2.88E-09	1.46E-10	3.13E-15	1.62E-09	8.67E-13	3.73E-09	0.00E+00	0.00E+00	1.62E-10	0.00E+00	8.54E-09
	Zn-69m	0.00E+00	0.00E+00	1.58E-10	8.44E-11	4.07E-19	1.89E-12	7.04E-14	2.75E-09	0.00E+00	0.00E+00	2.15E-13	0.00E+00	3.00E-09
	Total by pathway	4.32E-06	2.82E-05	1.22E-07	6.30E-09	7.14E-12	6.10E-06	4.54E-10	8.09E-06	0.00E+00	0.00E+00	3.57E-05	3.15E-06	8.57E-05

Appendix C Tables of Exposure Factors Used for Ecological Risk Assessment

Table C-1: Bioaccumulation Factors (BAFs) for Aquatic Biota

COPC	BAF [a] (L/kg fw)									
	Aquatic Plants	Aquatic Animals								
		Benthic Invertebrates	Alewife	Lake Trout	American Eel	Dace	Round Whitefish	White Sucker	Frogs	Turtles
Ba-137md	0.00E+00 [d]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ba-140	6.30E+01	1.80E+02	9.30E-01	9.30E-01	9.30E-01	9.30E-01	9.30E-01	9.30E-01	9.30E-01	9.30E-01
C-14	5.90E+03	5.60E+03	5.70E+03	5.70E+03	5.70E+03	5.70E+03	5.70E+03	5.70E+03	5.70E+03	5.70E+03
Co-58	7.90E+02	1.10E+02	5.40E+01	5.40E+01	5.40E+01	5.40E+01	5.40E+01	5.40E+01	5.40E+01	5.40E+01
Co-60	7.90E+02	1.10E+02	5.40E+01	5.40E+01	5.40E+01	5.40E+01	5.40E+01	5.40E+01	5.40E+01	5.40E+01
Cs-134	2.20E+02	9.90E+01	3.50E+03	3.50E+03	3.50E+03	3.50E+03	3.50E+03	3.50E+03	3.50E+03	3.50E+03
Cs-136	2.20E+02	9.90E+01	3.50E+03	3.50E+03	3.50E+03	3.50E+03	3.50E+03	3.50E+03	3.50E+03	3.50E+03
Cs-137	2.20E+02	9.90E+01	3.50E+03	3.50E+03	3.50E+03	3.50E+03	3.50E+03	3.50E+03	3.50E+03	3.50E+03
Cs-138d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cu-64 [b, c]	3.00E+03	4.20E+01	2.70E+02	2.70E+02	2.70E+02	2.70E+02	2.70E+02	2.70E+02	4.40E+02	4.40E+02
Fe-59	3.10E+03	2.80E+03	2.40E+02	2.40E+02	2.40E+02	2.40E+02	2.40E+02	2.40E+02	2.40E+02	2.40E+02
HTO	7.50E-01	7.50E-01	7.50E-01	7.50E-01	7.50E-01	7.50E-01	7.50E-01	7.50E-01	7.50E-01	7.50E-01
I-131	7.10E+01	9.60E+00	6.00E+00	6.00E+00	6.00E+00	6.00E+00	6.00E+00	6.00E+00	6.00E+00	6.00E+00
I-132	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I-133	7.10E+01	9.60E+00	6.00E+00	6.00E+00	6.00E+00	6.00E+00	6.00E+00	6.00E+00	6.00E+00	6.00E+00
I-134	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I-135	7.10E+01	9.60E+00	6.00E+00	6.00E+00	6.00E+00	6.00E+00	6.00E+00	6.00E+00	6.00E+00	6.00E+00
La-140d	3.30E+03	7.70E+02	1.50E+01	1.50E+01	1.50E+01	1.50E+01	1.50E+01	1.50E+01	1.50E+01	1.50E+01
Mn-54	4.40E+03	6.90E+02	2.40E+02	2.40E+02	2.40E+02	2.40E+02	2.40E+02	2.40E+02	2.40E+02	2.40E+02
Na-24	1.80E+01	7.30E+00	8.40E+01	8.40E+01	8.40E+01	8.40E+01	8.40E+01	8.40E+01	8.40E+01	8.40E+01
OBT	1.10E-01	1.40E-01	1.40E-01	1.40E-01	1.40E-01	1.40E-01	1.40E-01	1.40E-01	1.40E-01	1.40E-01
Rb-88d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sr-91	3.70E+02	2.40E+02	2.00E+00	2.00E+00	2.00E+00	2.00E+00	2.00E+00	2.00E+00	2.00E+00	2.00E+00
Y-91	7.10E+03	1.00E+03	2.00E+01	2.00E+01	2.00E+01	2.00E+01	2.00E+01	2.00E+01	2.00E+01	2.00E+01
Zn-65	1.40E+03	1.80E+03	5.00E+03	5.00E+03	5.00E+03	5.00E+03	5.00E+03	5.00E+03	5.00E+03	5.00E+03
Zn-69m	1.40E+03	1.80E+03	5.00E+03	5.00E+03	5.00E+03	5.00E+03	5.00E+03	5.00E+03	5.00E+03	5.00E+03

Notes:

[a] BAFs are taken from CSA N288.1:20, Table A.25a, except for:

[b] Cu-64 BAF for benthic invertebrates is from Sample et al. (1998).

[c] Cu-64 BAFs for other aquatic biota are from IAEA TRS 472 (2010).

[d] BAFs presented as zero in this table indicates those radionuclides do not bioaccumulate (e.g., due to short half-lives)

fw = fresh weight; COPC = constituent of potential concern, which includes radionuclides which are selected for the sensitivity analysis scenario.

Table C-2: Bioaccumulation Factors (BAFs) for Terrestrial Plants and Invertebrates

Soil-to-Plant BAFs [a] ($kg_{(dw\ soil)}/kg_{(dw\ plant)}$)			
COPC	Terrestrial Plants		Terrestrial Invertebrate
	Grass	Sugar Maple	Earthworm
Ba-140	2.80E-02	2.80E-02	0.00E+00
Co-58	4.70E-02	4.70E-02	3.58E-02
Co-60	4.70E-02	4.70E-02	3.58E-02
Cs-134	5.30E-02	5.30E-02	5.26E-01
Cs-136	5.30E-02	5.30E-02	5.26E-01
Cs-137	5.30E-02	5.30E-02	5.26E-01
Cs-138d	0.00E+00 [d]	0.00E+00	5.26E-01
Cu-64 [b, c]	1.60E-01	1.60E-01	5.15E-01
Fe-59	5.00E-03	5.00E-03	5.00E-03
I-131	5.00E-02	5.00E-02	9.18E-01
I-132	5.00E-02	5.00E-02	9.18E-01
I-133	5.00E-02	5.00E-02	9.18E-01
I-134	5.00E-02	5.00E-02	9.18E-01
I-135	5.00E-02	5.00E-02	9.18E-01
La-140d	1.00E-02	1.00E-02	1.00E-02
Mn-54	3.50E-01	3.50E-01	9.12E-02
Na-24	1.20E-01	1.20E-01	1.20E-01
Rb-88d	0.00E+00	0.00E+00	0.00E+00
Sr-91	8.70E-01	8.70E-01	5.28E-02
Y-91	2.20E-02	2.20E-02	2.20E-02
Zn-65	1.30E+00	1.30E+00	1.30E+00
Zn-69m	1.30E+00	1.30E+00	1.30E+00

Notes:
[a] BAFs are taken from CSA N288.1:20, Table A.25a, except for:
[b] Cu-64 BAF for terrestrial invertebrates is from Sample et al. (1998).
[c] Cu-64 BAFs for terrestrial plants are from IAEA TRS 472 (2010).
[d] BAFs presented as zero in this table indicates those radionuclides do not bioaccumulate (e.g., due to short half-lives).
dw = dry weight; COPC = constituent of potential concern, which includes radionuclides which are selected for the sensitivity analysis scenario.

Table C-3: Ingestion Transfer Factors (d/kg fw) for Mammals

COPC	Common Shrew	Eastern Cottontail	Meadow Vole	Muskrat	Raccoon	Red Fox	Short-tailed Weasel	White-tailed Deer
Ba-137md	0.00E+00 [b]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ba-140	1.05E+00	1.47E-02	2.14E-01	1.50E-02	4.60E-03	5.46E-03	6.14E-02	5.00E-04
Co-58	3.22E+00	4.50E-02	6.58E-01	4.60E-02	1.41E-02	1.68E-02	1.89E-01	1.54E-03
Co-60	3.22E+00	4.50E-02	6.58E-01	4.60E-02	1.41E-02	1.68E-02	1.89E-01	1.54E-03
Cs-134	1.65E+02	2.30E+00	3.37E+01	2.36E+00	7.23E-01	8.58E-01	9.65E+00	7.85E-02
Cs-136	1.65E+02	2.30E+00	3.37E+01	2.36E+00	7.23E-01	8.58E-01	9.65E+00	7.85E-02
Cs-137	1.65E+02	2.30E+00	3.37E+01	2.36E+00	7.23E-01	8.58E-01	9.65E+00	7.85E-02
Cs-138d	0.00E+00	2.30E+00	3.37E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.85E-02
Cu-64 [a]	7.48E+01	1.06E+00	2.72E+00	1.07E+00	3.29E-01	3.90E-01	4.39E+00	3.57E-02
Fe-59	1.05E+02	1.47E+00	2.14E+01	1.50E+00	4.60E-01	5.46E-01	6.14E+00	5.00E-02
I-131	5.01E+01	7.01E-01	1.03E+01	7.17E-01	2.20E-01	2.61E-01	2.94E+00	2.39E-02
I-132	0.00E+00	7.01E-01	1.03E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.39E-02
I-133	5.01E+01	7.01E-01	1.03E+01	7.17E-01	2.20E-01	2.61E-01	2.94E+00	2.39E-02
I-134	0.00E+00	7.01E-01	1.03E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.39E-02
I-135	5.01E+01	7.01E-01	1.03E+01	7.17E-01	2.20E-01	2.61E-01	2.94E+00	2.39E-02
La-140d	9.73E-01	1.36E-02	1.99E-01	1.39E-02	4.27E-03	5.07E-03	5.70E-02	4.64E-04
Mn-54	4.49E+00	6.28E-02	9.19E-01	6.42E-02	1.97E-02	2.34E-02	2.63E-01	2.14E-03
Na-24	1.12E+02	1.57E+00	2.30E+01	1.61E+00	4.93E-01	5.85E-01	6.58E+00	5.35E-02
Rb-88d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sr-91	9.73E+00	1.36E-01	1.99E+00	1.39E-01	4.27E-02	5.07E-02	5.70E-01	4.64E-03
Y-91	8.98E+00	1.26E-01	1.84E+00	1.28E-01	3.94E-02	4.68E-02	5.26E-01	4.28E-03
Zn-65	1.20E+03	1.68E+01	2.45E+02	1.71E+01	5.26E+00	6.24E+00	7.02E+01	5.71E-01
Zn-69m	1.20E+03	1.68E+01	2.45E+02	1.71E+01	5.26E+00	6.24E+00	7.02E+01	5.71E-01

Notes:

TFs in this table were calculated using the following allometric equation: TF (d/kg fw) = $aBW^{-0.75}$, where BW = body weight, TF = transfer factor, d/kg fw = days per kilogram fresh weight, "a" is a constant calculated using published transfer factor and body weight values for beef as per CSA N288.1:20, Table G.3, and applied to calculate species-specific transfer factors.

[a] For Cu-64 which is not listed in N288.1 Table G.3, the ingestion TF for beef was taken from NCRP No. 123, Table 5.2 (NCRP, 1996).

[b] BAFs presented as zero in this table indicates those radionuclides do not bioaccumulate (e.g., due to short half-lives).

fw = fresh weight; COPC = constituent of potential concern, which includes radionuclides which are selected for the sensitivity analysis scenario.

Table C-4: Ingestion Transfer Factors (d/kg fw) for Birds

COPC	American Robin	Bank Swallow	Bufflehead	Green Heron	Mallard	Song Sparrow	Yellow Warbler
Ba-137md	0.00E+00 [b]	0.00E+00	0.00E+00	1.18E-01	0.00E+00	0.00E+00	0.00E+00
Ba-140	2.19E-01	7.46E-01	5.60E-02	1.18E-01	3.01E-02	5.79E-01	1.01E+00
Co-58	1.12E+01	3.81E+01	2.86E+00	6.03E+00	1.54E+00	2.96E+01	5.16E+01
Co-60	1.12E+01	3.81E+01	2.86E+00	6.03E+00	1.54E+00	2.96E+01	5.16E+01
Cs-134	3.11E+01	1.06E+02	7.96E+00	1.68E+01	4.28E+00	8.23E+01	1.44E+02
Cs-136	3.11E+01	1.06E+02	7.96E+00	1.68E+01	4.28E+00	8.23E+01	1.44E+02
Cs-137	3.11E+01	1.06E+02	7.96E+00	1.68E+01	4.28E+00	8.23E+01	1.44E+02
Cs-138d	0.00E+00	0.00E+00	0.00E+00	1.68E+01	0.00E+00	0.00E+00	0.00E+00
Cu-64 [a]	7.13E+00	2.43E+01	1.83E+00	3.85E+00	9.83E-01	1.89E+01	3.30E+01
Fe-59	1.61E+01	5.49E+01	4.13E+00	8.70E+00	2.22E+00	4.27E+01	7.45E+01
I-131	1.00E-01	3.41E-01	2.57E-02	5.41E-02	1.38E-02	2.65E-01	4.63E-01
I-132	0.00E+00	0.00E+00	0.00E+00	5.41E-02	0.00E+00	0.00E+00	0.00E+00
I-133	1.00E-01	3.41E-01	2.57E-02	5.41E-02	1.38E-02	2.65E-01	4.63E-01
I-134	0.00E+00	0.00E+00	0.00E+00	5.41E-02	0.00E+00	0.00E+00	0.00E+00
I-135	1.00E-01	3.41E-01	2.57E-02	5.41E-02	1.38E-02	2.65E-01	4.63E-01
La-140d	1.15E+00	3.92E+00	2.95E-01	6.22E-01	1.59E-01	3.05E+00	5.32E+00
Mn-54	2.19E-02	7.46E-02	5.60E-03	1.18E-02	3.01E-03	5.79E-02	1.01E-01
Na-24	8.05E+01	2.75E+02	2.06E+01	4.35E+01	1.11E+01	2.13E+02	3.72E+02
Rb-88d	0.00E+00	0.00E+00	0.00E+00	6.84E+00	0.00E+00	0.00E+00	0.00E+00
Sr-91	2.30E-01	7.85E-01	5.90E-02	1.24E-01	3.17E-02	6.10E-01	1.06E+00
Y-91	1.50E-01	5.10E-01	3.83E-02	8.08E-02	2.06E-02	3.96E-01	6.91E-01
Zn-65	5.41E+00	1.84E+01	1.39E+00	2.92E+00	7.45E-01	1.43E+01	2.50E+01
Zn-69m	5.41E+00	1.84E+01	1.39E+00	2.92E+00	7.45E-01	1.43E+01	2.50E+01

Notes:

Transfer factors in this table were calculated using the following allometric equation: TF (d/kg FW) = $aBW^{-0.75}$, where "a" was calculated using published TF and BW values for poultry and applied to calculate species-specific TFs.

[a] For Cu-64 which is not listed in N288.1 Table G.3, the ingestion TF was calculated based on the beef TF published in NCRP No. 123 (NCRP, 1996), adjusted to poultry using a ratio of 62, as per the CANDU Owners Group DRL Guidance (COG, 2013).

[b] BAFs presented as zero in this table indicates those radionuclides do not bioaccumulate (e.g., due to short half-lives).

fw = fresh weight; COPC = constituent of potential concern, which includes radionuclides which are selected for the sensitivity analysis scenario.

Table C-5: Inhalation Transfer Factors (d/kg fw) for Mammals and Birds

COPC	American Robin	Bank Swallow	Bufflehead	Green Heron	Mallard	Song Sparrow	Yellow Warbler	Common Shrew	Eastern Cottontail	Meadow Vole	Muskrat	Raccoon	Red Fox	Short-tailed Weasel	White-tailed Deer
Ba-137md	0.00E+00 [b]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ba-140	2.43E-01	8.28E-01	6.22E-02	1.31E-01	3.34E-02	6.43E-01	1.12E+00	1.16E+00	1.63E-02	2.38E-01	1.66E-02	5.11E-03	6.06E-03	6.82E-02	5.55E-04
Co-58	1.91E+01	6.51E+01	4.89E+00	1.03E+01	2.63E+00	5.06E+01	8.82E+01	5.50E+00	7.70E-02	1.13E+00	7.87E-02	2.42E-02	2.87E-02	3.23E-01	2.62E-03
Co-60	1.91E+01	6.51E+01	4.89E+00	1.03E+01	2.63E+00	5.06E+01	8.82E+01	5.50E+00	7.70E-02	1.13E+00	7.87E-02	2.42E-02	2.87E-02	3.23E-01	2.62E-03
Cs-134	1.96E+01	6.67E+01	5.02E+00	1.06E+01	2.70E+00	5.19E+01	9.05E+01	1.04E+02	1.45E+00	2.12E+01	1.48E+00	4.55E-01	5.40E-01	6.08E+00	4.95E-02
Cs-136	1.96E+01	6.67E+01	5.02E+00	1.06E+01	2.70E+00	5.19E+01	9.05E+01	1.04E+02	1.45E+00	2.12E+01	1.48E+00	4.55E-01	5.40E-01	6.08E+00	4.95E-02
Cs-137	1.96E+01	6.67E+01	5.02E+00	1.06E+01	2.70E+00	5.19E+01	9.05E+01	1.04E+02	1.45E+00	2.12E+01	1.48E+00	4.55E-01	5.40E-01	6.08E+00	4.95E-02
Cs-138d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cu-64 [a]	7.92E+00	2.70E+01	2.03E+00	4.28E+00	1.09E+00	2.10E+01	3.66E+01	8.31E+01	1.17E+00	3.02E+00	1.19E+00	3.65E-01	4.33E-01	4.87E+00	3.96E-02
Fe-59	2.75E+01	9.39E+01	7.06E+00	1.49E+01	3.80E+00	7.30E+01	1.27E+02	1.79E+02	2.51E+00	3.67E+01	2.56E+00	7.87E-01	9.33E-01	1.05E+01	8.54E-02
I-131	6.31E-02	2.15E-01	1.62E-02	3.41E-02	8.69E-03	1.67E-01	2.92E-01	3.16E+01	4.42E-01	6.46E+00	4.52E-01	1.39E-01	1.65E-01	1.85E+00	1.51E-02
I-132	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I-133	6.31E-02	2.15E-01	1.62E-02	3.41E-02	8.69E-03	1.67E-01	2.92E-01	3.16E+01	4.42E-01	6.46E+00	4.52E-01	1.39E-01	1.65E-01	1.85E+00	1.51E-02
I-134	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I-135	6.31E-02	2.15E-01	1.62E-02	3.41E-02	8.69E-03	1.67E-01	2.92E-01	3.16E+01	4.42E-01	6.46E+00	4.52E-01	1.39E-01	1.65E-01	1.85E+00	1.51E-02
La-140d	1.10E+03	3.77E+03	2.83E+02	5.97E+02	1.52E+02	2.93E+03	5.11E+03	9.34E+02	1.31E+01	1.91E+02	1.34E+01	4.10E+00	4.86E+00	5.48E+01	4.45E-01
Mn-54	1.08E-01	3.69E-01	2.77E-02	5.85E-02	1.49E-02	2.87E-01	5.00E-01	2.22E+01	3.11E-01	4.55E+00	3.18E-01	9.76E-02	1.16E-01	1.30E+00	1.06E-02
Na-24	5.07E+01	1.73E+02	1.30E+01	2.74E+01	6.99E+00	1.34E+02	2.35E+02	7.07E+01	9.89E-01	1.45E+01	1.01E+00	3.11E-01	3.68E-01	4.15E+00	3.37E-02
Rb-88d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sr-91	2.09E-01	7.14E-01	5.37E-02	1.13E-01	2.89E-02	5.55E-01	9.68E-01	8.85E+00	1.24E-01	1.81E+00	1.27E-01	3.89E-02	4.61E-02	5.19E-01	4.22E-03
Y-91	1.80E+02	6.13E+02	4.60E+01	9.71E+01	2.48E+01	4.76E+02	8.30E+02	1.08E+04	1.51E+02	2.21E+03	1.54E+02	4.74E+01	5.62E+01	6.32E+02	5.14E+00
Zn-65	4.06E+00	1.38E+01	1.04E+00	2.19E+00	5.59E-01	1.08E+01	1.88E+01	8.98E+02	1.26E+01	1.84E+02	1.29E+01	3.94E+00	4.68E+00	5.26E+01	4.28E-01
Zn-69m	4.06E+00	1.38E+01	1.04E+00	2.19E+00	5.59E-01	1.08E+01	1.88E+01	8.98E+02	1.26E+01	1.84E+02	1.29E+01	3.94E+00	4.68E+00	5.26E+01	4.28E-01

Notes:

Inhalation TFs in this table were calculated from the ingestion TF, by adjusting the ingestion TF by a COPC-specific inhalation/ingestion ratio (II) from CSA N288.1:20, Table G.8.

[a] For Cu-64 which is not listed in N288.1 Table G.8, the inhalation/ingestion ratio (II) was calculated from II = fa / f1, where f1 was taken from ICRP 72 Table A.1 (1995); fa was calculated as per the CANDU Owners Group DRL Guidance, section G7 (COG, 2013).

[b] BAFs presented as zero in this table indicates those radionuclides do not bioaccumulate (e.g., due to short half-lives).

fw = fresh weight; COPC = constituent of potential concern, which includes radionuclides which are selected for the sensitivity analysis scenario.

Table C-6: Internal Dose Coefficients for Aquatic Receptors

COPC	DCF Internal (µGy/hr)/(Bq/kg fw)									
	Aquatic Plants	Aquatic Animals								
	Aquatic Plants [a]	Benthic Invertebrates [b]	Alewife [c]	Lake Trout [c]	American Eel [c]	Dace [c]	Round Whitefish [c]	White Sucker [c]	Frogs [d]	Turtles [d]
Ba-137md [f]	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00
Ba-140	5.00E-04	2.66E-04	7.08E-04	7.08E-04	7.08E-04	7.08E-04	7.08E-04	7.08E-04	4.58E-04	4.58E-04
C-14	2.83E-05	2.80E-05	2.83E-05	2.83E-05	2.83E-05	2.83E-05	2.83E-05	2.83E-05	2.83E-05	2.83E-05
Co-58	3.42E-05	1.80E-05	9.17E-05	9.17E-05	9.17E-05	9.17E-05	9.17E-05	9.17E-05	2.46E-05	2.46E-05
Co-60	8.75E-05	5.20E-05	2.13E-04	2.13E-04	2.13E-04	2.13E-04	2.13E-04	2.13E-04	6.25E-05	6.25E-05
Cs-134	1.13E-04	7.20E-05	2.04E-04	2.04E-04	2.04E-04	2.04E-04	2.04E-04	2.04E-04	9.58E-05	9.58E-05
Cs-136	1.08E-04	7.20E-05	2.29E-04	2.29E-04	2.29E-04	2.29E-04	2.29E-04	2.29E-04	8.75E-05	8.75E-05
Cs-137	1.38E-04	9.80E-05	1.83E-04	1.83E-04	1.83E-04	1.83E-04	1.83E-04	1.83E-04	1.33E-04	1.33E-04
Cs-138d [f]	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00
Cu-64 [e]	5.09E-05	5.45E-05	8.52E-05	8.52E-05	8.52E-05	8.63E-05	8.63E-05	8.63E-05	7.49E-05	8.62E-05
Fe-59 [e]	5.72E-05	1.50E-04	1.44E-04	1.44E-04	1.44E-04	1.50E-04	1.50E-04	1.50E-04	9.25E-05	1.50E-04
HTO	5.76E-06	5.78E-06	5.76E-06	5.76E-06	5.76E-06	5.76E-06	5.76E-06	5.76E-06	5.76E-06	5.76E-06
I-131	1.13E-04	8.70E-05	1.38E-04	1.38E-04	1.38E-04	1.38E-04	1.38E-04	1.38E-04	1.04E-04	1.04E-04
I-132	2.58E-04	1.20E-04	4.58E-04	4.58E-04	4.58E-04	4.58E-04	4.58E-04	4.58E-04	2.25E-04	2.25E-04
I-133	2.08E-04	1.20E-04	2.79E-04	2.79E-04	2.79E-04	2.79E-04	2.79E-04	2.79E-04	1.96E-04	1.96E-04
I-134 [e]	1.69E-04	1.26E-04	5.02E-04	5.02E-04	5.02E-04	5.15E-04	5.15E-04	5.15E-04	3.68E-04	5.15E-04
I-135 [e]	2.45E-04	2.29E-04	5.14E-04	5.14E-04	5.14E-04	5.23E-04	5.23E-04	5.23E-04	4.20E-04	5.22E-04
La-140d	2.75E-04	1.27E-04	4.58E-04	4.58E-04	4.58E-04	4.58E-04	4.58E-04	4.58E-04	2.46E-04	2.46E-04
Mn-54	1.54E-05	3.60E-06	6.25E-05	6.25E-05	6.25E-05	6.25E-05	6.25E-05	6.25E-05	7.50E-06	7.50E-06
Na-24 [f]	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00
OBT	5.76E-06	5.78E-06	5.76E-06	5.76E-06	5.76E-06	5.76E-06	5.76E-06	5.76E-06	5.76E-06	5.76E-06
Rb-88d [f]	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00
Sr-91 [e]	1.72E-04	1.25E-04	4.48E-04	4.48E-04	4.48E-04	4.54E-04	4.54E-04	4.54E-04	3.76E-04	4.54E-04
Y-91 [f]	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00
Zn-65	1.38E-05	4.92E-06	4.58E-05	4.58E-05	4.58E-05	4.58E-05	4.58E-05	4.58E-05	7.92E-06	7.92E-06
Zn-69m [e]	1.25E-04	1.23E-04	2.28E-04	2.28E-04	2.28E-04	2.31E-04	2.31E-04	2.31E-04	2.03E-04	2.30E-04

Notes:

[a] DCFs for aquatic plants are based on seaweed from ICRP 108 (2008).
[b] DCFs for benthic invertebrates are the value for insect larvae from the ERICA Database (Brown et al., 2008).
[c] DCFs for alewife, American eel, dace, lake trout, round whitefish, and white sucker are based on trout from ICRP 108 (2008).
[d] DCFs for frogs and turtles are based on tadpole from ICRP 108 (2008).
[e] DCFs of radionuclides which are not listed in ICRP 108, including Cu-64, Fe-59, I-134, I-135, Sr-91 and Zn-69m, for all aquatic biota are from the ERICA Database (Brown et al., 2008).
[f] DCFs of the daughter radionuclides (Ba-137md, Cs-138d, Na-24, Rb-88d and Y-91) are not applicable (values shown as -1), as progeny-inclusive DCFs are applied for their parents.
µGy = microgray; Bq = becquerel; fw = fresh weight; COPC = constituent of potential concern, which includes radionuclides which are selected for the sensitivity analysis scenario.

Table C-7: External Dose Coefficients for Aquatic Receptors

COPC	DCF External (µGy/hr)/(Bq/kg(fw sediment) or Bq/L(water))									
	Aquatic Plants	Aquatic Animals								
	Aquatic Plants [a]	Benthic Invertebrates [b]	Alewife [c]	Lake Trout [c]	American Eel [c]	Dace [c]	Round Whitefish [c]	White Sucker [c]	Frogs [d]	Turtles [d]
Ba-137md [f]	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00
Ba-140	1.71E-03	1.91E-03	1.46E-03	1.46E-03	1.46E-03	1.46E-03	1.46E-03	1.46E-03	1.75E-03	1.75E-03
C-14	2.17E-07	8.20E-07	1.79E-08	1.79E-08	1.79E-08	1.79E-08	1.79E-08	1.79E-08	2.29E-07	2.29E-07
Co-58	5.42E-04	5.60E-04	5.00E-04	5.00E-04	5.00E-04	5.00E-04	5.00E-04	5.00E-04	5.42E-04	5.42E-04
Co-60	1.42E-03	1.40E-03	1.29E-03	1.29E-03	1.29E-03	1.29E-03	1.29E-03	1.29E-03	1.42E-03	1.42E-03
Cs-134	8.75E-04	9.20E-04	7.92E-04	7.92E-04	7.92E-04	7.92E-04	7.92E-04	7.92E-04	9.17E-04	9.17E-04
Cs-136	1.21E-03	1.30E-03	1.08E-03	1.08E-03	1.08E-03	1.08E-03	1.08E-03	1.08E-03	1.25E-03	1.25E-03
Cs-137	3.29E-04	3.70E-04	2.83E-04	2.83E-04	2.83E-04	2.83E-04	2.83E-04	2.83E-04	3.38E-04	3.38E-04
Cs-138d [f]	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00
Cu-64 [e]	1.30E-04	1.26E-04	9.55E-05	9.55E-05	9.55E-05	9.44E-05	9.44E-05	9.44E-05	1.06E-04	9.46E-05
Fe-59 [e]	6.96E-04	6.94E-04	6.09E-04	6.09E-04	6.09E-04	6.03E-04	6.03E-04	6.03E-04	6.61E-04	6.03E-04
HTO	2.33E-09	2.40E-13	3.54E-13	3.54E-13	3.54E-13	3.54E-13	3.54E-13	3.54E-13	1.33E-11	1.33E-11
I-131	2.21E-04	2.40E-04	1.92E-04	1.92E-04	1.92E-04	1.92E-04	1.92E-04	1.92E-04	2.25E-04	2.25E-04
I-132	1.33E-03	1.50E-03	1.17E-03	1.17E-03	1.17E-03	1.17E-03	1.17E-03	1.17E-03	1.38E-03	1.38E-03
I-133	3.79E-04	4.70E-04	3.08E-04	3.08E-04	3.08E-04	3.08E-04	3.08E-04	3.08E-04	3.92E-04	3.92E-04
I-134 [e]	1.66E-03	1.70E-03	1.33E-03	1.33E-03	1.33E-03	1.32E-03	1.32E-03	1.32E-03	1.46E-03	1.32E-03
I-135 [e]	1.25E-03	1.26E-03	9.77E-04	9.77E-04	9.77E-04	9.67E-04	9.67E-04	9.67E-04	1.07E-03	9.68E-04
La-140d	1.38E-03	1.52E-03	1.21E-03	1.21E-03	1.21E-03	1.21E-03	1.21E-03	1.21E-03	1.42E-03	1.42E-03
Mn-54	4.58E-04	4.80E-04	4.17E-04	4.17E-04	4.17E-04	4.17E-04	4.17E-04	4.17E-04	4.58E-04	4.58E-04
Na-24 [f]	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00
OBT	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Rb-88d [f]	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00
Sr-91 [e]	8.11E-04	8.58E-04	5.37E-04	5.37E-04	5.37E-04	5.30E-04	5.30E-04	5.30E-04	6.09E-04	5.30E-04
Y-91 [f]	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00
Zn-65	3.29E-04	3.36E-04	2.96E-04	2.96E-04	2.96E-04	2.96E-04	2.96E-04	2.96E-04	3.33E-04	3.33E-04
Zn-69m [e]	3.13E-04	3.16E-04	2.10E-04	2.10E-04	2.10E-04	2.08E-04	2.08E-04	2.08E-04	2.36E-04	2.08E-04

Notes:
a DCFs for aquatic plants are based on seaweed from ICRP 108 (2008).
b DCFs for benthic invertebrates are the value for insect larvae from the ERICA Database (Brown et al., 2008).
c DCFs for alewife, American eel, dace, lake trout, round whitefish, and white sucker are based on trout from ICRP 108 (2008).
d DCFs for frogs and turtles are based on tadpole from ICRP 108 (2008).
e DCFs of radionuclides which are not listed in ICRP 108, including Cu-64, Fe-59, I-134, I-135, Sr-91 and Zn-69m, for all aquatic biota are from the ERICA Database (Brown et al., 2008).
f DCFs of the daughter radionuclides (Ba-137md, Cs-138d, Na-24, Rb-88d and Y-91) are not applicable (values shown as -1), as progeny-inclusive DCFs are applied for their parents.
µGy = microgray; Bq = becquerel; fw = fresh weight; COPC = constituent of potential concern, which includes radionuclides which are selected for the sensitivity analysis scenario.

Table C-8: Internal Dose Coefficients for Terrestrial Plants and Invertebrates

COPC	DCF internal (µGy/hr)/(Bq/kg(fw plant))		
	Grass [a]	Sugar Maple [b]	Earthworm [a]
Ba-137md [d]	-1.00E+00	-1.00E+00	-1.00E+00
Ba-140	5.00E-04	1.33E-03	5.00E-04
C-14	2.83E-05	2.83E-05	2.83E-05
Co-58	2.92E-05	3.21E-04	3.04E-05
Co-60	7.50E-05	7.50E-04	7.50E-05
Cs-134	1.04E-04	5.83E-04	1.08E-04
Cs-136	9.58E-05	7.50E-04	1.00E-04
Cs-137	1.42E-04	3.25E-04	1.42E-04
Cs-138d [d]	-1.00E+00	-1.00E+00	-1.00E+00
Cu-64 [c]	5.09E-05	5.09E-05	5.45E-05
Fe-59 [c]	5.72E-05	5.72E-05	5.94E-05
HTO	5.76E-06	5.76E-06	5.76E-06
I-131	1.08E-04	2.46E-04	1.13E-04
I-132	2.63E-04	1.00E-03	2.71E-04
I-133	2.17E-04	4.17E-04	2.17E-04
I-134 [c]	1.69E-04	1.69E-04	1.26E-04
I-135 [c]	2.45E-04	2.45E-04	2.29E-04
La-140d	2.83E-04	9.17E-04	2.88E-04
Mn-54	1.08E-05	2.54E-04	1.17E-05
Na-24 [d]	-1.00E+00	-1.00E+00	-1.00E+00
OBT	5.76E-10	5.76E-06	5.76E-06
Rb-88d [d]	-1.00E+00	-1.00E+00	-1.00E+00
Sr-91 [c]	1.72E-04	1.72E-04	1.25E-04
Y-91 [d]	-1.00E+00	-1.00E+00	-1.00E+00
Zn-65	1.00E-05	1.71E-04	1.08E-05
Zn-69m [c]	1.25E-04	1.25E-04	1.23E-04

Notes:
[a] DCFs for grass and earthworm are from ICRP 108 (2008).
[b] DCFs for sugar maple are based on pine tree from ICRP 108 (2008).
[c] DCFs of radionuclides which are not listed in ICRP 108, including Cu-64, Fe-59, I-134, I-135, Sr-91 and Zn-69m, for all aquatic biota are from the ERICA Database (Brown et al., 2008).
[d] DCFs of the daughter radionuclides (Ba-137m, Cs-138d, Na-24, Rb-88d and Y-91) are not applicable (values shown as -1), as progeny-inclusive DCFs are applied for their parents.
µGy = microgray; Bq = becquerel; fw = fresh weight; COPC = constituent of potential concern, which includes radionuclides which are selected for the sensitivity analysis scenario.

Table C-9: External Dose Coefficients on Soil Surface for Terrestrial Plants and in Soil for Terrestrial Invertebrates

COPC	DCF external on soil surface (µGy/hr)/(Bq/m^2)		DCF external in soil (uGy/hr)/(Bq/kg(dw soil))
	Grass [a]	Sugar Maple [b]	Earthworm [a]
Ba-137md [d]	-1.00E+00	-1.00E+00	-1.00E+00
Ba-140	2.08E-05	6.25E-06	1.46E-03
C-14	0.00E+00	0.00E+00	0.00E+00
Co-58	7.92E-06	2.25E-06	5.00E-04
Co-60	1.79E-05	5.42E-06	1.29E-03
Cs-134	1.21E-05	3.58E-06	8.33E-04
Cs-136	1.63E-05	5.00E-06	1.13E-03
Cs-137	4.58E-06	1.29E-06	3.04E-04
Cs-138d [d]	-1.00E+00	-1.00E+00	-1.00E+00
Cu-64 [c]	2.74E-07	2.18E-07	1.00E-04
Fe-59 [c]	1.62E-06	1.32E-06	6.14E-04
HTO	0.00E+00	0.00E+00	0.00E+00
I-131	3.08E-06	9.17E-07	1.92E-04
I-132	1.71E-05	5.42E-06	1.21E-03
I-133	4.58E-06	1.42E-06	3.21E-04
I-134 [c]	3.62E-06	2.92E-06	1.37E-03
I-135 [c]	2.58E-06	2.10E-06	9.68E-04
La-140d	1.63E-05	5.00E-06	1.21E-03
Mn-54	6.67E-06	1.92E-06	4.58E-04
Na-24 [d]	-1.00E+00	-1.00E+00	-1.00E+00
OBT	0.00E+00	0.00E+00	0.00E+00
Rb-88d [d]	-1.00E+00	-1.00E+00	-1.00E+00
Sr-91 [c]	1.46E-06	1.18E-06	5.47E-04
Y-91 [d]	-1.00E+00	-1.00E+00	-1.00E+00
Zn-65	5.83E-06	1.33E-06	3.04E-04
Zn-69m [c]	6.03E-07	4.81E-07	2.15E-04

Notes:
[a] DCFs for grass and earthworm are from ICRP 108 (2008).
[b] DCFs for sugar maple are based on pine tree from ICRP 108 (2008).
[c] DCFs of radionuclides which are not listed in ICRP 108, including Cu-64, Fe-59, I-134, I-135, Sr-91 and Zn-69m, for all aquatic biota are from the ERICA Database (Brown et al., 2008).
[d] DCFs of the daughter radionuclides (Ba-137m, Cs-138d, Na-24, Rb-88d and Y-91) are not applicable (values shown as -1), as progeny-inclusive DCFs are applied for their parents.
µGy = microgray; Bq = becquerel; dw = dry weight; COPC = constituent of potential concern, which includes radionuclides which are selected for the sensitivity analysis scenario.

Table C-10: External Dose Coefficients of Noble Gases for Terrestrial Plants and Invertebrates

COPC	DCF external air (noble gases) (μGy/hr)/(Bq/m^3)		
	Grass [a]	Sugar Maple [b]	Earthworm [a]
Kr-85	2.72E-05	5.95E-07	1.91E-08
Kr-85m	6.14E-05	1.56E-05	3.12E-08
Kr-87	5.25E-04	1.54E-05	1.57E-07
Kr-88	1.42E-03	3.05E-04	1.75E-07
Xe-131md	2.46E-06	1.46E-07	1.22E-08
Xe-133	5.15E-06	0.00E+00	6.98E-09
Xe-133dd	5.15E-06	0.00E+00	6.98E-09
Xe-133md	2.68E-06	1.61E-07	1.74E-08
Xe-135	4.87E-05	1.61E-06	4.28E-08
Xe-135d	4.87E-05	1.61E-06	4.28E-08
Xe-135dd	4.87E-05	1.61E-06	4.28E-08
Xe-135m	1.47E-04	4.67E-05	4.00E-08
Xe-135md	1.47E-04	4.67E-05	4.00E-08
Xe-138	1.50E-03	4.80E-04	1.32E-07

Notes:
[a] DCFs for grass and earthworm were calculated using the methodology from Copplestone et al. (2001) recommended in CSA N288.6:22.
[b] DCFs for sugar maple were calculated based on pine tree using the methodology from Copplestone et al. (2001) recommended in CSA N288.6:22.
μGy = microgray; Bq = becquerel; COPC = constituent of potential concern; DCF = dose coefficient.

Table C-11: Internal Dose Coefficients for Birds and Mammals

COPC	DCF internal (µGy/hr)/(Bq/kg(fw animal))														
	Birds							Mammals							
	American Robin [a]	Bank Swallow [a]	Bufflehead [a]	Green Heron [a]	Mallard [a]	Song Sparrow [a]	Yellow Warbler [a]	Common Shrew [b]	Eastern Cottontail [b]	Meadow Vole [b]	Muskrat [b]	Raccoon [b]	Red Fox [b]	Short-tailed Weasel [b]	White-tailed Deer [c]
Ba-137md [e]	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00
Ba-140	7.50E-04	7.50E-04	7.50E-04	7.50E-04	7.50E-04	7.50E-04	7.50E-04	6.67E-04	6.67E-04	6.67E-04	6.67E-04	6.67E-04	6.67E-04	6.67E-04	1.46E-03
C-14	2.83E-05	2.83E-05	2.83E-05	2.83E-05	2.83E-05	2.83E-05	2.83E-05	2.83E-05	2.83E-05	2.83E-05	2.83E-05	2.83E-05	2.83E-05	2.83E-05	2.83E-05
Co-58	1.00E-04	1.00E-04	1.00E-04	1.00E-04	1.00E-04	1.00E-04	1.00E-04	7.08E-05	7.08E-05	7.08E-05	7.08E-05	7.08E-05	7.08E-05	7.08E-05	3.54E-04
Co-60	2.38E-04	2.38E-04	2.38E-04	2.38E-04	2.38E-04	2.38E-04	2.38E-04	1.67E-04	1.67E-04	1.67E-04	1.67E-04	1.67E-04	1.67E-04	1.67E-04	8.33E-04
Cs-134	2.21E-04	2.21E-04	2.21E-04	2.21E-04	2.21E-04	2.21E-04	2.21E-04	1.71E-04	1.71E-04	1.71E-04	1.71E-04	1.71E-04	1.71E-04	1.71E-04	6.25E-04
Cs-136	2.50E-04	2.50E-04	2.50E-04	2.50E-04	2.50E-04	2.50E-04	2.50E-04	1.88E-04	1.88E-04	1.88E-04	1.88E-04	1.88E-04	1.88E-04	1.88E-04	8.33E-04
Cs-137	1.88E-04	1.88E-04	1.88E-04	1.88E-04	1.88E-04	1.88E-04	1.88E-04	1.71E-04	1.71E-04	1.71E-04	1.71E-04	1.71E-04	1.71E-04	1.71E-04	3.42E-04
Cs-138d [e]	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00
Cu-64 [d]	8.71E-05	8.71E-05	8.71E-05	8.71E-05	8.71E-05	8.71E-05	8.71E-05	9.53E-05	9.53E-05	9.53E-05	9.53E-05	9.53E-05	9.53E-05	9.53E-05	9.53E-05
Fe-59 [d]	1.55E-04	1.55E-04	1.55E-04	1.55E-04	1.55E-04	1.55E-04	1.55E-04	1.99E-04	1.99E-04	1.99E-04	1.99E-04	1.99E-04	1.99E-04	1.99E-04	1.99E-04
HTO	5.76E-06	5.76E-06	5.76E-06	5.76E-06	5.76E-06	5.76E-06	5.76E-06	5.76E-06	5.76E-06	5.76E-06	5.76E-06	5.76E-06	5.76E-06	5.76E-06	5.76E-06
I-131	1.42E-04	1.42E-04	1.42E-04	1.42E-04	1.42E-04	1.42E-04	1.42E-04	1.29E-04	1.29E-04	1.29E-04	1.29E-04	1.29E-04	1.29E-04	1.29E-04	2.50E-04
I-132	4.58E-04	4.58E-04	4.58E-04	4.58E-04	4.58E-04	4.58E-04	4.58E-04	3.92E-04	3.92E-04	3.92E-04	3.92E-04	3.92E-04	3.92E-04	3.92E-04	1.04E-03
I-133	2.83E-04	2.83E-04	2.83E-04	2.83E-04	2.83E-04	2.83E-04	2.83E-04	2.63E-04	2.63E-04	2.63E-04	2.63E-04	2.63E-04	2.63E-04	2.63E-04	4.58E-04
I-134 [d]	5.26E-04	5.26E-04	5.26E-04	5.26E-04	5.26E-04	5.26E-04	5.26E-04	6.30E-04	6.30E-04	6.30E-04	6.30E-04	6.30E-04	6.30E-04	6.30E-04	6.30E-04
I-135 [d]	5.31E-04	5.31E-04	5.31E-04	5.31E-04	5.31E-04	5.31E-04	5.31E-04	6.04E-04	6.04E-04	6.04E-04	6.04E-04	6.04E-04	6.04E-04	6.04E-04	6.04E-04
La-140d	4.58E-04	4.58E-04	4.58E-04	4.58E-04	4.58E-04	4.58E-04	4.58E-04	4.04E-04	4.04E-04	4.04E-04	4.04E-04	4.04E-04	4.04E-04	4.04E-04	1.04E-03
Mn-54	7.08E-05	7.08E-05	7.08E-05	7.08E-05	7.08E-05	7.08E-05	7.08E-05	4.58E-05	4.58E-05	4.58E-05	4.58E-05	4.58E-05	4.58E-05	4.58E-05	2.88E-04
Na-24 [e]	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00
OBT	5.76E-06	5.76E-06	5.76E-06	5.76E-06	5.76E-06	5.76E-06	5.76E-06	5.76E-06	5.76E-06	5.76E-06	5.76E-06	5.76E-06	5.76E-06	5.76E-06	5.76E-06
Rb-88d [e]	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00
Sr-91 [d]	4.59E-04	4.59E-04	4.59E-04	4.59E-04	4.59E-04	4.59E-04	4.59E-04	5.04E-04	5.04E-04	5.04E-04	5.04E-04	5.04E-04	5.04E-04	5.04E-04	5.04E-04
Y-91 [e]	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00
Zn-65	5.00E-05	5.00E-05	5.00E-05	5.00E-05	5.00E-05	5.00E-05	5.00E-05	3.29E-05	3.29E-05	3.29E-05	3.29E-05	3.29E-05	3.29E-05	3.29E-05	1.96E-04
Zn-69m [d]	2.32E-04	2.32E-04	2.32E-04	2.32E-04	2.32E-04	2.32E-04	2.32E-04	2.51E-04	2.51E-04	2.51E-04	2.51E-04	2.51E-04	2.51E-04	2.51E-04	2.51E-04

Notes:

[a] DCFs for all terrestrial birds are based on duck from ICRP 108 (2008).

[b] DCFs for all terrestrial mammals (except white-tailed deer) are based on rat from ICRP 108 (2008).

[c] DCFs for white-tailed deer are based on deer from ICRP 108 (2008).

[d] DCFs of radionuclides which are not listed in ICRP 108, including Cu-64, Fe-59, I-134, I-135, Sr-91 and Zn-69m, for all terrestrial biota are from the ERICA Database (Brown et al., 2008).

[e] DCFs of the daughter radionuclides (Ba-137m, Cs-138d, Na-24, Rb-88d and Y-91) are not applicable (values shown as -1), as progeny-inclusive DCFs are applied for their parents.

µGy = microgray; Bq = becquerel; fw = fresh weight; COPC = constituent of potential concern; DCF = dose coefficient. The COPC list includes radionuclides which are selected for the sensitivity analysis scenario.

Table C-12: External Dose Coefficients for Birds and Mammals

COPC	DCF external on soil surface (μGy/hr)/(Bq/m²)														
	Birds							Mammals							
	American Robin [a]	Bank Swallow [a]	Bufflehead [a]	Green Heron [a]	Mallard [a]	Song Sparrow [a]	Yellow Warbler [a]	Common Shrew [b]	Eastern Cottontail [b]	Meadow Vole [b]	Muskrat [b]	Raccoon [b]	Red Fox [b]	Short-tailed Weasel [b]	White-tailed Deer [c]
Ba-137md	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00
Ba-140	8.33E-06	8.33E-06	8.33E-06	8.33E-06	8.33E-06	8.33E-06	8.33E-06	8.75E-06	8.75E-06	8.75E-06	8.75E-06	8.75E-06	8.75E-06	8.75E-06	4.58E-06
C-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-58	3.04E-06	3.04E-06	3.04E-06	3.04E-06	3.04E-06	3.04E-06	3.04E-06	3.21E-06	3.21E-06	3.21E-06	3.21E-06	3.21E-06	3.21E-06	3.21E-06	1.58E-06
Co-60	7.50E-06	7.50E-06	7.50E-06	7.50E-06	7.50E-06	7.50E-06	7.50E-06	7.92E-06	7.92E-06	7.92E-06	7.92E-06	7.92E-06	7.92E-06	7.92E-06	4.04E-06
Cs-134	5.00E-06	5.00E-06	5.00E-06	5.00E-06	5.00E-06	5.00E-06	5.00E-06	5.00E-06	5.00E-06	5.00E-06	5.00E-06	5.00E-06	5.00E-06	5.00E-06	2.54E-06
Cs-136	6.67E-06	6.67E-06	6.67E-06	6.67E-06	6.67E-06	6.67E-06	6.67E-06	7.08E-06	7.08E-06	7.08E-06	7.08E-06	7.08E-06	7.08E-06	7.08E-06	3.50E-06
Cs-137	1.79E-06	1.79E-06	1.79E-06	1.79E-06	1.79E-06	1.79E-06	1.79E-06	1.88E-06	1.88E-06	1.88E-06	1.88E-06	1.88E-06	1.88E-06	1.88E-06	9.17E-07
Cs-138d	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00
Cu-64	2.56E-07	2.56E-07	2.56E-07	2.56E-07	2.56E-07	2.56E-07	2.56E-07	2.70E-07	2.70E-07	2.70E-07	2.70E-07	2.70E-07	2.70E-07	2.70E-07	1.35E-07
Fe-59	1.85E-06	1.85E-06	1.85E-06	1.85E-06	1.85E-06	1.85E-06	1.85E-06	1.88E-06	1.88E-06	1.88E-06	1.88E-06	1.88E-06	1.88E-06	1.88E-06	1.29E-06
HTO	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I-131	1.21E-06	1.21E-06	1.21E-06	1.21E-06	1.21E-06	1.21E-06	1.21E-06	1.29E-06	1.29E-06	1.29E-06	1.29E-06	1.29E-06	1.29E-06	1.29E-06	6.25E-07
I-132	7.08E-06	7.08E-06	7.08E-06	7.08E-06	7.08E-06	7.08E-06	7.08E-06	7.50E-06	7.50E-06	7.50E-06	7.50E-06	7.50E-06	7.50E-06	7.50E-06	3.71E-06
I-133	1.92E-06	1.92E-06	1.92E-06	1.92E-06	1.92E-06	1.92E-06	1.92E-06	2.00E-06	2.00E-06	2.00E-06	2.00E-06	2.00E-06	2.00E-06	2.00E-06	1.00E-06
I-134	3.90E-06	3.90E-06	3.90E-06	3.90E-06	3.90E-06	3.90E-06	3.90E-06	3.96E-06	3.96E-06	3.96E-06	3.96E-06	3.96E-06	3.96E-06	3.96E-06	2.60E-06
I-135	2.75E-06	2.75E-06	2.75E-06	2.75E-06	2.75E-06	2.75E-06	2.75E-06	2.78E-06	2.78E-06	2.78E-06	2.78E-06	2.78E-06	2.78E-06	2.78E-06	1.90E-06
La-140d	6.67E-06	6.67E-06	6.67E-06	6.67E-06	6.67E-06	6.67E-06	6.67E-06	7.08E-06	7.08E-06	7.08E-06	7.08E-06	7.08E-06	7.08E-06	7.08E-06	3.75E-06
Mn-54	2.58E-06	2.58E-06	2.58E-06	2.58E-06	2.58E-06	2.58E-06	2.58E-06	2.71E-06	2.71E-06	2.71E-06	2.71E-06	2.71E-06	2.71E-06	2.71E-06	1.33E-06
Na-24	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00
OBT	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Rb-88d	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00
Sr-91	1.40E-06	1.40E-06	1.40E-06	1.40E-06	1.40E-06	1.40E-06	1.40E-06	1.46E-06	1.46E-06	1.46E-06	1.46E-06	1.46E-06	1.46E-06	1.46E-06	7.45E-07
Y-91	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00	-1.00E+00
Zn-65	1.75E-06	1.75E-06	1.75E-06	1.75E-06	1.75E-06	1.75E-06	1.75E-06	1.83E-06	1.83E-06	1.83E-06	1.83E-06	1.83E-06	1.83E-06	1.83E-06	9.58E-07
Zn-69m	6.42E-07	6.42E-07	6.42E-07	6.42E-07	6.42E-07	6.42E-07	6.42E-07	6.57E-07	6.57E-07	6.57E-07	6.57E-07	6.57E-07	6.57E-07	6.57E-07	3.94E-07

Notes:

[a] DCFs for all terrestrial birds are based on duck from ICRP 108 (2008).
[b] DCFs for all terrestrial mammals (except white-tailed deer) are based on rat from ICRP 108 (2008).
[c] DCFs for white-tailed deer are based on deer from ICRP 108 (2008).
[d] DCFs of radionuclides which are not listed in ICRP 108, including Cu-64, Fe-59, I-134, I-135, Sr-91 and Zn-69m, for all terrestrial biota are from the ERICA Database (Brown et al., 2008).
[e] DCFs of the daughter radionuclides (Ba-137m, Cs-138d, Na-24, Rb-88d and Y-91) are not applicable (values shown as -1), as progeny-inclusive DCFs are applied for their parents.
μGy = microgray; Bq = becquerel.
COPC = constituent of potential concern; DCF = dose coefficient. The COPC list includes radionuclides which are selected for the sensitivity analysis scenario.

Table C-13: External Dose Coefficients of Noble Gases for Birds and Mammals

COPC	DCF external air (noble gases) (µGy/hr)/(Bq/m³)														
	Birds							Mammals							
	American Robin [a]	Bank Swallow [a]	Bufflehead [a]	Green Heron [a]	Mallard [a]	Song Sparrow [a]	Yellow Warbler [a]	Common Shrew [b]	Eastern Cottontail [b]	Meadow Vole [b]	Muskrat [b]	Raccoon [b]	Red Fox [b]	Short-tailed Weasel [b]	White-tailed Deer [c]
Kr-85	1.12E-04	1.12E-04	5.59E-05	5.59E-05	5.59E-05	1.12E-04	1.91E-08	6.62E-06	6.62E-06	6.62E-06	6.62E-06	6.62E-06	6.62E-06	6.62E-06	5.95E-07
Kr-85m	1.77E-04	1.77E-04	8.83E-05	8.83E-05	8.83E-05	1.77E-04	3.12E-08	4.06E-05	4.06E-05	4.06E-05	4.06E-05	4.06E-05	4.06E-05	4.06E-05	1.56E-05
Kr-87	1.29E-03	1.29E-03	6.46E-04	6.46E-04	6.46E-04	1.29E-03	1.57E-07	1.52E-04	1.52E-04	1.52E-04	1.52E-04	1.52E-04	1.52E-04	1.52E-04	1.54E-05
Kr-88	3.18E-03	3.18E-03	1.59E-03	1.59E-03	1.59E-03	3.18E-03	1.75E-07	7.99E-04	7.99E-04	7.99E-04	7.99E-04	7.99E-04	7.99E-04	7.99E-04	3.05E-04
Xe-131md	5.98E-06	5.98E-06	2.99E-06	2.99E-06	2.99E-06	5.98E-06	1.22E-08	1.14E-06	1.14E-06	1.14E-06	1.14E-06	1.14E-06	1.14E-06	1.14E-06	1.46E-07
Xe-133	2.39E-05	2.39E-05	1.19E-05	1.19E-05	1.19E-05	2.39E-05	6.98E-09	1.18E-06	1.18E-06	1.18E-06	1.18E-06	1.18E-06	1.18E-06	1.18E-06	0.00E+00
Xe-133dd	2.39E-05	2.39E-05	1.19E-05	1.19E-05	1.19E-05	2.39E-05	6.98E-09	1.18E-06	1.18E-06	1.18E-06	1.18E-06	1.18E-06	1.18E-06	1.18E-06	0.00E+00
Xe-133md	6.42E-06	6.42E-06	3.21E-06	3.21E-06	3.21E-06	6.42E-06	1.74E-08	1.26E-06	1.26E-06	1.26E-06	1.26E-06	1.26E-06	1.26E-06	1.26E-06	1.61E-07
Xe-135	1.94E-04	1.94E-04	9.68E-05	9.68E-05	9.68E-05	1.94E-04	4.28E-08	1.11E-05	1.11E-05	1.11E-05	1.11E-05	1.11E-05	1.11E-05	1.11E-05	1.61E-06
Xe-135d	1.94E-04	1.94E-04	9.68E-05	9.68E-05	9.68E-05	1.94E-04	4.28E-08	1.11E-05	1.11E-05	1.11E-05	1.11E-05	1.11E-05	1.11E-05	1.11E-05	1.61E-06
Xe-135dd	1.94E-04	1.94E-04	9.68E-05	9.68E-05	9.68E-05	1.94E-04	4.28E-08	1.11E-05	1.11E-05	1.11E-05	1.11E-05	1.11E-05	1.11E-05	1.11E-05	1.61E-06
Xe-135m	3.92E-04	3.92E-04	1.96E-04	1.96E-04	1.96E-04	3.92E-04	4.00E-08	1.04E-04	1.04E-04	1.04E-04	1.04E-04	1.04E-04	1.04E-04	1.04E-04	4.67E-05
Xe-135md	3.92E-04	3.92E-04	1.96E-04	1.96E-04	1.96E-04	3.92E-04	4.00E-08	1.04E-04	1.04E-04	1.04E-04	1.04E-04	1.04E-04	1.04E-04	1.04E-04	4.67E-05
Xe-138	3.49E-03	3.49E-03	1.74E-03	1.74E-03	1.74E-03	3.49E-03	1.32E-07	9.64E-04	9.64E-04	9.64E-04	9.64E-04	9.64E-04	9.64E-04	9.64E-04	4.80E-04

Notes:
[a] DCFs for all terrestrial birds were calculated based on duck using the methodology from Copplestone et al. (2001) recommended in CSA N288.6:22.
[b] DCFs for all terrestrial mammals (except white-tailed deer) were calculated based on rat using the methodology from Copplestone et al. (2001) recommended in CSA N288.6:22.
[c] DCFs for white-tailed deer were calculated based on deer using the methodology from Copplestone et al. (2001) recommended in CSA N288.6:22.
µGy = microgray; Bq = becquerel.
COPC = constituent of potential concern; DCF = dose coefficient.

Appendix D Tables of Estimated Concentrations and Doses at Ecological Risk Assessment Locations

Table D-1: Estimated Concentrations of Radionuclides in Environmental Media at Ecological Assessment Locations under an Air Release Scenario

Environmental Media	Location	Estimated Concentrations of Radionuclides													
		Ba-137md	C-14	Co-60	Cs-134	Cs-137	Cs-138d	HTO	I-131	I-132	I-133	I-134	I-135	Kr-85	Kr-85m
Outdoor Air (Bq/m³)	Lake Ontario Shore	5.29E-08	2.36E-02	6.50E-07	3.90E-08	5.90E-08	2.52E-02	5.73E-02	3.07E-05	1.68E-04	1.40E-04	4.12E-04	2.64E-04	1.30E-01	1.92E-03
	AB	3.05E-08	1.32E-02	3.62E-07	2.17E-08	3.29E-08	1.56E-02	3.19E-02	1.71E-05	9.12E-05	7.80E-05	2.14E-04	1.46E-04	7.24E-02	1.06E-03
	C	3.07E-08	1.34E-02	3.69E-07	2.22E-08	3.36E-08	1.50E-02	3.26E-02	1.74E-05	9.54E-05	7.98E-05	2.33E-04	1.50E-04	7.39E-02	1.09E-03
	D	3.36E-08	1.65E-02	4.52E-07	2.71E-08	4.11E-08	1.30E-02	3.99E-02	2.14E-05	1.22E-04	9.82E-05	3.17E-04	1.86E-04	9.05E-02	1.37E-03
	E	5.96E-08	3.86E-02	1.06E-06	6.37E-08	9.65E-08	1.76E-02	9.36E-02	5.02E-05	2.93E-04	2.31E-04	7.93E-04	4.41E-04	2.12E-01	3.24E-03
	F (SMR)	1.55E-07	1.70E-01	4.66E-06	2.80E-07	4.24E-07	3.76E-02	4.11E-01	2.20E-04	1.30E-03	1.02E-03	3.60E-03	1.94E-03	9.33E-01	1.43E-02
Soil (Bq/kg(dw))	AB	1.44E-03	0.00E+00	4.57E-03	1.11E-04	1.52E-03	2.52E-03	0.00E+00	5.16E-04	3.29E-05	2.56E-04	2.95E-05	1.51E-04	0.00E+00	0.00E+00
	C	1.28E-03	0.00E+00	4.07E-03	9.91E-05	1.35E-03	2.12E-03	0.00E+00	5.23E-04	3.42E-05	2.60E-04	3.19E-05	1.54E-04	0.00E+00	0.00E+00
	D	9.23E-04	0.00E+00	2.93E-03	7.13E-05	9.72E-04	1.08E-03	0.00E+00	6.29E-04	4.28E-05	3.13E-04	4.26E-05	1.88E-04	0.00E+00	0.00E+00
	E	2.25E-03	0.00E+00	7.13E-03	1.74E-04	2.37E-03	1.51E-03	0.00E+00	1.48E-03	1.03E-04	7.38E-04	1.07E-04	4.45E-04	0.00E+00	0.00E+00
	F (SMR)	3.24E-03	0.00E+00	1.03E-02	2.50E-04	3.41E-03	1.06E-03	0.00E+00	6.36E-03	4.49E-04	3.18E-03	4.73E-04	1.93E-03	0.00E+00	0.00E+00
Water (Bq/L)	Lake Ontario	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Coot's Pond	3.75E-07	1.34E-03	9.64E-07	2.56E-07	3.94E-07	3.27E-04	3.19E+00	5.25E-05	4.27E-06	3.22E-05	3.83E-06	1.94E-05	0.00E+00	0.00E+00
	Dragonfly Pond	2.40E-07	1.68E-03	6.18E-07	1.64E-07	2.53E-07	1.40E-04	3.99E+00	6.39E-05	5.55E-06	3.95E-05	5.53E-06	2.42E-05	0.00E+00	0.00E+00
	Polliwog Pond	2.40E-07	1.68E-03	6.18E-07	1.64E-07	2.53E-07	1.40E-04	3.99E+00	6.39E-05	5.55E-06	3.95E-05	5.53E-06	2.42E-05	0.00E+00	0.00E+00
	Treefrog Pond	2.40E-07	1.68E-03	6.18E-07	1.64E-07	2.53E-07	1.40E-04	3.99E+00	6.39E-05	5.55E-06	3.95E-05	5.53E-06	2.42E-05	0.00E+00	0.00E+00
Sediment (Bq/kg(dw))	Lake Ontario	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Coot's Pond	7.49E-04	6.71E-02	4.15E-02	2.43E-03	3.75E-03	3.11E+00	0.00E+00	2.31E-01	1.88E-02	1.42E-01	1.69E-02	8.55E-02	0.00E+00	0.00E+00
	Dragonfly Pond	4.80E-04	8.38E-02	2.66E-02	1.56E-03	2.40E-03	1.33E+00	0.00E+00	2.81E-01	2.44E-02	1.74E-01	2.43E-02	1.06E-01	0.00E+00	0.00E+00
	Polliwog Pond	4.80E-04	8.38E-02	2.66E-02	1.56E-03	2.40E-03	1.33E+00	0.00E+00	2.81E-01	2.44E-02	1.74E-01	2.43E-02	1.06E-01	0.00E+00	0.00E+00
	Treefrog Pond	4.80E-04	8.38E-02	2.66E-02	1.56E-03	2.40E-03	1.33E+00	0.00E+00	2.81E-01	2.44E-02	1.74E-01	2.43E-02	1.06E-01	0.00E+00	0.00E+00

Environmental media	Location	Estimated Point Concentrations of Radionuclides													
		Kr-87	Kr-88	OBT	Rb-88d	Xe-131md	Xe-133	Xe-133dd	Xe-133md	Xe-135	Xe-135d	Xe-135dd	Xe-135m	Xe-135md	Xe-138
Outdoor Air (Bq/m^3)	Lake Ontario Shore	6.08E-03	6.61E-03	0.00E+00	3.11E-03	2.14E-08	9.43E-02	5.12E-10	5.29E-07	7.51E-02	9.86E-04	5.10E-06	3.50E-02	2.16E-05	6.62E-02
	AB	3.23E-03	3.61E-03	0.00E+00	2.07E-03	1.58E-08	5.26E-02	4.74E-10	3.89E-07	4.16E-02	6.54E-04	3.77E-06	1.56E-02	1.43E-05	2.90E-02
	C	3.45E-03	3.76E-03	0.00E+00	1.83E-03	1.23E-08	5.36E-02	2.75E-10	3.05E-07	4.27E-02	5.80E-04	2.93E-06	1.92E-02	1.27E-05	3.62E-02
	D	4.54E-03	4.75E-03	0.00E+00	1.41E-03	8.07E-09	6.58E-02	1.03E-10	2.00E-07	5.28E-02	4.52E-04	1.90E-06	3.30E-02	9.92E-06	6.39E-02
	E	1.11E-02	1.14E-02	0.00E+00	1.76E-03	8.94E-09	1.54E-01	5.37E-11	2.22E-07	1.25E-01	5.68E-04	2.09E-06	9.54E-02	1.25E-05	1.88E-01
	F (SMR)	5.00E-02	5.05E-02	0.00E+00	3.65E-03	1.75E-08	6.78E-01	5.38E-11	4.36E-07	5.50E-01	1.18E-03	4.06E-06	4.66E-01	2.59E-05	9.26E-01
Soil (Bq/kg(dw))	AB	0.00E+00	0.00E+00	0.00E+00	1.78E-04	2.74E-04	0.00E+00	1.57E-04	2.19E-04	0.00E+00	0.00E+00	1.47E-04	0.00E+00	2.41E-05	0.00E+00
	C	0.00E+00	0.00E+00	0.00E+00	1.38E-04	2.77E-04	0.00E+00	1.60E-04	2.23E-04	0.00E+00	0.00E+00	1.50E-04	0.00E+00	2.47E-05	0.00E+00
	D	0.00E+00	0.00E+00	0.00E+00	6.26E-05	3.33E-04	0.00E+00	1.93E-04	2.69E-04	0.00E+00	0.00E+00	1.83E-04	0.00E+00	3.00E-05	0.00E+00
	E	0.00E+00	0.00E+00	0.00E+00	8.11E-05	7.83E-04	0.00E+00	4.55E-04	6.34E-04	0.00E+00	0.00E+00	4.33E-04	0.00E+00	7.12E-05	0.00E+00
	F (SMR)	0.00E+00	0.00E+00	0.00E+00	5.49E-05	3.37E-03	0.00E+00	1.96E-03	2.73E-03	0.00E+00	0.00E+00	1.87E-03	0.00E+00	3.08E-04	0.00E+00
Water (Bq/L)	Lake Ontario	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Coot's Pond	0.00E+00	0.00E+00	0.00E+00	2.32E-05	5.21E-05	0.00E+00	3.21E-05	3.22E-05	0.00E+00	0.00E+00	1.94E-05	0.00E+00	3.11E-06	0.00E+00
	Dragonfly Pond	0.00E+00	0.00E+00	0.00E+00	8.14E-06	6.34E-05	0.00E+00	3.93E-05	3.95E-05	0.00E+00	0.00E+00	2.42E-05	0.00E+00	3.87E-06	0.00E+00
	Polliwog Pond	0.00E+00	0.00E+00	0.00E+00	8.14E-06	6.34E-05	0.00E+00	3.93E-05	3.95E-05	0.00E+00	0.00E+00	2.42E-05	0.00E+00	3.87E-06	0.00E+00
	Treefrog Pond	0.00E+00	0.00E+00	0.00E+00	8.14E-06	6.34E-05	0.00E+00	3.93E-05	3.95E-05	0.00E+00	0.00E+00	2.42E-05	0.00E+00	3.87E-06	0.00E+00
Sediment (Bq/kg(dw))	Lake Ontario	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Coot's Pond	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Dragonfly Pond	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Polliwog Pond	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Treefrog Pond	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table D-2: Estimated Concentrations of Radionuclides for Ecological Receptors under an Air Release Scenario

Ecological Receptors	Location	Estimated Concentrations of Radionuclides in the Tissue of Ecological Receptors (Bq/kg(fw))														
		Ba-137md	C-14	Co-60	Cs-134	Cs-137	Cs-138d	HTO	I-131	I-132	I-133	I-134	I-135	Kr-85	OBT	Rb-88d
Benthic Invertebrates	Lake Ontario	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Alewife	Lake Ontario	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Lake Trout	Lake Ontario	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Round Whitefish	Lake Ontario	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
White Sucker	Lake Ontario	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
American Eel	Lake Ontario	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Bufflehead	Lake Ontario Shore	0.00E+00	0.00E+00	3.65E-07	2.25E-08	3.41E-08	0.00E+00	2.73E-02	5.70E-08	0.00E+00	2.61E-07	0.00E+00	4.90E-07	0.00E+00	3.01E-03	0.00E+00
Mallard	Lake Ontario Shore	0.00E+00	0.00E+00	3.84E-07	2.36E-08	3.58E-08	0.00E+00	2.73E-02	6.00E-08	0.00E+00	2.74E-07	0.00E+00	5.15E-07	0.00E+00	3.01E-03	0.00E+00
Aquatic Plants	Coot's Pond	0.00E+00	7.92E+00	7.62E-04	5.63E-05	8.67E-05	0.00E+00	2.40E+00	3.73E-03	0.00E+00	2.29E-03	0.00E+00	1.38E-03	0.00E+00	3.51E-01	0.00E+00
Benthic Invertebrates	Coot's Pond	0.00E+00	7.52E+00	1.06E-04	2.53E-05	3.90E-05	0.00E+00	2.40E+00	5.04E-04	0.00E+00	3.10E-04	0.00E+00	1.87E-04	0.00E+00	4.47E-01	0.00E+00
Dace	Coot's Pond	0.00E+00	7.65E+00	5.21E-05	8.96E-04	1.38E-03	0.00E+00	2.40E+00	3.15E-04	0.00E+00	1.93E-04	0.00E+00	1.17E-04	0.00E+00	4.47E-01	0.00E+00
Frogs	Coot's Pond	0.00E+00	7.65E+00	5.21E-05	8.96E-04	1.38E-03	0.00E+00	2.40E+00	3.15E-04	0.00E+00	1.93E-04	0.00E+00	1.17E-04	0.00E+00	4.47E-01	0.00E+00
Turtles	Coot's Pond	0.00E+00	7.65E+00	5.21E-05	8.96E-04	1.38E-03	0.00E+00	2.40E+00	3.15E-04	0.00E+00	1.93E-04	0.00E+00	1.17E-04	0.00E+00	4.47E-01	0.00E+00
Grass	AB	4.08E-08	6.27E+00	4.04E-03	2.39E-04	3.81E-04	2.73E-01	1.58E+00	2.13E-01	1.80E-02	1.36E-01	1.62E-02	8.19E-02	0.00E+00	1.55E-01	1.93E-02
Earthworm	AB	4.08E-09	5.27E+00	4.27E-04	2.48E-04	5.00E-04	2.73E-01	1.64E+00	2.14E-02	1.81E-03	1.36E-02	1.62E-03	8.22E-03	0.00E+00	1.64E-01	1.93E-02
American Robin	AB	0.00E+00	6.43E+00	1.61E-04	2.03E-04	4.13E-04	0.00E+00	7.07E-01	4.74E-05	0.00E+00	1.48E-05	0.00E+00	1.85E-06	0.00E+00	4.95E-02	0.00E+00
Bank Swallow	AB	0.00E+00	5.36E+00	1.97E-04	2.93E-04	6.04E-04	0.00E+00	7.07E-01	7.45E-05	0.00E+00	2.34E-05	0.00E+00	2.76E-06	0.00E+00	4.95E-02	0.00E+00
Bufflehead	AB	0.00E+00	7.73E+00	5.80E-05	1.99E-05	3.07E-05	0.00E+00	9.83E-01	2.70E-06	0.00E+00	1.79E-06	0.00E+00	1.26E-06	0.00E+00	6.72E-02	0.00E+00
Common Shrew	AB	0.00E+00	8.82E+00	1.16E-05	3.32E-04	6.75E-04	0.00E+00	1.62E+00	7.99E-03	0.00E+00	2.51E-03	0.00E+00	2.99E-04	0.00E+00	1.44E-01	0.00E+00
Eastern Cottontail	AB	0.00E+00	1.26E+01	7.44E-05	2.23E-04	3.72E-04	1.18E-04	1.62E+00	5.53E-02	4.09E-06	1.73E-02	4.22E-07	1.90E-03	0.00E+00	1.44E-01	0.00E+00
Green Heron	AB	1.68E-08	7.66E+00	5.83E-05	5.71E-04	8.80E-04	9.70E-03	9.83E-01	3.01E-06	1.90E-07	1.97E-06	1.71E-07	1.37E-06	0.00E+00	2.87E-02	1.46E-06
Mallard	AB	0.00E+00	7.73E+00	1.18E-04	2.86E-05	4.40E-05	0.00E+00	9.83E-01	5.61E-06	0.00E+00	3.58E-06	0.00E+00	2.35E-06	0.00E+00	6.72E-02	0.00E+00
Meadow Vole	AB	0.00E+00	1.26E+01	2.94E-05	8.88E-05	1.44E-04	5.63E-05	1.62E+00	2.21E-02	1.67E-06	6.92E-03	2.01E-07	7.85E-04	0.00E+00	1.44E-01	0.00E+00
Muskrat	AB	0.00E+00	1.27E+01	1.80E-05	6.36E-05	9.79E-05	0.00E+00	2.04E+00	1.43E-03	0.00E+00	8.99E-04	0.00E+00	5.68E-04	0.00E+00	1.14E-01	0.00E+00
Raccoon	AB	0.00E+00	1.26E+01	2.76E-05	1.98E-04	3.89E-04	0.00E+00	2.04E+00	1.97E-02	0.00E+00	6.20E-03	0.00E+00	7.17E-04	0.00E+00	1.70E-01	0.00E+00
Red Fox	AB	0.00E+00	1.26E+01	4.90E-06	3.83E-05	6.52E-05	0.00E+00	1.62E+00	5.04E-03	0.00E+00	1.60E-03	0.00E+00	2.17E-04	0.00E+00	1.44E-01	0.00E+00
Short-tailed Weasel	AB	0.00E+00	1.26E+01	1.02E-06	4.88E-05	8.93E-05	0.00E+00	1.74E+00	3.63E-03	0.00E+00	1.16E-03	0.00E+00	1.68E-04	0.00E+00	1.27E-01	0.00E+00
Song Sparrow	AB	0.00E+00	1.17E+01	1.96E-04	2.49E-04	4.58E-04	0.00E+00	1.13E+00	5.10E-05	0.00E+00	1.58E-05	0.00E+00	2.10E-06	0.00E+00	7.93E-02	0.00E+00
White-tailed Deer	AB	0.00E+00	1.26E+01	1.02E-04	3.08E-04	4.97E-04	1.88E-04	1.53E+00	7.65E-02	5.75E-06	2.40E-02	6.69E-07	2.62E-03	0.00E+00	1.26E-01	0.00E+00
Yellow Warbler	AB	0.00E+00	5.49E+00	2.00E-04	2.95E-04	6.06E-04	0.00E+00	7.07E-01	7.44E-05	0.00E+00	2.34E-05	0.00E+00	2.76E-06	0.00E+00	4.95E-02	0.00E+00

Ecological Receptors	Location	Estimated Concentrations of Radionuclides in the Tissue of Ecological Receptors (Bq/kg(fw))														
		Ba-137md	C-14	Co-60	Cs-134	Cs-137	Cs-138d	HTO	I-131	I-132	I-133	I-134	I-135	Kr-85	OBT	Rb-88d
Grass	C	3.81E-08	6.40E+00	3.82E-03	2.26E-04	3.59E-04	2.43E-01	1.61E+00	2.15E-01	1.87E-02	1.38E-01	1.74E-02	8.36E-02	0.00E+00	1.58E-01	1.58E-02
Earthworm	C	3.81E-09	5.37E+00	4.03E-04	2.34E-04	4.66E-04	2.44E-01	1.67E+00	2.16E-02	1.87E-03	1.38E-02	1.75E-03	8.39E-03	0.00E+00	1.68E-01	1.58E-02
American Robin	C	0.00E+00	6.56E+00	1.50E-04	1.92E-04	3.85E-04	0.00E+00	5.84E-01	4.79E-05	0.00E+00	1.50E-05	0.00E+00	1.89E-06	0.00E+00	3.55E-02	0.00E+00
Common Shrew	C	0.00E+00	9.00E+00	1.09E-05	3.13E-04	6.29E-04	0.00E+00	1.14E+00	8.08E-03	0.00E+00	2.55E-03	0.00E+00	3.05E-04	0.00E+00	8.52E-02	0.00E+00
Eastern Cottontail	C	0.00E+00	1.29E+01	7.03E-05	2.11E-04	3.51E-04	2.64E-05	1.14E+00	5.59E-02	4.03E-06	1.76E-02	2.60E-07	1.93E-03	0.00E+00	8.52E-02	0.00E+00
Meadow Vole	C	0.00E+00	1.29E+01	2.78E-05	8.39E-05	1.36E-04	4.51E-06	1.14E+00	2.23E-02	1.61E-06	7.02E-03	1.02E-07	8.01E-04	0.00E+00	8.52E-02	0.00E+00
Raccoon	C	0.00E+00	1.29E+01	2.82E-05	2.23E-04	4.35E-04	0.00E+00	1.14E+00	2.19E-02	0.00E+00	6.89E-03	0.00E+00	7.91E-04	0.00E+00	8.52E-02	0.00E+00
Red Fox	C	0.00E+00	1.29E+01	4.61E-06	4.73E-05	8.09E-05	0.00E+00	1.14E+00	6.14E-03	0.00E+00	1.95E-03	0.00E+00	2.57E-04	0.00E+00	8.52E-02	0.00E+00
Short-tailed Weasel	C	0.00E+00	1.29E+01	9.49E-07	4.61E-05	8.46E-05	0.00E+00	1.01E+00	3.67E-03	0.00E+00	1.18E-03	0.00E+00	1.71E-04	0.00E+00	6.21E-02	0.00E+00
Song Sparrow	C	0.00E+00	1.19E+01	1.83E-04	2.35E-04	4.30E-04	0.00E+00	9.35E-01	5.16E-05	0.00E+00	1.60E-05	0.00E+00	2.14E-06	0.00E+00	5.68E-02	0.00E+00
White-tailed Deer	C	0.00E+00	1.29E+01	9.64E-05	2.91E-04	4.71E-04	1.40E-05	1.15E+00	7.74E-02	5.55E-06	2.43E-02	3.37E-07	2.67E-03	0.00E+00	7.93E-02	0.00E+00
Yellow Warbler	C	0.00E+00	5.60E+00	1.88E-04	2.78E-04	5.64E-04	0.00E+00	5.84E-01	7.52E-05	0.00E+00	2.37E-05	0.00E+00	2.81E-06	0.00E+00	3.55E-02	0.00E+00
Aquatic Plants	Dragonfly Pond	0.00E+00	9.89E+00	4.88E-04	3.61E-05	5.56E-05	0.00E+00	2.99E+00	4.54E-03	0.00E+00	2.81E-03	0.00E+00	1.72E-03	0.00E+00	4.39E-01	0.00E+00
Frogs	Dragonfly Pond	0.00E+00	9.56E+00	3.34E-05	5.74E-04	8.84E-04	0.00E+00	2.99E+00	3.83E-04	0.00E+00	2.37E-04	0.00E+00	1.45E-04	0.00E+00	5.59E-01	0.00E+00
Turtles	Dragonfly Pond	0.00E+00	9.56E+00	3.34E-05	5.74E-04	8.84E-04	0.00E+00	2.99E+00	3.83E-04	0.00E+00	2.37E-04	0.00E+00	1.45E-04	0.00E+00	5.59E-01	0.00E+00
Aquatic Plants	Polliwog Pond	0.00E+00	9.89E+00	4.88E-04	3.61E-05	5.56E-05	0.00E+00	2.99E+00	4.54E-03	0.00E+00	2.81E-03	0.00E+00	1.72E-03	0.00E+00	4.39E-01	0.00E+00
Frogs	Polliwog Pond	0.00E+00	9.56E+00	3.34E-05	5.74E-04	8.84E-04	0.00E+00	2.99E+00	3.83E-04	0.00E+00	2.37E-04	0.00E+00	1.45E-04	0.00E+00	5.59E-01	0.00E+00
Turtles	Polliwog Pond	0.00E+00	9.56E+00	3.34E-05	5.74E-04	8.84E-04	0.00E+00	2.99E+00	3.83E-04	0.00E+00	2.37E-04	0.00E+00	1.45E-04	0.00E+00	5.59E-01	0.00E+00
Aquatic Plants	Treefrog Pond	0.00E+00	9.89E+00	4.88E-04	3.61E-05	5.56E-05	0.00E+00	2.99E+00	4.54E-03	0.00E+00	2.81E-03	0.00E+00	1.72E-03	0.00E+00	4.39E-01	0.00E+00
Frogs	Treefrog Pond	0.00E+00	9.56E+00	3.34E-05	5.74E-04	8.84E-04	0.00E+00	2.99E+00	3.83E-04	0.00E+00	2.37E-04	0.00E+00	1.45E-04	0.00E+00	5.59E-01	0.00E+00
Turtles	Treefrog Pond	0.00E+00	9.56E+00	3.34E-05	5.74E-04	8.84E-04	0.00E+00	2.99E+00	3.83E-04	0.00E+00	2.37E-04	0.00E+00	1.45E-04	0.00E+00	5.59E-01	0.00E+00
Grass	D	3.24E-08	7.83E+00	3.62E-03	2.15E-04	3.39E-04	1.64E-01	1.97E+00	2.58E-01	2.33E-02	1.66E-01	2.32E-02	1.01E-01	0.00E+00	1.93E-01	9.51E-03
Sugar Maple	D	3.24E-09	7.83E+00	3.87E-04	2.15E-04	3.39E-04	1.64E-01	1.97E+00	2.58E-02	2.33E-03	1.66E-02	2.32E-03	1.01E-02	0.00E+00	1.93E-01	9.51E-03
Earthworm	D	3.24E-09	6.58E+00	3.77E-04	2.21E-04	4.15E-04	1.64E-01	2.05E+00	2.59E-02	2.33E-03	1.66E-02	2.32E-03	1.02E-02	0.00E+00	2.05E-01	9.51E-03
American Robin	D	0.00E+00	8.04E+00	1.34E-04	1.81E-04	3.42E-04	0.00E+00	8.83E-01	5.73E-05	0.00E+00	1.81E-05	0.00E+00	2.30E-06	0.00E+00	6.19E-02	0.00E+00
Common Shrew	D	0.00E+00	1.10E+01	1.01E-05	2.95E-04	5.59E-04	0.00E+00	2.03E+00	9.66E-03	0.00E+00	3.06E-03	0.00E+00	3.71E-04	0.00E+00	1.80E-01	0.00E+00
Eastern Cottontail	D	0.00E+00	1.57E+01	6.65E-05	2.00E-04	3.26E-04	5.08E-05	2.03E+00	6.69E-02	5.28E-06	2.11E-02	6.09E-07	2.35E-03	0.00E+00	1.80E-01	0.00E+00
Meadow Vole	D	0.00E+00	1.57E+01	2.64E-05	7.97E-05	1.27E-04	2.41E-05	2.03E+00	2.67E-02	2.15E-06	8.43E-03	2.90E-07	9.73E-04	0.00E+00	1.80E-01	0.00E+00
Raccoon	D	0.00E+00	1.57E+01	1.72E-05	2.11E-04	3.89E-04	0.00E+00	2.17E+00	1.69E-02	0.00E+00	5.34E-03	0.00E+00	6.42E-04	0.00E+00	1.80E-01	0.00E+00
Red Fox	D	0.00E+00	1.57E+01	4.31E-06	4.48E-05	7.39E-05	0.00E+00	2.17E+00	7.34E-03	0.00E+00	2.34E-03	0.00E+00	3.14E-04	0.00E+00	1.80E-01	0.00E+00
Short-tailed Weasel	D	0.00E+00	1.57E+01	7.42E-07	4.36E-05	7.62E-05	0.00E+00	2.17E+00	4.40E-03	0.00E+00	1.41E-03	0.00E+00	2.09E-04	0.00E+00	1.58E-01	0.00E+00
Song Sparrow	D	0.00E+00	1.46E+01	1.64E-04	2.22E-04	3.90E-04	0.00E+00	1.41E+00	6.17E-05	0.00E+00	1.93E-05	0.00E+00	2.62E-06	0.00E+00	9.90E-02	0.00E+00
White-tailed Deer	D	0.00E+00	1.57E+01	5.07E-05	2.77E-04	4.40E-04	8.04E-05	1.92E+00	5.09E-02	4.52E-06	1.61E-02	9.65E-07	1.81E-03	0.00E+00	1.57E-01	0.00E+00
Yellow Warbler	D	0.00E+00	6.86E+00	1.72E-04	2.62E-04	5.00E-04	0.00E+00	8.83E-01	9.00E-05	0.00E+00	2.85E-05	0.00E+00	3.42E-06	0.00E+00	6.19E-02	0.00E+00

Ecological Receptors	Location	Estimated Concentrations of Radionuclides in the Tissue of Ecological Receptors (Bq/kg(fw))														
		Ba-137md	C-14	Co-60	Cs-134	Cs-137	Cs-138d	HTO	I-131	I-132	I-133	I-134	I-135	Kr-85	OBT	Rb-88d
Grass	E	5.83E-08	1.84E+01	8.64E-03	5.12E-04	8.07E-04	2.24E-01	4.63E+00	6.06E-01	5.60E-02	3.90E-01	5.80E-02	2.40E-01	0.00E+00	4.54E-01	1.20E-02
Sugar Maple	E	5.83E-09	1.84E+01	9.24E-04	5.12E-04	8.07E-04	2.24E-01	4.63E+00	6.06E-02	5.60E-03	3.90E-02	5.80E-03	2.40E-02	0.00E+00	4.54E-01	1.20E-02
Earthworm	E	5.83E-09	1.54E+01	9.00E-04	5.26E-04	9.94E-04	2.25E-01	4.80E+00	6.08E-02	5.62E-03	3.91E-02	5.81E-03	2.41E-02	0.00E+00	4.82E-01	1.20E-02
American Robin	E	0.00E+00	1.89E+01	3.20E-04	4.31E-04	8.19E-04	0.00E+00	1.35E+00	1.35E-04	0.00E+00	4.25E-05	0.00E+00	5.43E-06	0.00E+00	6.59E-02	0.00E+00
Bank Swallow	E	0.00E+00	1.57E+01	4.07E-04	6.21E-04	1.19E-03	0.00E+00	1.35E+00	2.12E-04	0.00E+00	6.72E-05	0.00E+00	8.08E-06	0.00E+00	6.59E-02	0.00E+00
Common Shrew	E	0.00E+00	2.59E+01	2.42E-05	7.03E-04	1.34E-03	0.00E+00	2.05E+00	2.27E-02	0.00E+00	7.21E-03	0.00E+00	8.77E-04	0.00E+00	9.73E-02	0.00E+00
Eastern Cottontail	E	0.00E+00	3.70E+01	1.59E-04	4.78E-04	7.78E-04	1.77E-05	2.05E+00	1.57E-01	1.16E-05	4.97E-02	3.80E-07	5.56E-03	0.00E+00	9.73E-02	0.00E+00
Meadow Vole	E	0.00E+00	3.70E+01	6.28E-05	1.90E-04	3.03E-04	2.56E-06	2.05E+00	6.27E-02	4.54E-06	1.99E-02	5.50E-08	2.30E-03	0.00E+00	9.73E-02	0.00E+00
Raccoon	E	0.00E+00	3.70E+01	4.11E-05	5.03E-04	9.31E-04	0.00E+00	2.05E+00	3.96E-02	0.00E+00	1.26E-02	0.00E+00	1.52E-03	0.00E+00	9.74E-02	0.00E+00
Red Fox	E	0.00E+00	3.70E+01	1.03E-05	1.07E-04	1.76E-04	0.00E+00	2.05E+00	1.72E-02	0.00E+00	5.51E-03	0.00E+00	7.38E-04	0.00E+00	9.73E-02	0.00E+00
Short-tailed Weasel	E	0.00E+00	3.70E+01	1.79E-06	1.04E-04	1.82E-04	0.00E+00	1.07E+00	1.03E-02	0.00E+00	3.32E-03	0.00E+00	4.92E-04	0.00E+00	1.72E-02	0.00E+00
Song Sparrow	E	0.00E+00	3.42E+01	3.92E-04	5.30E-04	9.33E-04	0.00E+00	2.16E+00	1.45E-04	0.00E+00	4.53E-05	0.00E+00	6.15E-06	0.00E+00	1.05E-01	0.00E+00
White-tailed Deer	E	0.00E+00	3.70E+01	1.21E-04	6.59E-04	1.05E-03	7.78E-06	2.33E+00	1.20E-01	8.72E-06	3.78E-02	1.67E-07	4.29E-03	0.00E+00	1.10E-01	0.00E+00
Yellow Warbler	E	0.00E+00	1.61E+01	4.12E-04	6.25E-04	1.20E-03	0.00E+00	1.35E+00	2.11E-04	0.00E+00	6.70E-05	0.00E+00	8.08E-06	0.00E+00	6.59E-02	0.00E+00
Grass	F (SMR)	1.09E-07	8.08E+01	2.72E-02	1.62E-03	2.51E-03	3.46E-01	2.03E+01	2.60E+00	2.43E-01	1.67E+00	2.56E-01	1.03E+00	0.00E+00	1.99E+00	1.79E-02
Sugar Maple	F (SMR)	1.09E-08	8.08E+01	2.80E-03	1.62E-03	2.51E-03	3.46E-01	2.03E+01	2.60E-01	2.43E-02	1.67E-01	2.56E-02	1.03E-01	0.00E+00	1.99E+00	1.79E-02
Earthworm	F (SMR)	1.09E-08	6.78E+01	2.77E-03	1.64E-03	2.78E-03	3.46E-01	2.11E+01	2.61E-01	2.44E-02	1.68E-01	2.57E-02	1.04E-01	0.00E+00	2.12E+00	1.79E-02
American Robin	F (SMR)	0.00E+00	8.29E+01	8.97E-04	1.34E-03	2.29E-03	0.00E+00	5.94E+00	5.77E-04	0.00E+00	1.83E-04	0.00E+00	2.34E-05	0.00E+00	2.90E-01	0.00E+00
Bank Swallow	F (SMR)	0.00E+00	6.90E+01	1.21E-03	1.93E-03	3.30E-03	0.00E+00	5.94E+00	9.08E-04	0.00E+00	2.88E-04	0.00E+00	3.49E-05	0.00E+00	2.90E-01	0.00E+00
Common Shrew	F (SMR)	0.00E+00	1.14E+02	7.34E-05	2.18E-03	3.73E-03	0.00E+00	9.00E+00	9.73E-02	0.00E+00	3.09E-02	0.00E+00	3.79E-03	0.00E+00	4.27E-01	0.00E+00
Eastern Cottontail	F (SMR)	0.00E+00	1.62E+02	4.96E-04	1.50E-03	2.37E-03	1.24E-05	9.00E+00	6.74E-01	5.04E-05	2.13E-01	1.69E-06	2.39E-02	0.00E+00	4.27E-01	0.00E+00
Meadow Vole	F (SMR)	0.00E+00	1.62E+02	1.97E-04	5.99E-04	9.35E-04	1.80E-06	9.00E+00	2.69E-01	1.97E-05	8.53E-02	2.44E-07	9.93E-03	0.00E+00	4.27E-01	0.00E+00
Raccoon	F (SMR)	0.00E+00	1.62E+02	1.24E-04	1.57E-03	2.63E-03	0.00E+00	9.01E+00	1.70E-01	0.00E+00	5.39E-02	0.00E+00	6.54E-03	0.00E+00	4.28E-01	0.00E+00
Red Fox	F (SMR)	0.00E+00	1.62E+02	3.18E-05	3.36E-04	5.32E-04	0.00E+00	9.00E+00	7.39E-02	0.00E+00	2.37E-02	0.00E+00	3.19E-03	0.00E+00	4.27E-01	0.00E+00
Short-tailed Weasel	F (SMR)	0.00E+00	1.62E+02	3.84E-06	3.25E-04	5.31E-04	0.00E+00	4.70E+00	4.42E-02	0.00E+00	1.43E-02	0.00E+00	2.13E-03	0.00E+00	7.58E-02	0.00E+00
Song Sparrow	F (SMR)	0.00E+00	1.50E+02	1.11E-03	1.66E-03	2.72E-03	0.00E+00	9.51E+00	6.21E-04	0.00E+00	1.95E-04	0.00E+00	2.66E-05	0.00E+00	4.63E-01	0.00E+00
White-tailed Deer	F (SMR)	0.00E+00	1.62E+02	3.78E-04	2.08E-03	3.24E-03	5.45E-06	1.02E+01	5.13E-01	3.78E-05	1.62E-01	7.42E-07	1.85E-02	0.00E+00	4.83E-01	0.00E+00
Yellow Warbler	F (SMR)	0.00E+00	7.08E+01	1.22E-03	1.94E-03	3.32E-03	0.00E+00	5.94E+00	9.06E-04	0.00E+00	2.88E-04	0.00E+00	3.48E-05	0.00E+00	2.90E-01	0.00E+00

Note:
The estimated concentrations of noble gases in the tissue of ecological receptors are zero, which are not shown in the above table.

Table D-3: Estimated Radiation Dose for Ecological Receptors under an Air Release Scenario

Ecological Receptors	Location	Estimated Radiation Dose for Ecological Receptors (mGy/d)																									
		C-14	Co-60	Cs-134	Cs-137	HTO	I-131	I-132	I-133	I-134	I-135	Kr-85	Kr-85m	Kr-87	Kr-88	OBT	Xe-131md	Xe-133	Xe-133dd	Xe-133md	Xe-135	Xe-135d	Xe-135dd	Xe-135m	Xe-135md	Xe-138	Total Dose
Benthic Invertebrates	Lake Ontario	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Alewife		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Lake Trout		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
American Eel		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Round Whitefish		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
White Sucker		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Bufflehead		0.00E+00	2.08E-12	1.19E-13	1.53E-13	3.78E-09	1.94E-13	0.00E+00	1.77E-12	0.00E+00	6.24E-12	8.71E-08	2.04E-09	4.71E-08	1.26E-07	4.16E-10	7.68E-16	1.35E-08	7.33E-17	2.04E-14	8.72E-08	1.15E-09	5.92E-12	8.21E-08	5.07E-11	1.39E-06	1.84E-06
Mallard		0.00E+00	2.19E-12	1.25E-13	1.61E-13	3.78E-09	2.04E-13	0.00E+00	1.87E-12	0.00E+00	6.56E-12	8.71E-08	2.04E-09	4.71E-08	1.26E-07	4.16E-10	7.68E-16	1.35E-08	7.33E-17	2.04E-14	8.72E-08	1.15E-09	5.92E-12	8.21E-08	5.07E-11	1.39E-06	1.84E-06
Aquatic Plants	Coot's Pond	5.38E-06	7.21E-08	2.71E-09	1.77E-09	7.14E-08	3.01E-08	7.62E-08	3.37E-08	1.36E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.86E-08	7.14E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.19E-06
Benthic Invertebrates		5.05E-06	2.79E-07	1.08E-08	6.74E-09	3.32E-07	2.67E-07	1.35E-07	3.21E-07	1.38E-07	5.18E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.20E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.12E-06
Dace		5.20E-06	6.46E-08	6.71E-09	7.35E-09	3.31E-07	5.43E-08	2.64E-08	5.40E-08	2.67E-08	1.01E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.18E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.94E-06
Frogs		5.20E-06	7.06E-08	4.74E-09	5.93E-09	3.31E-07	6.33E-08	3.11E-08	6.78E-08	2.97E-08	1.11E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.18E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.98E-06
Turtles		5.20E-06	7.06E-08	4.74E-09	5.93E-09	3.31E-07	6.33E-08	3.11E-08	6.78E-08	2.67E-08	1.01E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.18E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.97E-06
Grass	AB	4.26E-06	5.18E-07	8.98E-09	4.47E-08	2.18E-07	5.64E-07	1.17E-07	7.14E-07	6.62E-08	4.83E-07	4.73E-08	1.56E-09	4.07E-08	1.23E-07	2.14E-12	9.30E-16	6.50E-09	5.87E-17	2.50E-14	4.86E-08	7.65E-10	4.41E-12	5.49E-08	5.04E-11	1.05E-06	8.37E-06
Earthworm		3.58E-06	1.42E-07	2.87E-09	1.28E-08	2.27E-07	6.01E-08	1.27E-08	7.29E-08	5.88E-09	4.87E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.27E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.19E-06
American Robin		4.37E-06	1.08E-07	2.81E-09	1.03E-08	9.78E-08	2.11E-09	7.28E-10	1.63E-09	3.59E-10	1.32E-09	9.72E-08	2.24E-09	5.00E-08	1.37E-07	6.85E-09	1.13E-15	1.51E-08	1.36E-16	3.00E-14	9.66E-08	1.52E-09	8.75E-12	7.32E-08	6.72E-11	1.22E-06	6.29E-06
Bank Swallow		3.64E-06	5.46E-08	2.42E-09	6.96E-09	9.78E-08	1.23E-09	3.64E-10	9.24E-10	1.79E-10	6.82E-10	9.72E-08	2.24E-09	5.00E-08	1.37E-07	6.85E-09	1.13E-15	1.51E-08	1.36E-16	3.00E-14	9.66E-08	1.52E-09	8.75E-12	7.32E-08	6.72E-11	1.22E-06	5.50E-06
Bufflehead		5.25E-06	3.76E-08	1.57E-09	9.44E-10	1.36E-07	3.35E-08	1.60E-08	3.26E-08	7.88E-09	2.82E-08	4.86E-08	1.12E-09	2.50E-08	6.87E-08	9.29E-09	5.66E-16	7.53E-09	6.79E-17	1.50E-14	4.83E-08	7.60E-10	4.38E-12	3.66E-08	3.36E-11	6.07E-07	6.40E-06
Common Shrew		6.00E-06	2.26E-07	4.83E-09	2.05E-08	2.24E-07	2.89E-08	1.54E-09	1.90E-08	7.30E-10	6.95E-09	1.15E-08	1.03E-09	1.18E-08	6.91E-08	1.99E-08	4.31E-16	1.49E-09	1.34E-17	1.18E-14	1.11E-08	1.74E-10	1.00E-12	3.88E-08	3.56E-11	6.72E-07	7.37E-06
Eastern Cottontail		8.57E-06	2.26E-07	4.39E-09	1.93E-08	2.24E-07	1.76E-07	1.58E-09	1.12E-07	7.36E-10	3.01E-08	1.15E-08	1.03E-09	1.18E-08	6.91E-08	1.99E-08	4.31E-16	1.49E-09	1.34E-17	1.18E-14	1.11E-08	1.74E-10	1.00E-12	3.88E-08	3.56E-11	6.72E-07	1.02E-05
Green Heron		5.21E-06	3.76E-08	4.49E-09	4.77E-09	1.36E-07	3.35E-08	1.60E-08	3.26E-08	7.88E-09	2.82E-08	4.86E-08	1.12E-09	2.50E-08	6.87E-08	3.97E-09	5.66E-16	7.53E-09	6.79E-17	1.50E-14	4.83E-08	7.60E-10	4.38E-12	3.66E-08	3.36E-11	6.07E-07	6.36E-06
Mallard AB		5.25E-06	3.80E-08	1.61E-09	1.00E-09	1.36E-07	3.35E-08	1.60E-08	3.27E-08	7.88E-09	2.82E-08	4.86E-08	1.12E-09	2.50E-08	6.87E-08	9.29E-09	5.66E-16	7.53E-09	6.79E-17	1.50E-14	4.83E-08	7.60E-10	4.38E-12	3.66E-08	3.36E-11	6.07E-07	6.40E-06
Meadow Vole		8.57E-06	2.26E-07	3.83E-09	1.83E-08	2.24E-07	7.26E-08	1.56E-09	4.68E-08	7.33E-10	1.40E-08	1.15E-08	1.03E-09	1.18E-08	6.91E-08	1.99E-08	4.31E-16	1.49E-09	1.34E-17	1.18E-14	1.11E-08	1.74E-10	1.00E-12	3.88E-08	3.56E-11	6.72E-07	1.00E-05
Muskrat		8.66E-06	1.58E-07	6.10E-09	3.77E-09	2.82E-07	1.48E-07	6.76E-08	1.42E-07	3.21E-08	1.22E-07	1.15E-08	1.03E-09	1.18E-08	6.91E-08	1.57E-08	4.31E-16	1.49E-09	1.34E-17	1.18E-14	1.11E-08	1.74E-10	1.00E-12	3.88E-08	3.56E-11	6.72E-07	1.04E-05
Raccoon Poly AB		8.57E-06	2.26E-07	4.28E-09	1.93E-08	2.82E-07	6.53E-08	1.54E-09	4.22E-08	7.30E-10	1.30E-08	1.15E-08	1.03E-09	1.18E-08	6.91E-08	2.35E-08	4.31E-16	1.49E-09	1.34E-17	1.18E-14	1.11E-08	1.74E-10	1.00E-12	3.88E-08	3.56E-11	6.72E-07	1.01E-05
Red Fox AB		8.57E-06	1.84E-07	3.02E-09	1.57E-08	2.24E-07	1.93E-08	1.30E-09	1.30E-08	7.66E-10	5.90E-09	1.15E-08	1.03E-09	1.18E-08	6.91E-08	1.99E-08	4.31E-16	1.49E-09	1.34E-17	1.18E-14	1.11E-08	1.74E-10	1.00E-12	3.88E-08	3.56E-11	6.72E-07	9.87E-06
Short-tailed Weasel		8.57E-06	2.26E-07	3.67E-09	1.81E-08	2.40E-07	1.54E-08	1.54E-09	1.05E-08	7.30E-10	5.05E-09	1.15E-08	1.03E-09	1.18E-08	6.91E-08	1.75E-08	4.31E-16	1.49E-09	1.34E-17	1.18E-14	1.11E-08	1.74E-10	1.00E-12	3.88E-08	3.56E-11	6.72E-07	9.93E-06
Song Sparrow		7.93E-06	1.72E-07	4.09E-09	1.56E-08	1.56E-07	3.29E-09	1.16E-09	2.55E-09	5.74E-10	2.10E-09	1.55E-07	3.58E-09	8.00E-08	2.20E-07	1.10E-08	1.81E-15	2.41E-08	2.17E-16	4.79E-14	1.55E-07	2.43E-09	1.40E-11	1.17E-07	1.07E-10	1.94E-06	1.10E-05
White-tailed Deer		8.57E-06	1.17E-07	6.38E-09	1.28E-08	2.12E-07	4.61E-07	9.06E-10	2.65E-07	4.89E-10	3.97E-08	1.03E-09	3.96E-10	1.20E-09	2.64E-08	1.74E-08	5.51E-17	0.00E+00	0.00E+00	1.50E-15	1.61E-09	2.53E-11	1.46E-13	1.75E-08	1.60E-11	3.35E-07	1.01E-05
Yellow Warbler		3.73E-06	5.46E-08	2.43E-09	6.97E-09	9.78E-08	1.23E-09	3.64E-10	9.23E-10	1.79E-10	6.82E-10	1.66E-11	3.95E-13	6.08E-12	7.57E-12	6.85E-09	2.31E-18	4.40E-12	3.97E-20	8.13E-17	2.14E-11	3.36E-13	1.94E-15	7.47E-12	6.86E-15	4.60E-11	3.91E-06
Grass	C	4.35E-06	4.62E-07	8.04E-09	3.99E-08	2.23E-07	5.70E-07	1.21E-07	7.24E-07	7.15E-08	4.93E-07	4.83E-08	1.61E-09	4.34E-08	1.28E-07	2.18E-12	7.27E-16	6.64E-09	3.41E-17	1.96E-14	4.99E-08	6.78E-10	3.43E-12	6.77E-08	4.48E-11	1.30E-06	8.71E-06
Earthworm		3.65E-06	1.27E-07	2.59E-09	1.14E-08	2.31E-07	6.08E-08	1.32E-08	7.39E-08	6.35E-09	4.97E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.32E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.25E-06
American Robin		4.46E-06	9.61E-08	2.56E-09	9.29E-09	8.08E-08	2.14E-09	7.57E-10	1.66E-09	3.88E-10	1.35E-09	9.91E-08	2.31E-09	5.34E-08	1.43E-07	4.90E-09	8.84E-16	1.54E-08	7.89E-17	2.35E-14	9.92E-08	1.35E-09	6.82E-12	9.02E-08	5.97E-11	1.51E-06	6.68E-06
Common Shrew		6.12E-06	2.01E-07	4.37E-09	1.84E-08	1.58E-07	2.93E-08	1.60E-09	1.93E-08	7.90E-10	7.10E-09	1.17E-08	1.06E-09	1.26E-08	7.20E-08	1.18E-08	3.37E-16	1.52E-09	7.78E-18	9.25E-15	1.14E-08	1.54E-10	7.81E-13	4.78E-08	3.17E-11	8.37E-07	7.57E-06
Eastern Cottontail		8.74E-06	2.01E-07	3.96E-09	1.72E-08	1.58E-07	1.78E-07	1.64E-09	1.14E-07	7.94E-10	3.07E-08	1.17E-08	1.06E-09	1.26E-08	7.20E-08	1.18E-08	3.37E-16	1.52E-09	7.78E-18	9.25E-15	1.14E-08	1.54E-10	7.81E-13	4.78E-08	3.17E-11	8.37E-07	1.05E-05
Meadow Vole		8.74E-06	2.01E-07	3.44E-09	1.64E-08	1.58E-07	7.34E-08	1.62E-09	4.75E-08	7.91E-10	1.43E-08	1.17E-08	1.06E-09	1.26E-08	7.20E-08	1.18E-08	3.37E-16	1.52E-09	7.78E-18	9.25E-15	1.14E-08	1.54E-10	7.81E-13	4.78E-08	3.17E-11	8.37E-07	1.03E-05
Raccoon		8.74E-06	2.01E-07	4.01E-09	1.76E-08	1.58E-07	7.21E-08	1.60E-09	4.66E-08	7.90E-10	1.41E-08	1.17E-08	1.06E-09	1.26E-08	7.20E-08	1.18E-08	3.37E-16	1.52E-09	7.78E-18	9.25E-15	1.14E-08	1.54E-10	7.81E-13	4.78E-08	3.17E-11	8.37E-07	1.03E-05
Red Fox		8.74E-06	1.64E-07	2.75E-09	1.41E-08	1.58E-07	2.27E-08	1.35E-09	1.52E-08	8.29E-10	6.54E-09	1.17E-08	1.06E-09	1.26E-08	7.20E-08	1.18E-08	3.37E-16	1.52E-09	7.78E-18	9.25E-15	1.14E-08	1.54E-10	7.81E-13	4.78E-08	3.17E-11	8.37E-07	1.01E-05
Short-tailed Weasel		8.74E-06	2.01E-07	3.28E-09	1.62E-08	1.40E-07	1.56E-08	1.60E-09	1.06E-08	7.90E-10	5.16E-09	1.17E-08	1.06E-09	1.26E-08	7.20E-08	8.58E-09	3.37E-16	1.52E-09	7.78E-18	9.25E-15	1.14E-08	1.54E-10	7.81E-13	4.78E-08	3.17E-11	8.37E-07	1.01E-05
Song Sparrow		8.08E-06	1.53E-07	3.72E-09	1.40E-08	1.29E-07	3.33E-09	1.21E-09	2.59E-09	6.21E-10	2.14E-09	1.59E-07	3.70E-09	8.55E-08	2.29E-07	7.85E-09	1.41E-15	2.46E-08	1.26E-16	3.75E-14	1.59E-07	2.16E-09	1.09E-11	1.44E-07	9.55E-11	2.42E-06	1.16E-05
White-tailed Deer		8.74E-06	1.05E-07	5.94E-09	1.16E-08	1.59E-07	4.66E-07	9.31E-10	2.69E-07	5.23E-10	4.05E-08	1.06E-09	4.10E-10	1.28E-09	2.75E-08	1.10E-08	4.31E-17	0.00E+00	0.00E+00	1.18E-15	1.65E-09	2.24E-11	1.14E-13	2.15E-08	1.42E-11	4.17E-07	1.03E-05
Yellow Warbler		3.81E-06	4.87E-08	2.25E-09	6.32E-09	8.08E-08	1.24E-09	3.78E-10	9.38E-10	1.94E-10	6.97E-10	1.69E-11	4.09E-13	6.50E-12	7.89E-12	4.90E-09	1.80E-18	4.49E-12	2.31E-20	6.36E-17	2.19E-11	2.98E-13	1.51E-15	9.21E-12	6.09E-15	5.73E-11	3.96E-06

Ecological Receptors	Location	Estimated Radiation Dose for Ecological Receptors (mGy/d)																									
		C-14	Co-60	Cs-134	Cs-137	HTO	I-131	I-132	I-133	I-134	I-135	Kr-85	Kr-85m	Kr-87	Kr-88	OBT	Xe-131md	Xe-133	Xe-133dd	Xe-133md	Xe-135	Xe-135d	Xe-135dd	Xe-135m	Xe-135md	Xe-138	Total Dose
Aquatic Plants	Dragonfly Pond	6.73E-06	4.62E-08	1.74E-09	1.13E-09	4.14E-07	8.70E-08	3.92E-08	9.34E-08	4.86E-08	1.70E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.07E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.69E-06
Frogs		6.50E-06	4.52E-08	3.04E-09	3.80E-09	4.14E-07	7.71E-08	4.04E-08	8.31E-08	4.28E-08	1.39E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.72E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.42E-06
Turtles		6.50E-06	4.52E-08	3.04E-09	3.80E-09	4.14E-07	7.71E-08	4.04E-08	8.31E-08	3.85E-08	1.26E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.72E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.41E-06
Aquatic Plants	Polliwog Pond	6.73E-06	4.62E-08	1.74E-09	1.13E-09	4.14E-07	8.70E-08	3.92E-08	9.34E-08	4.86E-08	1.70E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.07E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.69E-06
Frogs		6.50E-06	4.52E-08	3.04E-09	3.80E-09	4.14E-07	7.71E-08	4.04E-08	8.31E-08	4.28E-08	1.39E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.72E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.42E-06
Turtles		6.50E-06	4.52E-08	3.04E-09	3.80E-09	4.14E-07	7.71E-08	4.04E-08	8.31E-08	3.85E-08	1.26E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.72E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.41E-06
Aquatic Plants	Treefrog Pond	6.73E-06	4.62E-08	1.74E-09	1.13E-09	4.14E-07	8.70E-08	3.92E-08	9.34E-08	4.86E-08	1.70E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.07E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.69E-06
Frogs		6.50E-06	4.52E-08	3.04E-09	3.80E-09	4.14E-07	7.71E-08	4.04E-08	8.31E-08	4.28E-08	1.39E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.72E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.42E-06
Turtles		6.50E-06	4.52E-08	3.04E-09	3.80E-09	4.14E-07	7.71E-08	4.04E-08	8.31E-08	3.85E-08	1.26E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.72E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.41E-06
Grass	D	5.33E-06	3.34E-07	5.91E-09	2.89E-08	2.73E-07	6.82E-07	1.51E-07	8.70E-07	9.48E-08	5.98E-07	5.91E-08	2.01E-09	5.72E-08	1.62E-07	2.67E-12	4.76E-16	8.13E-09	1.27E-17	1.29E-14	6.18E-08	5.28E-10	2.23E-12	1.16E-07	3.50E-11	2.30E-06	1.11E-05
Sugar Maple		5.33E-06	1.06E-07	4.60E-09	1.05E-08	2.73E-07	1.56E-07	5.73E-08	1.68E-07	1.02E-08	6.20E-08	1.29E-09	5.12E-10	1.68E-09	3.48E-08	2.67E-08	2.82E-17	0.00E+00	0.00E+00	7.72E-16	2.04E-09	1.75E-11	7.36E-14	3.70E-08	1.11E-11	7.37E-07	7.02E-06
Earthworm		4.47E-06	9.15E-08	2.00E-09	8.51E-09	2.83E-07	7.27E-08	1.64E-08	8.88E-08	8.43E-09	6.03E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.84E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.13E-06
American Robin		5.47E-06	6.93E-08	2.07E-09	6.97E-09	1.22E-07	2.57E-09	9.46E-10	2.00E-09	5.17E-10	1.64E-09	1.21E-07	2.89E-09	7.04E-08	1.81E-07	8.56E-09	5.79E-16	1.88E-08	2.94E-17	1.54E-14	1.23E-07	1.05E-09	4.42E-12	1.55E-07	4.66E-11	2.68E-06	9.03E-06
Common Shrew		7.49E-06	1.45E-07	3.43E-09	1.37E-08	2.80E-07	3.50E-08	2.00E-09	2.32E-08	1.05E-09	8.64E-09	1.44E-08	1.33E-09	1.66E-08	9.11E-08	2.49E-08	2.21E-16	1.86E-09	2.90E-18	6.07E-15	1.41E-08	1.20E-10	5.06E-13	8.23E-08	2.47E-11	1.48E-06	9.73E-06
Eastern Cottontail		1.07E-05	1.45E-07	3.04E-09	1.27E-08	2.80E-07	2.13E-07	2.05E-09	1.37E-07	1.06E-09	3.73E-08	1.44E-08	1.33E-09	1.66E-08	9.11E-08	2.49E-08	2.21E-16	1.86E-09	2.90E-18	6.07E-15	1.41E-08	1.20E-10	5.06E-13	8.23E-08	2.47E-11	1.48E-06	1.33E-05
Meadow Vole		1.07E-05	1.45E-07	2.55E-09	1.19E-08	2.80E-07	8.78E-08	2.02E-09	5.70E-08	1.06E-09	1.74E-08	1.44E-08	1.33E-09	1.66E-08	9.11E-08	2.49E-08	2.21E-16	1.86E-09	2.90E-18	6.07E-15	1.41E-08	1.20E-10	5.06E-13	8.23E-08	2.47E-11	1.48E-06	1.30E-05
Raccoon		1.07E-05	1.45E-07	3.09E-09	1.30E-08	3.00E-07	5.74E-08	2.00E-09	3.75E-08	1.05E-09	1.26E-08	1.44E-08	1.33E-09	1.66E-08	9.11E-08	2.49E-08	2.21E-16	1.86E-09	2.90E-18	6.07E-15	1.41E-08	1.20E-10	5.06E-13	8.23E-08	2.47E-11	1.48E-06	1.30E-05
Red Fox		1.07E-05	1.18E-07	2.02E-09	1.02E-08	3.00E-07	2.72E-08	1.68E-09	1.83E-08	1.11E-09	7.99E-09	1.44E-08	1.33E-09	1.66E-08	9.11E-08	2.49E-08	2.21E-16	1.86E-09	2.90E-18	6.07E-15	1.41E-08	1.20E-10	5.06E-13	8.23E-08	2.47E-11	1.48E-06	1.29E-05
Short-tailed Weasel		1.07E-05	1.45E-07	2.40E-09	1.17E-08	3.00E-07	1.87E-08	2.00E-09	1.28E-08	1.05E-09	6.30E-09	1.44E-08	1.33E-09	1.66E-08	9.11E-08	2.19E-08	2.21E-16	1.86E-09	2.90E-18	6.07E-15	1.41E-08	1.20E-10	5.06E-13	8.23E-08	2.47E-11	1.48E-06	1.29E-05
Song Sparrow		9.90E-06	1.11E-07	2.96E-09	1.04E-08	1.95E-07	4.00E-09	1.51E-09	3.13E-09	8.27E-10	2.61E-09	1.94E-07	4.63E-09	1.13E-07	2.90E-07	1.37E-08	9.27E-16	3.01E-08	4.70E-17	2.47E-14	1.96E-07	1.68E-09	7.07E-12	2.48E-07	7.46E-11	4.28E-06	1.56E-05
White-tailed Deer		1.07E-05	7.48E-08	5.28E-09	9.17E-09	2.65E-07	3.08E-07	1.10E-09	1.79E-07	7.05E-10	2.85E-08	1.29E-09	5.12E-10	1.68E-09	3.48E-08	2.18E-08	2.82E-17	0.00E+00	0.00E+00	7.72E-16	2.04E-09	1.75E-11	7.36E-14	3.70E-08	1.11E-11	7.37E-07	1.24E-05
Yellow Warbler		4.67E-06	3.52E-08	1.94E-09	4.97E-09	1.22E-07	1.49E-09	4.73E-10	1.13E-09	2.59E-10	8.49E-10	2.07E-11	5.11E-13	8.56E-12	9.98E-12	8.56E-09	1.18E-18	5.51E-12	8.60E-21	4.18E-17	2.71E-11	2.32E-13	9.77E-16	1.59E-11	4.76E-15	1.01E-10	4.84E-06
Grass	E	1.25E-05	8.13E-07	1.44E-08	7.05E-08	6.40E-07	1.60E-06	3.64E-07	2.05E-06	2.37E-07	1.42E-06	1.39E-07	4.78E-09	1.40E-07	3.87E-07	6.27E-12	5.27E-16	1.91E-08	6.65E-18	1.43E-14	1.46E-07	6.64E-10	2.44E-12	3.36E-07	4.40E-11	6.77E-06	2.76E-05
Sugar Maple		1.25E-05	2.58E-07	1.11E-08	2.54E-08	6.40E-07	3.66E-07	1.38E-07	3.97E-07	2.54E-08	1.47E-07	3.03E-09	1.22E-09	4.13E-09	8.33E-08	6.27E-08	3.12E-17	0.00E+00	0.00E+00	8.57E-16	4.83E-09	2.20E-11	8.07E-14	1.07E-07	1.40E-11	2.16E-06	1.69E-05
Earthworm		1.05E-05	2.23E-07	4.84E-09	2.07E-08	6.64E-07	1.71E-07	3.95E-08	2.09E-07	2.11E-08	1.43E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.66E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.21E-05
American Robin		1.28E-05	1.69E-07	4.99E-09	1.69E-08	1.87E-07	6.03E-09	2.28E-09	4.70E-09	1.29E-09	3.89E-09	2.85E-07	6.88E-09	1.72E-07	4.33E-07	9.11E-09	6.42E-16	4.42E-08	1.54E-17	1.71E-14	2.90E-07	1.32E-09	4.85E-12	4.48E-07	5.86E-11	7.86E-06	2.28E-05
Bank Swallow		1.07E-05	8.58E-08	4.64E-09	1.20E-08	1.87E-07	3.50E-09	1.14E-09	2.66E-09	6.47E-10	2.01E-09	2.85E-07	6.88E-09	1.72E-07	4.33E-07	9.11E-09	6.42E-16	4.42E-08	1.54E-17	1.71E-14	2.90E-07	1.32E-09	4.85E-12	4.48E-07	5.86E-11	7.86E-06	2.05E-05
Common Shrew		1.76E-05	3.53E-07	8.30E-09	3.32E-08	2.83E-07	8.23E-08	4.82E-09	5.46E-08	2.63E-09	2.05E-08	3.37E-08	3.16E-09	4.06E-08	2.18E-07	1.35E-08	2.45E-16	4.36E-09	1.52E-18	6.74E-15	3.32E-08	1.51E-10	5.55E-13	2.38E-07	3.11E-11	4.34E-06	2.34E-05
Eastern Cottontail		2.51E-05	3.53E-07	7.38E-09	3.09E-08	2.83E-07	5.00E-07	4.93E-09	3.22E-07	2.64E-09	8.83E-08	3.37E-08	3.16E-09	4.06E-08	2.18E-07	1.35E-08	2.45E-16	4.36E-09	1.52E-18	6.74E-15	3.32E-08	1.51E-10	5.55E-13	2.38E-07	3.11E-11	4.34E-06	3.16E-05
Meadow Vole		2.51E-05	3.53E-07	6.20E-09	2.89E-08	2.83E-07	2.06E-07	4.87E-09	1.34E-07	2.64E-09	4.11E-08	3.37E-08	3.16E-09	4.06E-08	2.18E-07	1.35E-08	2.45E-16	4.36E-09	1.52E-18	6.74E-15	3.32E-08	1.51E-10	5.55E-13	2.38E-07	3.11E-11	4.34E-06	3.11E-05
Raccoon		2.51E-05	3.53E-07	7.48E-09	3.15E-08	2.83E-07	1.35E-07	4.82E-09	8.84E-08	2.63E-09	2.97E-08	3.37E-08	3.16E-09	4.06E-08	2.18E-07	1.35E-08	2.45E-16	4.36E-09	1.52E-18	6.74E-15	3.32E-08	1.51E-10	5.55E-13	2.38E-07	3.11E-11	4.34E-06	3.10E-05
Red Fox		2.51E-05	2.88E-07	4.91E-09	2.48E-08	2.83E-07	6.39E-08	4.05E-09	4.30E-08	2.77E-09	1.88E-08	3.37E-08	3.16E-09	4.06E-08	2.18E-07	1.35E-08	2.45E-16	4.36E-09	1.52E-18	6.74E-15	3.32E-08	1.51E-10	5.55E-13	2.38E-07	3.11E-11	4.34E-06	3.08E-05
Short-tailed Weasel		2.51E-05	3.52E-07	5.84E-09	2.84E-08	1.48E-07	4.39E-08	4.82E-09	3.02E-08	2.63E-09	1.49E-08	3.37E-08	3.16E-09	4.06E-08	2.18E-07	2.38E-09	2.45E-16	4.36E-09	1.52E-18	6.74E-15	3.32E-08	1.51E-10	5.55E-13	2.38E-07	3.11E-11	4.34E-06	3.07E-05
Song Sparrow		2.32E-05	2.69E-07	7.14E-09	2.54E-08	2.99E-07	9.40E-09	3.65E-09	7.37E-09	2.07E-09	6.18E-09	4.56E-07	1.10E-08	2.76E-07	6.94E-07	1.46E-08	1.03E-15	7.07E-08	2.46E-17	2.74E-14	4.64E-07	2.11E-09	7.75E-12	7.17E-07	9.38E-11	1.26E-05	3.91E-05
White-tailed Deer		2.51E-05	1.82E-07	1.26E-08	2.22E-08	3.22E-07	7.24E-07	2.60E-09	4.21E-07	1.73E-09	6.75E-08	3.03E-09	1.22E-09	4.13E-09	8.33E-08	1.52E-08	3.12E-17	0.00E+00	0.00E+00	8.57E-16	4.83E-09	2.20E-11	8.07E-14	1.07E-07	1.40E-11	2.16E-06	2.93E-05
Yellow Warbler		1.09E-05	8.58E-08	4.67E-09	1.20E-08	1.87E-07	3.50E-09	1.14E-09	2.66E-09	6.47E-10	2.01E-09	4.87E-11	1.21E-12	2.10E-11	2.39E-11	9.11E-09	1.31E-18	1.29E-11	4.50E-21	4.64E-17	6.41E-11	2.92E-13	1.07E-15	4.58E-11	5.99E-15	2.97E-10	1.13E-05

Ecological Receptors	Location	Estimated Radiation Dose for Ecological Receptors (mGy/d)																									
		C-14	Co-60	Cs-134	Cs-137	HTO	I-131	I-132	I-133	I-134	I-135	Kr-85	Kr-85m	Kr-87	Kr-88	OBT	Xe-131md	Xe-133	Xe-133dd	Xe-133md	Xe-135	Xe-135d	Xe-135dd	Xe-135m	Xe-135md	Xe-138	Total Dose
Grass	F (SMR)	5.49E-05	1.20E-06	2.29E-08	1.06E-07	2.81E-06	6.87E-06	1.58E-06	8.80E-06	1.05E-06	6.10E-06	6.10E-07	2.11E-08	6.30E-07	1.72E-06	2.76E-11	1.03E-15	8.39E-08	6.66E-18	2.80E-14	6.43E-07	1.38E-09	4.75E-12	1.65E-06	9.14E-11	3.34E-05	1.22E-04
Sugar Maple		5.49E-05	3.97E-07	2.82E-08	4.70E-08	2.81E-06	1.57E-06	5.98E-07	1.70E-06	1.13E-07	6.32E-07	1.33E-08	5.38E-09	1.85E-08	3.69E-07	2.76E-07	6.12E-17	0.00E+00	0.00E+00	1.68E-15	2.13E-08	4.56E-11	1.57E-13	5.23E-07	2.91E-11	1.07E-05	7.47E-05
Earthworm		4.61E-05	3.23E-07	9.25E-09	3.43E-08	2.92E-06	7.33E-07	1.71E-07	8.98E-07	9.34E-08	6.15E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.93E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.22E-05
American Robin		5.63E-05	2.45E-07	1.10E-08	2.93E-08	8.21E-07	2.60E-08	9.93E-09	2.03E-08	5.75E-09	1.68E-08	1.25E-06	3.04E-08	7.75E-07	1.92E-06	4.00E-08	1.26E-15	1.94E-07	1.54E-17	3.36E-14	1.28E-06	2.74E-09	9.44E-12	2.19E-06	1.22E-10	3.88E-05	1.04E-04
Bank Swallow		4.69E-05	1.27E-07	1.22E-08	2.44E-08	8.21E-07	1.51E-08	4.97E-09	1.15E-08	2.88E-09	8.70E-09	1.25E-06	3.04E-08	7.75E-07	1.92E-06	4.00E-08	1.26E-15	1.94E-07	1.54E-17	3.36E-14	1.28E-06	2.74E-09	9.44E-12	2.19E-06	1.22E-10	3.88E-05	9.44E-05
Common Shrew		7.73E-05	5.07E-07	1.68E-08	5.51E-08	1.24E-06	3.53E-07	2.10E-08	2.35E-07	1.17E-08	8.83E-08	1.48E-07	1.40E-08	1.82E-07	9.68E-07	5.91E-08	4.79E-16	1.92E-08	1.52E-18	1.32E-14	1.46E-07	3.14E-10	1.08E-12	1.16E-06	6.46E-11	2.14E-05	1.04E-04
Eastern Cottontail		1.10E-04	5.09E-07	1.40E-08	4.96E-08	1.24E-06	2.14E-06	2.15E-08	1.38E-06	1.17E-08	3.80E-07	1.48E-07	1.40E-08	1.82E-07	9.68E-07	5.91E-08	4.79E-16	1.92E-08	1.52E-18	1.32E-14	1.46E-07	3.14E-10	1.08E-12	1.16E-06	6.46E-11	2.14E-05	1.40E-04
Meadow Vole		1.10E-04	5.08E-07	1.02E-08	4.37E-08	1.24E-06	8.85E-07	2.12E-08	5.77E-07	1.17E-08	1.77E-07	1.48E-07	1.40E-08	1.82E-07	9.68E-07	5.91E-08	4.79E-16	1.92E-08	1.52E-18	1.32E-14	1.46E-07	3.14E-10	1.08E-12	1.16E-06	6.46E-11	2.14E-05	1.38E-04
Raccoon		1.10E-04	5.08E-07	1.42E-08	5.07E-08	1.25E-06	5.78E-07	2.10E-08	3.80E-07	1.17E-08	1.28E-07	1.48E-07	1.40E-08	1.82E-07	9.68E-07	5.91E-08	4.79E-16	1.92E-08	1.52E-18	1.32E-14	1.46E-07	3.14E-10	1.08E-12	1.16E-06	6.46E-11	2.14E-05	1.37E-04
Red Fox		1.10E-04	4.14E-07	7.82E-09	3.69E-08	1.24E-06	2.74E-07	1.77E-08	1.85E-07	1.23E-08	8.15E-08	1.48E-07	1.40E-08	1.82E-07	9.68E-07	5.91E-08	4.79E-16	1.92E-08	1.52E-18	1.32E-14	1.46E-07	3.14E-10	1.08E-12	1.16E-06	6.46E-11	2.14E-05	1.37E-04
Short-tailed Weasel		1.10E-04	5.07E-07	9.13E-09	4.20E-08	6.50E-07	1.88E-07	2.10E-08	1.30E-07	1.17E-08	6.44E-08	1.48E-07	1.40E-08	1.82E-07	9.68E-07	1.05E-08	4.79E-16	1.92E-08	1.52E-18	1.32E-14	1.46E-07	3.14E-10	1.08E-12	1.16E-06	6.46E-11	2.14E-05	1.36E-04
Song Sparrow		1.02E-04	3.91E-07	1.50E-08	4.27E-08	1.31E-06	4.05E-08	1.59E-08	3.18E-08	9.21E-09	2.67E-08	2.00E-06	4.86E-08	1.24E-06	3.08E-06	6.41E-08	2.01E-15	3.11E-07	2.47E-17	5.37E-14	2.04E-06	4.38E-09	1.51E-11	3.51E-06	1.95E-10	6.20E-05	1.78E-04
White-tailed Deer		1.10E-04	2.66E-07	3.51E-08	4.61E-08	1.42E-06	3.10E-06	1.13E-08	1.81E-06	7.70E-09	2.91E-07	1.33E-08	5.38E-09	1.85E-08	3.69E-07	6.68E-08	6.12E-17	0.00E+00	0.00E+00	1.68E-15	2.13E-08	4.56E-11	1.57E-13	5.23E-07	2.91E-11	1.07E-05	1.29E-04
Yellow Warbler		4.81E-05	1.27E-07	1.22E-08	2.45E-08	8.21E-07	1.51E-08	4.97E-09	1.15E-08	2.88E-09	8.70E-09	2.14E-10	5.37E-12	9.42E-11	1.06E-10	4.00E-08	2.56E-18	5.68E-11	4.51E-21	9.10E-17	2.82E-10	6.05E-13	2.09E-15	2.24E-10	1.24E-14	1.47E-09	4.92E-05

Note:
The daughter radionuclides (Ba-137m, Cs-138d, Rb-88d), whose estimated radiation doses are zero for ecological receptors, are not shown in this table.

Table D-4: Estimated Concentrations of Radionuclides in Environmental Media at Ecological Assessment Locations under an Air and Water Release Scenario

Environmental Media	Location	Estimated Point Concentrations of Radionuclides																			
		Ba-137md	Ba-140	C-14	Co-58	Co-60	Cs-134	Cs-136	Cs-137	Cs-138d	Cu-64	Fe-59	HTO	I-131	I-132	I-133	I-134	I-135	Kr-85	Kr-85m	Kr-87
Outdoor Air (Bq/m^3)	Lake Ontario Shore	5.29E-08	0.00E+00	2.36E-02	0.00E+00	6.50E-07	3.90E-08	0.00E+00	5.90E-08	2.52E-02	0.00E+00	0.00E+00	5.73E-02	3.07E-05	1.68E-04	1.40E-04	4.12E-04	2.64E-04	1.30E-01	1.92E-03	6.08E-03
	AB	3.05E-08	0.00E+00	1.32E-02	0.00E+00	3.62E-07	2.17E-08	0.00E+00	3.29E-08	1.56E-02	0.00E+00	0.00E+00	3.19E-02	1.71E-05	9.12E-05	7.80E-05	2.14E-04	1.46E-04	7.24E-02	1.06E-03	3.23E-03
	C	3.07E-08	0.00E+00	1.34E-02	0.00E+00	3.69E-07	2.22E-08	0.00E+00	3.36E-08	1.50E-02	0.00E+00	0.00E+00	3.26E-02	1.74E-05	9.54E-05	7.98E-05	2.33E-04	1.50E-04	7.39E-02	1.09E-03	3.45E-03
	D	3.36E-08	0.00E+00	1.65E-02	0.00E+00	4.52E-07	2.71E-08	0.00E+00	4.11E-08	1.30E-02	0.00E+00	0.00E+00	3.99E-02	2.14E-05	1.22E-04	9.82E-05	3.17E-04	1.86E-04	9.05E-02	1.37E-03	4.54E-03
	E	5.96E-08	0.00E+00	3.86E-02	0.00E+00	1.06E-06	6.37E-08	0.00E+00	9.65E-08	1.76E-02	0.00E+00	0.00E+00	9.36E-02	5.02E-05	2.93E-04	2.31E-04	7.93E-04	4.41E-04	2.12E-01	3.24E-03	1.11E-02
	F (SMR)	1.55E-07	0.00E+00	1.70E-01	0.00E+00	4.66E-06	2.80E-07	0.00E+00	4.24E-07	3.76E-02	0.00E+00	0.00E+00	4.11E-01	2.20E-04	1.30E-03	1.02E-03	3.60E-03	1.94E-03	9.33E-01	1.43E-02	5.00E-02
Soil (Bq/kg(dw))	AB	1.44E-03	0.00E+00	0.00E+00	0.00E+00	4.57E-03	1.11E-04	0.00E+00	1.52E-03	2.52E-03	0.00E+00	0.00E+00	0.00E+00	5.16E-04	3.29E-05	2.56E-04	2.95E-05	1.51E-04	0.00E+00	0.00E+00	0.00E+00
	C	1.28E-03	0.00E+00	0.00E+00	0.00E+00	4.07E-03	9.91E-05	0.00E+00	1.35E-03	2.12E-03	0.00E+00	0.00E+00	0.00E+00	5.23E-04	3.42E-05	2.60E-04	3.19E-05	1.54E-04	0.00E+00	0.00E+00	0.00E+00
	D	9.23E-04	0.00E+00	0.00E+00	0.00E+00	2.93E-03	7.13E-05	0.00E+00	9.72E-04	1.08E-03	0.00E+00	0.00E+00	0.00E+00	6.29E-04	4.28E-05	3.13E-04	4.26E-05	1.88E-04	0.00E+00	0.00E+00	0.00E+00
	E	2.25E-03	0.00E+00	0.00E+00	0.00E+00	7.13E-03	1.74E-04	0.00E+00	2.37E-03	1.51E-03	0.00E+00	0.00E+00	0.00E+00	1.48E-03	1.03E-04	7.38E-04	1.07E-04	4.45E-04	0.00E+00	0.00E+00	0.00E+00
	F (SMR)	3.24E-03	0.00E+00	0.00E+00	0.00E+00	1.03E-02	2.50E-04	0.00E+00	3.41E-03	1.06E-03	0.00E+00	0.00E+00	0.00E+00	6.36E-03	4.49E-04	3.18E-03	4.73E-04	1.93E-03	0.00E+00	0.00E+00	0.00E+00
Water (Bq/L)	Lake Ontario	0.00E+00	9.02E-05	0.00E+00	6.28E-05	1.22E-04	4.24E-05	2.40E-05	6.48E-05	0.00E+00	1.37E-04	6.48E-05	2.42E-01	2.03E-05	0.00E+00	3.50E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Coot's Pond	3.75E-07	0.00E+00	1.34E-03	0.00E+00	9.64E-07	2.56E-07	0.00E+00	3.94E-07	3.27E-04	0.00E+00	0.00E+00	3.19E+00	5.25E-05	4.27E-06	3.22E-05	3.83E-06	1.94E-05	0.00E+00	0.00E+00	0.00E+00
	Dragonfly Pond	2.40E-07	0.00E+00	1.68E-03	0.00E+00	6.18E-07	1.64E-07	0.00E+00	2.53E-07	1.40E-04	0.00E+00	0.00E+00	3.99E+00	6.39E-05	5.55E-06	3.95E-05	5.53E-06	2.42E-05	0.00E+00	0.00E+00	0.00E+00
	Polliwog Pond	2.40E-07	0.00E+00	1.68E-03	0.00E+00	6.18E-07	1.64E-07	0.00E+00	2.53E-07	1.40E-04	0.00E+00	0.00E+00	3.99E+00	6.39E-05	5.55E-06	3.95E-05	5.53E-06	2.42E-05	0.00E+00	0.00E+00	0.00E+00
	Treefrog Pond	2.40E-07	0.00E+00	1.68E-03	0.00E+00	6.18E-07	1.64E-07	0.00E+00	2.53E-07	1.40E-04	0.00E+00	0.00E+00	3.99E+00	6.39E-05	5.55E-06	3.95E-05	5.53E-06	2.42E-05	0.00E+00	0.00E+00	0.00E+00
Sediment (Bq/kg(dw))	Lake Ontario	2.32E-01	1.80E-01	0.00E+00	2.70E+00	5.23E+00	4.03E-01	2.28E-01	6.16E-01	0.00E+00	4.32E-01	3.24E-01	0.00E+00	8.93E-02	0.00E+00	1.54E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Coot's Pond	7.49E-04	0.00E+00	6.71E-02	0.00E+00	4.15E-02	2.43E-03	0.00E+00	3.75E-03	3.11E+00	0.00E+00	0.00E+00	0.00E+00	2.31E-01	1.88E-02	1.42E-01	1.69E-02	8.55E-02	0.00E+00	0.00E+00	0.00E+00
	Dragonfly Pond	4.80E-04	0.00E+00	8.38E-02	0.00E+00	2.66E-02	1.56E-03	0.00E+00	2.40E-03	1.33E+00	0.00E+00	0.00E+00	0.00E+00	2.81E-01	2.44E-02	1.74E-01	2.43E-02	1.06E-01	0.00E+00	0.00E+00	0.00E+00
	Polliwog Pond	4.80E-04	0.00E+00	8.38E-02	0.00E+00	2.66E-02	1.56E-03	0.00E+00	2.40E-03	1.33E+00	0.00E+00	0.00E+00	0.00E+00	2.81E-01	2.44E-02	1.74E-01	2.43E-02	1.06E-01	0.00E+00	0.00E+00	0.00E+00
	Treefrog Pond	4.80E-04	0.00E+00	8.38E-02	0.00E+00	2.66E-02	1.56E-03	0.00E+00	2.40E-03	1.33E+00	0.00E+00	0.00E+00	0.00E+00	2.81E-01	2.44E-02	1.74E-01	2.43E-02	1.06E-01	0.00E+00	0.00E+00	0.00E+00

Environmental Media	Location	Kr-88	La-140d	Mn-54	Na-24	OBT	Rb-88d	Sr-91	Xe-131md	Xe-133	Xe-133dd	Xe-133md	Xe-135	Xe-135d	Xe-135dd	Xe-135m	Xe-135md	Xe-138	Y-91	Zn-65	Zn-69m
Outdoor Air (Bq/m^3)	Lake Ontario Shore	6.61E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.11E-03	0.00E+00	2.14E-08	9.43E-02	5.12E-10	5.29E-07	7.51E-02	9.86E-04	5.10E-06	3.50E-02	2.16E-05	6.62E-02	0.00E+00	0.00E+00	0.00E+00
	AB	3.61E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.07E-03	0.00E+00	1.58E-08	5.26E-02	4.74E-10	3.89E-07	4.16E-02	6.54E-04	3.77E-06	1.56E-02	1.43E-05	2.90E-02	0.00E+00	0.00E+00	0.00E+00
	C	3.76E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.83E-03	0.00E+00	1.23E-08	5.36E-02	2.75E-10	3.05E-07	4.27E-02	5.80E-04	2.93E-06	1.92E-02	1.27E-05	3.62E-02	0.00E+00	0.00E+00	0.00E+00
	D	4.75E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.41E-03	0.00E+00	8.07E-09	6.58E-02	1.03E-10	2.00E-07	5.28E-02	4.52E-04	1.90E-06	3.30E-02	9.92E-06	6.39E-02	0.00E+00	0.00E+00	0.00E+00
	E	1.14E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.76E-03	0.00E+00	8.94E-09	1.54E-01	5.37E-11	2.22E-07	1.25E-01	5.68E-04	2.09E-06	9.54E-02	1.25E-05	1.88E-01	0.00E+00	0.00E+00	0.00E+00
	F (SMR)	5.05E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.65E-03	0.00E+00	1.75E-08	6.78E-01	5.38E-11	4.36E-07	5.50E-01	1.18E-03	4.06E-06	4.66E-01	2.59E-05	9.26E-01	0.00E+00	0.00E+00	0.00E+00
Soil (Bq/kg(dw))	AB	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.78E-04	0.00E+00	2.74E-04	0.00E+00	1.57E-04	2.19E-04	0.00E+00	0.00E+00	1.47E-04	0.00E+00	2.41E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	C	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.38E-04	0.00E+00	2.77E-04	0.00E+00	1.60E-04	2.23E-04	0.00E+00	0.00E+00	1.50E-04	0.00E+00	2.47E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	D	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.26E-05	0.00E+00	3.33E-04	0.00E+00	1.93E-04	2.69E-04	0.00E+00	0.00E+00	1.83E-04	0.00E+00	3.00E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	E	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.11E-05	0.00E+00	7.83E-04	0.00E+00	4.55E-04	6.34E-04	0.00E+00	0.00E+00	4.33E-04	0.00E+00	7.12E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	F (SMR)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.49E-05	0.00E+00	3.37E-03	0.00E+00	1.96E-03	2.73E-03	0.00E+00	0.00E+00	1.87E-03	0.00E+00	3.08E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Water (Bq/L)	Lake Ontario	0.00E+00	0.00E+00	1.20E-04	3.50E-05	0.00E+00	0.00E+00	3.69E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.98E-05	7.73E-05
	Coot's Pond	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.32E-05	0.00E+00	5.21E-05	0.00E+00	3.21E-05	3.22E-05	0.00E+00	0.00E+00	1.94E-05	0.00E+00	3.11E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Dragonfly Pond	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.14E-06	0.00E+00	6.34E-05	0.00E+00	3.93E-05	3.95E-05	0.00E+00	0.00E+00	2.42E-05	0.00E+00	3.87E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Polliwog Pond	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.14E-06	0.00E+00	6.34E-05	0.00E+00	3.93E-05	3.95E-05	0.00E+00	0.00E+00	2.42E-05	0.00E+00	3.87E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Treefrog Pond	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.14E-06	0.00E+00	6.34E-05	0.00E+00	3.93E-05	3.95E-05	0.00E+00	0.00E+00	2.42E-05	0.00E+00	3.87E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sediment (Bq/kg(dw))	Lake Ontario	0.00E+00	0.00E+00	1.56E+01	1.68E-02	0.00E+00	0.00E+00	7.01E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.29E-80	2.49E-02	3.86E-02
	Coot's Pond	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Dragonfly Pond	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Polliwog Pond	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Treefrog Pond	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table D-5: Estimated Concentrations of Radionuclides for Ecological Receptors at Lake Ontario and Lake Ontario Shore under an Air and Water Release Scenario

Ecological Receptors	Location	Estimated Point Concentrations of Radionuclides in the Tissue of Ecological Receptors (Bq/kg(fw))											
		Ba-137md	Ba-140	C-14	Co-58	Co-60	Cs-134	Cs-136	Cs-137	Cs-138d	Cu-64	Fe-59	HTO
Benthic Invertebrates	Lake Ontario	0.00E+00	1.62E-02	0.00E+00	6.91E-03	1.34E-02	4.20E-03	2.37E-03	6.42E-03	0.00E+00	5.74E-03	1.81E-01	1.81E-01
Alewife	Lake Ontario	0.00E+00	8.39E-05	0.00E+00	3.39E-03	6.57E-03	1.48E-01	8.39E-02	2.27E-01	0.00E+00	3.69E-02	1.56E-02	1.81E-01
Lake Trout	Lake Ontario	0.00E+00	8.39E-05	0.00E+00	3.39E-03	6.57E-03	1.48E-01	8.39E-02	2.27E-01	0.00E+00	3.69E-02	1.56E-02	1.81E-01
Round Whitefish	Lake Ontario	0.00E+00	8.39E-05	0.00E+00	3.39E-03	6.57E-03	1.48E-01	8.39E-02	2.27E-01	0.00E+00	3.69E-02	1.56E-02	1.81E-01
White Sucker	Lake Ontario	0.00E+00	8.39E-05	0.00E+00	3.39E-03	6.57E-03	1.48E-01	8.39E-02	2.27E-01	0.00E+00	3.69E-02	1.56E-02	1.81E-01
American Eel	Lake Ontario	0.00E+00	8.39E-05	0.00E+00	3.39E-03	6.57E-03	1.48E-01	8.39E-02	2.27E-01	0.00E+00	3.69E-02	1.56E-02	1.81E-01
Bufflehead	Lake Ontario Shore	0.00E+00	6.71E-05	0.00E+00	2.91E-03	5.63E-03	3.02E-03	1.70E-03	4.61E-03	0.00E+00	9.07E-04	5.38E-02	1.01E-01
Mallard	Lake Ontario Shore	0.00E+00	6.68E-05	0.00E+00	5.61E-03	1.09E-02	4.03E-03	2.28E-03	6.16E-03	0.00E+00	1.15E-03	5.11E-02	1.01E-01
		I-131	**I-132**	**I-133**	**I-134**	**I-135**	**Na-24**	**OBT**	**Rb-88d**	**Sr-91**	**Y-91**	**Zn-65**	**Zn-69m**
Benthic Invertebrates	Lake Ontario	1.95E-04	0.00E+00	3.36E-04	0.00E+00	0.00E+00	2.56E-04	3.38E-02	0.00E+00	8.85E-03	0.00E+00	8.96E-02	1.39E-01
Alewife	Lake Ontario	1.22E-04	0.00E+00	2.10E-04	0.00E+00	0.00E+00	2.94E-03	3.38E-02	0.00E+00	7.38E-05	0.00E+00	2.49E-01	3.86E-01
Lake Trout	Lake Ontario	1.22E-04	0.00E+00	2.10E-04	0.00E+00	0.00E+00	2.94E-03	3.38E-02	0.00E+00	7.38E-05	0.00E+00	2.49E-01	3.86E-01
Round Whitefish	Lake Ontario	1.22E-04	0.00E+00	2.10E-04	0.00E+00	0.00E+00	2.94E-03	3.38E-02	0.00E+00	7.38E-05	0.00E+00	2.49E-01	3.86E-01
White Sucker	Lake Ontario	1.22E-04	0.00E+00	2.10E-04	0.00E+00	0.00E+00	2.94E-03	3.38E-02	0.00E+00	7.38E-05	0.00E+00	2.49E-01	3.86E-01
American Eel	Lake Ontario	1.22E-04	0.00E+00	2.10E-04	0.00E+00	0.00E+00	2.94E-03	3.38E-02	0.00E+00	7.38E-05	0.00E+00	2.49E-01	3.86E-01
Bufflehead	Lake Ontario Shore	8.66E-07	0.00E+00	1.66E-06	0.00E+00	4.90E-07	4.58E-04	7.97E-03	0.00E+00	3.75E-05	3.18E-85	8.89E-03	1.38E-02
Mallard	Lake Ontario Shore	1.67E-06	0.00E+00	3.06E-06	0.00E+00	5.15E-07	5.59E-04	7.97E-03	0.00E+00	3.54E-05	9.11E-85	8.37E-03	1.30E-02

Note: Estimated concentrations of noble gases in the tissue of ecological receptors are zero, which are not shown in this table.

Table D-6: Estimated Concentrations of Radionuclides for Ecological Receptors at Coot's Pond and Location AB under an Air and Water Release Scenario

Ecological Receptors	Location	Estimated Point Concentrations of Radionuclides in the Tissue of Ecological Receptors (Bq/kg(fw))											
		Ba-137md	Ba-140	C-14	Co-58	Co-60	Cs-134	Cs-136	Cs-137	Cs-138d	Cu-64	Fe-59	HTO
Aquatic Plants	Coot's Pond	0.00E+00	0.00E+00	7.92E+00	0.00E+00	7.62E-04	5.63E-05	0.00E+00	8.67E-05	0.00E+00	0.00E+00	0.00E+00	2.40E+00
Benthic Invertebrates	Coot's Pond	0.00E+00	0.00E+00	7.52E+00	0.00E+00	1.06E-04	2.53E-05	0.00E+00	3.90E-05	0.00E+00	0.00E+00	0.00E+00	2.40E+00
Dace	Coot's Pond	0.00E+00	0.00E+00	7.65E+00	0.00E+00	5.21E-05	8.96E-04	0.00E+00	1.38E-03	0.00E+00	0.00E+00	0.00E+00	2.40E+00
Frogs	Coot's Pond	0.00E+00	0.00E+00	7.65E+00	0.00E+00	5.21E-05	8.96E-04	0.00E+00	1.38E-03	0.00E+00	0.00E+00	0.00E+00	2.40E+00
Turtles	Coot's Pond	0.00E+00	0.00E+00	7.65E+00	0.00E+00	5.21E-05	8.96E-04	0.00E+00	1.38E-03	0.00E+00	0.00E+00	0.00E+00	2.40E+00
Grass	AB	4.08E-08	0.00E+00	6.27E+00	0.00E+00	4.04E-03	2.39E-04	0.00E+00	3.81E-04	2.73E-01	0.00E+00	0.00E+00	1.58E+00
Earthworm	AB	4.08E-09	0.00E+00	5.27E+00	0.00E+00	4.27E-04	2.48E-04	0.00E+00	5.00E-04	2.73E-01	0.00E+00	0.00E+00	1.64E+00
American Robin	AB	0.00E+00	0.00E+00	6.43E+00	0.00E+00	1.61E-04	2.03E-04	0.00E+00	4.13E-04	0.00E+00	0.00E+00	0.00E+00	7.07E-01
Bank Swallow	AB	0.00E+00	0.00E+00	5.36E+00	0.00E+00	1.97E-04	2.93E-04	0.00E+00	6.04E-04	0.00E+00	0.00E+00	0.00E+00	7.07E-01
Bufflehead	AB	0.00E+00	0.00E+00	7.73E+00	0.00E+00	5.80E-05	1.99E-05	0.00E+00	3.07E-05	0.00E+00	0.00E+00	0.00E+00	9.83E-01
Common Shrew	AB	0.00E+00	0.00E+00	8.82E+00	0.00E+00	1.16E-05	3.32E-04	0.00E+00	6.75E-04	0.00E+00	0.00E+00	0.00E+00	1.62E+00
Eastern Cottontail	AB	0.00E+00	0.00E+00	1.26E+01	0.00E+00	7.44E-05	2.23E-04	0.00E+00	3.72E-04	1.18E-04	0.00E+00	0.00E+00	1.62E+00
Green Heron	AB	1.68E-08	0.00E+00	7.66E+00	0.00E+00	5.83E-05	5.71E-04	0.00E+00	8.80E-04	9.70E-03	0.00E+00	0.00E+00	9.83E-01
Mallard AB	AB	0.00E+00	0.00E+00	7.73E+00	0.00E+00	1.18E-04	2.86E-05	0.00E+00	4.40E-05	0.00E+00	0.00E+00	0.00E+00	9.83E-01
Meadow Vole	AB	0.00E+00	0.00E+00	1.26E+01	0.00E+00	2.94E-05	8.88E-05	0.00E+00	1.44E-04	5.63E-05	0.00E+00	0.00E+00	1.62E+00
Muskrat	AB	0.00E+00	0.00E+00	1.27E+01	0.00E+00	1.80E-05	6.36E-05	0.00E+00	9.79E-05	0.00E+00	0.00E+00	0.00E+00	2.04E+00
Raccoon	AB	0.00E+00	0.00E+00	1.26E+01	0.00E+00	2.76E-05	1.98E-04	0.00E+00	3.89E-04	0.00E+00	0.00E+00	0.00E+00	2.04E+00
Red Fo	AB	0.00E+00	0.00E+00	1.26E+01	0.00E+00	4.90E-06	3.83E-05	0.00E+00	6.52E-05	0.00E+00	0.00E+00	0.00E+00	1.62E+00
Short-tailed Weasel	AB	0.00E+00	0.00E+00	1.26E+01	0.00E+00	1.02E-06	4.88E-05	0.00E+00	8.93E-05	0.00E+00	0.00E+00	0.00E+00	1.74E+00
Song Sparrow	AB	0.00E+00	0.00E+00	1.17E+01	0.00E+00	1.96E-04	2.49E-04	0.00E+00	4.58E-04	0.00E+00	0.00E+00	0.00E+00	1.13E+00
White-tailed Deer	AB	0.00E+00	0.00E+00	1.26E+01	0.00E+00	1.02E-04	3.08E-04	0.00E+00	4.97E-04	1.88E-04	0.00E+00	0.00E+00	1.53E+00
Yellow Warbler	AB	0.00E+00	0.00E+00	5.49E+00	0.00E+00	2.00E-04	2.95E-04	0.00E+00	6.06E-04	0.00E+00	0.00E+00	0.00E+00	7.07E-01

Ecological Receptors	Location	Estimated Point Concentrations of Radionuclides in the Tissue of Ecological Receptors (Bq/kg(fw))											
		I-131	I-132	I-133	I-134	I-135	Mn-54	Na-24	OBT	Rb-88d	Sr-91	Y-91	Zn-65
Aquatic Plants	Coot's Pond	1.95E-04	0.00E+00	3.36E-04	0.00E+00	0.00E+00	8.29E-02	2.56E-04	3.38E-02	0.00E+00	8.85E-03	0.00E+00	8.96E-02
Benthic Invertebrates	Coot's Pond	1.22E-04	0.00E+00	2.10E-04	0.00E+00	0.00E+00	2.88E-02	2.94E-03	3.38E-02	0.00E+00	7.38E-05	0.00E+00	2.49E-01
Dace	Coot's Pond	1.22E-04	0.00E+00	2.10E-04	0.00E+00	0.00E+00	2.88E-02	2.94E-03	3.38E-02	0.00E+00	7.38E-05	0.00E+00	2.49E-01
Frogs	Coot's Pond	1.22E-04	0.00E+00	2.10E-04	0.00E+00	0.00E+00	2.88E-02	2.94E-03	3.38E-02	0.00E+00	7.38E-05	0.00E+00	2.49E-01
Turtles	Coot's Pond	1.22E-04	0.00E+00	2.10E-04	0.00E+00	0.00E+00	2.88E-02	2.94E-03	3.38E-02	0.00E+00	7.38E-05	0.00E+00	2.49E-01
Grass	AB	1.22E-04	0.00E+00	2.10E-04	0.00E+00	0.00E+00	2.88E-02	2.94E-03	3.38E-02	0.00E+00	7.38E-05	0.00E+00	2.49E-01
Earthworm	AB	8.66E-07	0.00E+00	1.66E-06	0.00E+00	4.90E-07	5.01E-05	4.58E-04	7.97E-03	0.00E+00	3.75E-05	3.18E-85	8.89E-03
American Robin	AB	1.67E-06	0.00E+00	3.06E-06	0.00E+00	5.15E-07	7.97E-05	5.59E-04	7.97E-03	0.00E+00	3.54E-05	9.11E-85	8.37E-03
Bank Swallow	AB	3.73E-03	0.00E+00	2.29E-03	0.00E+00	1.38E-03	0.00E+00	0.00E+00	3.51E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Bufflehead	AB	5.04E-04	0.00E+00	3.10E-04	0.00E+00	1.87E-04	0.00E+00	0.00E+00	4.47E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Common Shrew	AB	3.15E-04	0.00E+00	1.93E-04	0.00E+00	1.17E-04	0.00E+00	0.00E+00	4.47E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Eastern Cottontail	AB	3.15E-04	0.00E+00	1.93E-04	0.00E+00	1.17E-04	0.00E+00	0.00E+00	4.47E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Green Heron	AB	3.15E-04	0.00E+00	1.93E-04	0.00E+00	1.17E-04	0.00E+00	0.00E+00	4.47E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mallard	AB	2.13E-01	1.80E-02	1.36E-01	1.62E-02	8.19E-02	0.00E+00	0.00E+00	1.55E-01	1.93E-02	0.00E+00	0.00E+00	0.00E+00
Meadow Vole	AB	2.14E-02	1.81E-03	1.36E-02	1.62E-03	8.22E-03	0.00E+00	0.00E+00	1.64E-01	1.93E-02	0.00E+00	0.00E+00	0.00E+00
Muskrat	AB	4.74E-05	0.00E+00	1.48E-05	0.00E+00	1.85E-06	0.00E+00	0.00E+00	4.95E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Raccoon	AB	7.45E-05	0.00E+00	2.34E-05	0.00E+00	2.76E-06	0.00E+00	0.00E+00	4.95E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Red Fox	AB	2.70E-06	0.00E+00	1.79E-06	0.00E+00	1.26E-06	0.00E+00	0.00E+00	6.72E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Short-tailed Weasel	AB	7.99E-03	0.00E+00	2.51E-03	0.00E+00	2.99E-04	0.00E+00	0.00E+00	1.44E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Song Sparrow	AB	5.53E-02	4.09E-06	1.73E-02	4.22E-07	1.90E-03	0.00E+00	0.00E+00	1.44E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
White-tailed Deer	AB	3.01E-06	1.90E-07	1.97E-06	1.71E-07	1.37E-06	0.00E+00	0.00E+00	2.87E-02	1.46E-06	0.00E+00	0.00E+00	0.00E+00
Yellow Warbler	AB	5.61E-06	0.00E+00	3.58E-06	0.00E+00	2.35E-06	0.00E+00	0.00E+00	6.72E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Note: Estimated concentrations of noble gases in the tissue of ecological receptors are zero, which are not shown in this table.

Table D-7: Estimated Concentrations of Radionuclides for Ecological Receptors at Location C under an Air and Water Release Scenario

Ecological Receptors	Location	Estimated Point Concentrations of Radionuclides in the Tissue of Ecological Receptors (Bq/kg(fw))											
		Ba-137md	Ba-140	C-14	Co-58	Co-60	Cs-134	Cs-136	Cs-137	Cs-138d	Cu-64	Fe-59	HTO
Grass	C	3.81E-08	0.00E+00	6.40E+00	0.00E+00	3.82E-03	2.26E-04	0.00E+00	3.59E-04	2.43E-01	0.00E+00	0.00E+00	1.61E+00
Earthworm	C	3.81E-09	0.00E+00	5.37E+00	0.00E+00	4.03E-04	2.34E-04	0.00E+00	4.66E-04	2.44E-01	0.00E+00	0.00E+00	1.67E+00
American Robin	C	0.00E+00	0.00E+00	6.56E+00	0.00E+00	1.50E-04	1.92E-04	0.00E+00	3.85E-04	0.00E+00	0.00E+00	0.00E+00	5.84E-01
Common Shrew	C	0.00E+00	0.00E+00	9.00E+00	0.00E+00	1.09E-05	3.13E-04	0.00E+00	6.29E-04	0.00E+00	0.00E+00	0.00E+00	1.14E+00
Eastern Cottontail	C	0.00E+00	0.00E+00	1.29E+01	0.00E+00	7.03E-05	2.11E-04	0.00E+00	3.51E-04	2.64E-05	0.00E+00	0.00E+00	1.14E+00
Meadow Vole	C	0.00E+00	0.00E+00	1.29E+01	0.00E+00	2.78E-05	8.39E-05	0.00E+00	1.36E-04	4.51E-06	0.00E+00	0.00E+00	1.14E+00
Raccoon	C	0.00E+00	0.00E+00	1.29E+01	0.00E+00	2.82E-05	2.23E-04	0.00E+00	4.35E-04	0.00E+00	0.00E+00	0.00E+00	1.14E+00
Red Fox	C	0.00E+00	0.00E+00	1.29E+01	0.00E+00	4.61E-06	4.73E-05	0.00E+00	8.09E-05	0.00E+00	0.00E+00	0.00E+00	1.14E+00
Short-tailed Weasel	C	0.00E+00	0.00E+00	1.29E+01	0.00E+00	9.49E-07	4.61E-05	0.00E+00	8.46E-05	0.00E+00	0.00E+00	0.00E+00	1.01E+00
Song Sparrow	C	0.00E+00	0.00E+00	1.19E+01	0.00E+00	1.83E-04	2.35E-04	0.00E+00	4.30E-04	0.00E+00	0.00E+00	0.00E+00	9.35E-01
White-tailed Deer	C	0.00E+00	0.00E+00	1.29E+01	0.00E+00	9.64E-05	2.91E-04	0.00E+00	4.71E-04	1.40E-05	0.00E+00	0.00E+00	1.15E+00
Yellow Warbler	C	0.00E+00	0.00E+00	5.60E+00	0.00E+00	1.88E-04	2.78E-04	0.00E+00	5.64E-04	0.00E+00	0.00E+00	0.00E+00	5.84E-01
		I-131	I-132	I-133	I-134	I-135	Na-24	OBT	Rb-88d	Sr-91	Y-91	Zn-65	Zn-69m
Grass	C	2.15E-01	1.87E-02	1.38E-01	1.74E-02	8.36E-02	0.00E+00	0.00E+00	1.58E-01	1.58E-02	0.00E+00	0.00E+00	0.00E+00
Earthworm	C	2.16E-02	1.87E-03	1.38E-02	1.75E-03	8.39E-03	0.00E+00	0.00E+00	1.68E-01	1.58E-02	0.00E+00	0.00E+00	0.00E+00
American Robin	C	4.79E-05	0.00E+00	1.50E-05	0.00E+00	1.89E-06	0.00E+00	0.00E+00	3.55E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Common Shrew	C	8.08E-03	0.00E+00	2.55E-03	0.00E+00	3.05E-04	0.00E+00	0.00E+00	8.52E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Eastern Cottontail	C	5.59E-02	4.03E-06	1.76E-02	2.60E-07	1.93E-03	0.00E+00	0.00E+00	8.52E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Meadow Vole	C	2.23E-02	1.61E-06	7.02E-03	1.02E-07	8.01E-04	0.00E+00	0.00E+00	8.52E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Raccoon	C	2.19E-02	0.00E+00	6.89E-03	0.00E+00	7.91E-04	0.00E+00	0.00E+00	8.52E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Red Fox	C	6.14E-03	0.00E+00	1.95E-03	0.00E+00	2.57E-04	0.00E+00	0.00E+00	8.52E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Short-tailed Weasel	C	3.67E-03	0.00E+00	1.18E-03	0.00E+00	1.71E-04	0.00E+00	0.00E+00	6.21E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Song Sparrow	C	5.16E-05	0.00E+00	1.60E-05	0.00E+00	2.14E-06	0.00E+00	0.00E+00	5.68E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
White-tailed Deer	C	7.74E-02	5.55E-06	2.43E-02	3.37E-07	2.67E-03	0.00E+00	0.00E+00	7.93E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Yellow Warbler	C	7.52E-05	0.00E+00	2.37E-05	0.00E+00	2.81E-06	0.00E+00	0.00E+00	3.55E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Note: Estimated concentrations of noble gases in the tissue of ecological receptors are zero, which are not shown in this table.

Table D-8: Estimated Concentrations of Radionuclides for Ecological Receptors at Dragonfly Pond, Polliwog Pond, Treefrog Pond, and Location D under an Air and Water Release Scenario

Ecological Receptors	Location	Estimated Point Concentrations of Radionuclides in the Tissue of Ecological Receptors (Bq/kg(fw))											
		Ba-137md	Ba-140	C-14	Co-58	Co-60	Cs-134	Cs-136	Cs-137	Cs-138d	Cu-64	Fe-59	HTO
Aquatic Plants	Dragonfly Pond	0.00E+00	0.00E+00	9.89E+00	0.00E+00	4.88E-04	3.61E-05	0.00E+00	5.56E-05	0.00E+00	0.00E+00	0.00E+00	2.99E+00
Frogs	Dragonfly Pond	0.00E+00	0.00E+00	9.56E+00	0.00E+00	3.34E-05	5.74E-04	0.00E+00	8.84E-04	0.00E+00	0.00E+00	0.00E+00	2.99E+00
Turtles	Dragonfly Pond	0.00E+00	0.00E+00	9.56E+00	0.00E+00	3.34E-05	5.74E-04	0.00E+00	8.84E-04	0.00E+00	0.00E+00	0.00E+00	2.99E+00
Aquatic Plants	Polliwog Pond	0.00E+00	0.00E+00	9.89E+00	0.00E+00	4.88E-04	3.61E-05	0.00E+00	5.56E-05	0.00E+00	0.00E+00	0.00E+00	2.99E+00
Frogs	Polliwog Pond	0.00E+00	0.00E+00	9.56E+00	0.00E+00	3.34E-05	5.74E-04	0.00E+00	8.84E-04	0.00E+00	0.00E+00	0.00E+00	2.99E+00
Turtles	Polliwog Pond	0.00E+00	0.00E+00	9.56E+00	0.00E+00	3.34E-05	5.74E-04	0.00E+00	8.84E-04	0.00E+00	0.00E+00	0.00E+00	2.99E+00
Aquatic Plants	Treefrog Pond	0.00E+00	0.00E+00	9.89E+00	0.00E+00	4.88E-04	3.61E-05	0.00E+00	5.56E-05	0.00E+00	0.00E+00	0.00E+00	2.99E+00
Frogs	Treefrog Pond	0.00E+00	0.00E+00	9.56E+00	0.00E+00	3.34E-05	5.74E-04	0.00E+00	8.84E-04	0.00E+00	0.00E+00	0.00E+00	2.99E+00
Turtles	Treefrog Pond	0.00E+00	0.00E+00	9.56E+00	0.00E+00	3.34E-05	5.74E-04	0.00E+00	8.84E-04	0.00E+00	0.00E+00	0.00E+00	2.99E+00
Grass	D	3.24E-08	0.00E+00	7.83E+00	0.00E+00	3.62E-03	2.15E-04	0.00E+00	3.39E-04	1.64E-01	0.00E+00	0.00E+00	1.97E+00
Sugar Maple	D	3.24E-09	0.00E+00	7.83E+00	0.00E+00	3.87E-04	2.15E-04	0.00E+00	3.39E-04	1.64E-01	0.00E+00	0.00E+00	1.97E+00
Earthworm	D	3.24E-09	0.00E+00	6.58E+00	0.00E+00	3.77E-04	2.21E-04	0.00E+00	4.15E-04	1.64E-01	0.00E+00	0.00E+00	2.05E+00
American Robin	D	0.00E+00	0.00E+00	8.04E+00	0.00E+00	1.34E-04	1.81E-04	0.00E+00	3.42E-04	0.00E+00	0.00E+00	0.00E+00	8.83E-01
Common Shrew	D	0.00E+00	0.00E+00	1.10E+01	0.00E+00	1.01E-05	2.95E-04	0.00E+00	5.59E-04	0.00E+00	0.00E+00	0.00E+00	2.03E+00
Eastern Cottontail	D	0.00E+00	0.00E+00	1.57E+01	0.00E+00	6.65E-05	2.00E-04	0.00E+00	3.26E-04	5.08E-05	0.00E+00	0.00E+00	2.03E+00
Meadow Vole	D	0.00E+00	0.00E+00	1.57E+01	0.00E+00	2.64E-05	7.97E-05	0.00E+00	1.27E-04	2.41E-05	0.00E+00	0.00E+00	2.03E+00
Raccoon	D	0.00E+00	0.00E+00	1.57E+01	0.00E+00	1.72E-05	2.11E-04	0.00E+00	3.89E-04	0.00E+00	0.00E+00	0.00E+00	2.17E+00
Red Fox	D	0.00E+00	0.00E+00	1.57E+01	0.00E+00	4.31E-06	4.48E-05	0.00E+00	7.39E-05	0.00E+00	0.00E+00	0.00E+00	2.17E+00
Short-tailed Weasel	D	0.00E+00	0.00E+00	1.57E+01	0.00E+00	7.42E-07	4.36E-05	0.00E+00	7.62E-05	0.00E+00	0.00E+00	0.00E+00	2.17E+00
Song Sparrow	D	0.00E+00	0.00E+00	1.46E+01	0.00E+00	1.64E-04	2.22E-04	0.00E+00	3.90E-04	0.00E+00	0.00E+00	0.00E+00	1.41E+00
White-tailed Deer	D	0.00E+00	0.00E+00	1.57E+01	0.00E+00	5.07E-05	2.77E-04	0.00E+00	4.40E-04	8.04E-05	0.00E+00	0.00E+00	1.92E+00
Yellow Warbler	D	0.00E+00	0.00E+00	6.86E+00	0.00E+00	1.72E-04	2.62E-04	0.00E+00	5.00E-04	0.00E+00	0.00E+00	0.00E+00	8.83E-01

Ecological Receptors	Location	Estimated Point Concentrations of Radionuclides in the Tissue of Ecological Receptors (Bq/kg(fw))											
		I-131	I-132	I-133	I-134	I-135	Mn-54	Na-24	OBT	Rb-88d	Sr-91	Y-91	Zn-65
Aquatic Plants	Dragonfly Pond	4.54E-03	0.00E+00	2.81E-03	0.00E+00	1.72E-03	0.00E+00	0.00E+00	4.39E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Frogs	Dragonfly Pond	3.83E-04	0.00E+00	2.37E-04	0.00E+00	1.45E-04	0.00E+00	0.00E+00	5.59E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Turtles	Dragonfly Pond	3.83E-04	0.00E+00	2.37E-04	0.00E+00	1.45E-04	0.00E+00	0.00E+00	5.59E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Aquatic Plants	Polliwog Pond	4.54E-03	0.00E+00	2.81E-03	0.00E+00	1.72E-03	0.00E+00	0.00E+00	4.39E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Frogs	Polliwog Pond	3.83E-04	0.00E+00	2.37E-04	0.00E+00	1.45E-04	0.00E+00	0.00E+00	5.59E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Turtles	Polliwog Pond	3.83E-04	0.00E+00	2.37E-04	0.00E+00	1.45E-04	0.00E+00	0.00E+00	5.59E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Aquatic Plants	Treefrog Pond	4.54E-03	0.00E+00	2.81E-03	0.00E+00	1.72E-03	0.00E+00	0.00E+00	4.39E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Frogs	Treefrog Pond	3.83E-04	0.00E+00	2.37E-04	0.00E+00	1.45E-04	0.00E+00	0.00E+00	5.59E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Turtles	Treefrog Pond	3.83E-04	0.00E+00	2.37E-04	0.00E+00	1.45E-04	0.00E+00	0.00E+00	5.59E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Grass	D	2.58E-01	2.33E-02	1.66E-01	2.32E-02	1.01E-01	0.00E+00	0.00E+00	1.93E-01	9.51E-03	0.00E+00	0.00E+00	0.00E+00
Sugar Maple	D	2.58E-02	2.33E-03	1.66E-02	2.32E-03	1.01E-02	0.00E+00	0.00E+00	1.93E-01	9.51E-03	0.00E+00	0.00E+00	0.00E+00
Earthworm	D	2.59E-02	2.33E-03	1.66E-02	2.32E-03	1.02E-02	0.00E+00	0.00E+00	2.05E-01	9.51E-03	0.00E+00	0.00E+00	0.00E+00
American Robin	D	5.73E-05	0.00E+00	1.81E-05	0.00E+00	2.30E-06	0.00E+00	0.00E+00	6.19E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Common Shrew	D	9.66E-03	0.00E+00	3.06E-03	0.00E+00	3.71E-04	0.00E+00	0.00E+00	1.80E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Eastern Cottontail	D	6.69E-02	5.28E-06	2.11E-02	6.09E-07	2.35E-03	0.00E+00	0.00E+00	1.80E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Meadow Vole	D	2.67E-02	2.15E-06	8.43E-03	2.90E-07	9.73E-04	0.00E+00	0.00E+00	1.80E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Raccoon	D	1.69E-02	0.00E+00	5.34E-03	0.00E+00	6.42E-04	0.00E+00	0.00E+00	1.80E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Red Fox	D	7.34E-03	0.00E+00	2.34E-03	0.00E+00	3.14E-04	0.00E+00	0.00E+00	1.80E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Short-tailed Weasel	D	4.40E-03	0.00E+00	1.41E-03	0.00E+00	2.09E-04	0.00E+00	0.00E+00	1.58E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Song Sparrow	D	6.17E-05	0.00E+00	1.93E-05	0.00E+00	2.62E-06	0.00E+00	0.00E+00	9.90E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
White-tailed Deer	D	5.09E-02	4.52E-06	1.61E-02	9.65E-07	1.81E-03	0.00E+00	0.00E+00	1.57E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Yellow Warbler	D	9.00E-05	0.00E+00	2.85E-05	0.00E+00	3.42E-06	0.00E+00	0.00E+00	6.19E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Note: Estimated concentrations of noble gases in the tissue of ecological receptors are zero, which are not shown in this table.

Table D-9: Estimated Concentrations of Radionuclides for Ecological Receptors at Location E under an Air and Water Release Scenario

Ecological Receptors	Location	Estimated Point Concentrations of Radionuclides in the Tissue of Ecological Receptors (Bq/kg(fw))											
		Ba-137md	Ba-140	C-14	Co-58	Co-60	Cs-134	Cs-136	Cs-137	Cs-138d	Cu-64	Fe-59	HTO
Grass	E	5.83E-08	0.00E+00	1.84E+01	0.00E+00	8.64E-03	5.12E-04	0.00E+00	8.07E-04	2.24E-01	0.00E+00	0.00E+00	4.63E+00
Sugar Maple	E	5.83E-09	0.00E+00	1.84E+01	0.00E+00	9.24E-04	5.12E-04	0.00E+00	8.07E-04	2.24E-01	0.00E+00	0.00E+00	4.63E+00
Earthworm	E	5.83E-09	0.00E+00	1.54E+01	0.00E+00	9.00E-04	5.26E-04	0.00E+00	9.94E-04	2.25E-01	0.00E+00	0.00E+00	4.80E+00
American Robin	E	0.00E+00	1.08E-07	1.89E+01	3.86E-06	3.27E-04	4.39E-04	4.10E-06	8.30E-04	0.00E+00	5.36E-06	5.74E-06	1.37E+00
Bank Swallow	E	0.00E+00	1.35E-07	1.57E+01	4.78E-06	4.16E-04	6.30E-04	5.08E-06	1.21E-03	0.00E+00	6.65E-06	7.12E-06	1.37E+00
Common Shrew	E	0.00E+00	6.61E-08	2.59E+01	1.41E-07	2.45E-05	7.08E-04	2.76E-06	1.35E-03	0.00E+00	7.15E-06	4.75E-06	2.12E+00
Eastern Cottontail	E	0.00E+00	1.56E-07	3.70E+01	3.34E-07	1.59E-04	4.89E-04	6.52E-06	7.96E-04	1.77E-05	1.70E-05	1.12E-05	2.12E+00
Meadow Vole	E	0.00E+00	9.13E-08	3.70E+01	1.95E-07	6.32E-05	1.97E-04	3.81E-06	3.14E-04	2.56E-06	1.76E-06	6.56E-06	2.12E+00
Raccoon	E	0.00E+00	1.95E-07	3.70E+01	4.18E-07	4.19E-05	5.18E-04	8.59E-06	9.54E-04	0.00E+00	2.12E-05	1.45E-05	2.12E+00
Red Fox	E	0.00E+00	1.90E-07	3.70E+01	4.08E-07	1.11E-05	1.23E-04	9.10E-06	2.01E-04	0.00E+00	2.16E-05	1.49E-05	2.12E+00
Short-tailed Weasel	E	0.00E+00	1.18E-07	3.70E+01	2.53E-07	2.28E-06	1.16E-04	6.95E-06	2.01E-04	0.00E+00	1.31E-05	1.07E-05	1.17E+00
Song Sparrow	E	0.00E+00	1.85E-07	3.42E+01	6.58E-06	4.04E-04	5.42E-04	6.99E-06	9.52E-04	0.00E+00	9.15E-06	9.80E-06	2.19E+00
White-tailed Deer	E	0.00E+00	3.07E-07	3.70E+01	6.56E-07	1.22E-04	6.82E-04	1.28E-05	1.08E-03	7.78E-06	3.32E-05	2.20E-05	2.39E+00
Yellow Warbler	E	0.00E+00	1.23E-07	1.61E+01	4.37E-06	4.20E-04	6.33E-04	4.65E-06	1.21E-03	0.00E+00	6.08E-06	6.51E-06	1.37E+00
		I-131	I-132	I-133	I-134	I-135	Na-24	OBT	Rb-88d	Sr-91	Y-91	Zn-65	Zn-69m
Grass	E	6.06E-01	5.60E-02	3.90E-01	5.80E-02	2.40E-01	0.00E+00	0.00E+00	4.54E-01	1.20E-02	0.00E+00	0.00E+00	0.00E+00
Sugar Maple	E	6.06E-02	5.60E-03	3.90E-02	5.80E-03	2.40E-02	0.00E+00	0.00E+00	4.54E-01	1.20E-02	0.00E+00	0.00E+00	0.00E+00
Earthworm	E	6.08E-02	5.62E-03	3.91E-02	5.81E-03	2.41E-02	0.00E+00	0.00E+00	4.82E-01	1.20E-02	0.00E+00	0.00E+00	0.00E+00
American Robin	E	1.35E-04	0.00E+00	4.26E-05	0.00E+00	5.43E-06	1.44E-08	1.55E-05	6.80E-02	0.00E+00	4.67E-08	0.00E+00	1.48E-06
Bank Swallow	E	2.12E-04	0.00E+00	6.72E-05	0.00E+00	8.08E-06	1.79E-08	1.93E-05	6.80E-02	0.00E+00	5.79E-08	0.00E+00	1.84E-06
Common Shrew	E	2.27E-02	0.00E+00	7.21E-03	0.00E+00	8.77E-04	3.78E-07	2.75E-06	1.06E-01	0.00E+00	2.51E-07	0.00E+00	4.17E-05
Eastern Cottontail	E	1.57E-01	1.16E-05	4.97E-02	3.80E-07	5.56E-03	8.91E-07	6.49E-06	1.06E-01	0.00E+00	5.92E-07	0.00E+00	9.84E-05
Meadow Vole	E	6.27E-02	4.54E-06	1.99E-02	5.50E-08	2.30E-03	5.21E-07	3.80E-06	1.06E-01	0.00E+00	3.47E-07	0.00E+00	5.76E-05
Raccoon	E	3.96E-02	0.00E+00	1.26E-02	0.00E+00	1.52E-03	1.12E-06	8.42E-06	1.06E-01	0.00E+00	7.43E-07	0.00E+00	1.72E-04
Red Fox	E	1.72E-02	0.00E+00	5.52E-03	0.00E+00	7.38E-04	1.09E-06	8.70E-06	1.06E-01	0.00E+00	7.28E-07	0.00E+00	2.48E-04
Short-tailed Weasel	E	1.03E-02	0.00E+00	3.33E-03	0.00E+00	4.92E-04	6.76E-07	6.27E-06	2.64E-02	0.00E+00	4.56E-07	0.00E+00	3.00E-04
Song Sparrow	E	1.45E-04	0.00E+00	4.54E-05	0.00E+00	6.15E-06	2.47E-08	2.65E-05	1.09E-01	0.00E+00	7.97E-08	0.00E+00	2.53E-06
White-tailed Deer	E	1.20E-01	8.72E-06	3.78E-02	1.67E-07	4.29E-03	1.75E-06	1.28E-05	1.17E-01	0.00E+00	1.16E-06	0.00E+00	1.93E-04
Yellow Warbler	E	2.11E-04	0.00E+00	6.71E-05	0.00E+00	8.08E-06	1.64E-08	1.76E-05	6.80E-02	0.00E+00	5.30E-08	0.00E+00	1.68E-06

Note: Estimated concentrations of noble gases in the tissue of ecological receptors are zero, which are not shown in this table.

Table D-10: Estimated Concentrations of Radionuclides for Ecological Receptors at Location F (SMR) under an Air and Water Release Scenario

Ecological Receptors	Location	Estimated Point Concentrations of Radionuclides in the Tissue of Ecological Receptors (Bq/kg(fw))											
		Ba-137md	Ba-140	C-14	Co-58	Co-60	Cs-134	Cs-136	Cs-137	Cs-138d	Cu-64	Fe-59	HTO
Grass	F (SMR)	1.09E-07	0.00E+00	8.08E+01	0.00E+00	2.72E-02	1.62E-03	0.00E+00	2.51E-03	3.46E-01	0.00E+00	0.00E+00	2.03E+01
Sugar Maple	F (SMR)	1.09E-08	0.00E+00	8.08E+01	0.00E+00	2.80E-03	1.62E-03	0.00E+00	2.51E-03	3.46E-01	0.00E+00	0.00E+00	2.03E+01
Earthworm	F (SMR)	1.09E-08	0.00E+00	6.78E+01	0.00E+00	2.77E-03	1.64E-03	0.00E+00	2.78E-03	3.46E-01	0.00E+00	0.00E+00	2.11E+01
American Robin	F (SMR)	0.00E+00	1.08E-07	8.29E+01	3.86E-06	9.05E-04	1.35E-03	4.10E-06	2.30E-03	0.00E+00	5.36E-06	5.74E-06	5.96E+00
Bank Swallow	F (SMR)	0.00E+00	1.35E-07	6.90E+01	4.78E-06	1.22E-03	1.94E-03	5.08E-06	3.32E-03	0.00E+00	6.65E-06	7.12E-06	5.96E+00
Common Shrew	F (SMR)	0.00E+00	6.61E-08	1.14E+02	1.41E-07	7.37E-05	2.19E-03	2.76E-06	3.73E-03	0.00E+00	7.15E-06	4.75E-06	9.07E+00
Eastern Cottontail	F (SMR)	0.00E+00	1.56E-07	1.62E+02	3.34E-07	4.97E-04	1.51E-03	6.52E-06	2.39E-03	1.24E-05	1.70E-05	1.12E-05	9.07E+00
Meadow Vole	F (SMR)	0.00E+00	9.13E-08	1.62E+02	1.95E-07	1.98E-04	6.06E-04	3.81E-06	9.46E-04	1.80E-06	1.76E-06	6.56E-06	9.07E+00
Raccoon	F (SMR)	0.00E+00	1.95E-07	1.62E+02	4.18E-07	1.24E-04	1.58E-03	8.59E-06	2.66E-03	0.00E+00	2.12E-05	1.45E-05	9.08E+00
Red Fox	F (SMR)	0.00E+00	1.90E-07	1.62E+02	4.08E-07	3.26E-05	3.52E-04	9.10E-06	5.57E-04	0.00E+00	2.16E-05	1.49E-05	9.07E+00
Short-tailed Weasel	F (SMR)	0.00E+00	1.18E-07	1.62E+02	2.53E-07	4.33E-06	3.38E-04	6.95E-06	5.50E-04	0.00E+00	1.31E-05	1.07E-05	4.81E+00
Song Sparrow	F (SMR)	0.00E+00	1.85E-07	1.50E+02	6.58E-06	1.12E-03	1.67E-03	6.99E-06	2.74E-03	0.00E+00	9.15E-06	9.80E-06	9.54E+00
White-tailed Deer	F (SMR)	0.00E+00	3.07E-07	1.62E+02	6.56E-07	3.79E-04	2.10E-03	1.28E-05	3.28E-03	5.45E-06	3.32E-05	2.20E-05	1.03E+01
Yellow Warbler	F (SMR)	0.00E+00	1.23E-07	7.08E+01	4.37E-06	1.23E-03	1.95E-03	4.65E-06	3.33E-03	0.00E+00	6.08E-06	6.51E-06	5.96E+00
		I-131	I-132	I-133	I-134	I-135	Na-24	OBT	Rb-88d	Sr-91	Y-91	Zn-65	Zn-69m
Grass	F (SMR)	2.60E+00	2.43E-01	1.67E+00	2.56E-01	1.03E+00	0.00E+00	0.00E+00	1.99E+00	1.79E-02	0.00E+00	0.00E+00	0.00E+00
Sugar Maple	F (SMR)	2.60E-01	2.43E-02	1.67E-01	2.56E-02	1.03E-01	0.00E+00	0.00E+00	1.99E+00	1.79E-02	0.00E+00	0.00E+00	0.00E+00
Earthworm	F (SMR)	2.61E-01	2.44E-02	1.68E-01	2.57E-02	1.04E-01	0.00E+00	0.00E+00	2.12E+00	1.79E-02	0.00E+00	0.00E+00	0.00E+00
American Robin	F (SMR)	5.77E-04	0.00E+00	1.83E-04	0.00E+00	2.34E-05	1.44E-08	1.55E-05	2.92E-01	0.00E+00	4.67E-08	0.00E+00	1.48E-06
Bank Swallow	F (SMR)	9.08E-04	0.00E+00	2.88E-04	0.00E+00	3.49E-05	1.79E-08	1.93E-05	2.92E-01	0.00E+00	5.79E-08	0.00E+00	1.84E-06
Common Shrew	F (SMR)	9.73E-02	0.00E+00	3.09E-02	0.00E+00	3.79E-03	3.78E-07	2.75E-06	4.36E-01	0.00E+00	2.51E-07	0.00E+00	4.17E-05
Eastern Cottontail	F (SMR)	6.74E-01	5.04E-05	2.13E-01	1.69E-06	2.39E-02	8.91E-07	6.49E-06	4.36E-01	0.00E+00	5.92E-07	0.00E+00	9.84E-05
Meadow Vole	F (SMR)	2.69E-01	1.97E-05	8.53E-02	2.44E-07	9.93E-03	5.21E-07	3.80E-06	4.36E-01	0.00E+00	3.47E-07	0.00E+00	5.76E-05
Raccoon	F (SMR)	1.70E-01	0.00E+00	5.39E-02	0.00E+00	6.54E-03	1.12E-06	8.42E-06	4.36E-01	0.00E+00	7.43E-07	0.00E+00	1.72E-04
Red Fox	F (SMR)	7.39E-02	0.00E+00	2.37E-02	0.00E+00	3.19E-03	1.09E-06	8.70E-06	4.36E-01	0.00E+00	7.28E-07	0.00E+00	2.48E-04
Short-tailed Weasel	F (SMR)	4.42E-02	0.00E+00	1.43E-02	0.00E+00	2.13E-03	6.76E-07	6.27E-06	8.49E-02	0.00E+00	4.56E-07	0.00E+00	3.00E-04
Song Sparrow	F (SMR)	6.21E-04	0.00E+00	1.95E-04	0.00E+00	2.66E-05	2.47E-08	2.65E-05	4.67E-01	0.00E+00	7.97E-08	0.00E+00	2.53E-06
White-tailed Deer	F (SMR)	5.13E-01	3.78E-05	1.62E-01	7.42E-07	1.85E-02	1.75E-06	1.28E-05	4.90E-01	0.00E+00	1.16E-06	0.00E+00	1.93E-04
Yellow Warbler	F (SMR)	9.06E-04	0.00E+00	2.88E-04	0.00E+00	3.48E-05	1.64E-08	1.76E-05	2.92E-01	0.00E+00	5.30E-08	0.00E+00	1.68E-06

Note: Estimated concentrations of noble gases in the tissue of ecological receptors are zero, which are not shown in this table.

Table D-11: Estimated Radiation Dose for Ecological Receptors under an Air and Water Release Scenario

Estimated Radiation Dose for Ecological Receptors (mGy/d)

Ecological Receptors	Location	Ba-140	C-14	Co-58	Co-60	Cs-134	Cs-136	Cs-137	Cu-64	Fe-59	HTO	I-131	I-132	I-133	I-134	I-135
Benthic Invertebrates	Lake Ontario	1.76E-06	0.00E+00	7.26E-06	3.52E-05	1.79E-06	1.43E-06	1.11E-06	2.69E-07	1.73E-06	2.51E-08	1.03E-07	0.00E+00	3.49E-07	0.00E+00	0.00E+00
Alewife	Lake Ontario	4.58E-09	0.00E+00	8.22E-09	3.73E-08	7.28E-07	4.62E-07	9.98E-07	7.57E-08	5.48E-08	2.51E-08	4.95E-10	0.00E+00	1.67E-09	0.00E+00	0.00E+00
Lake Trout	Lake Ontario	4.58E-09	0.00E+00	8.22E-09	3.73E-08	7.28E-07	4.62E-07	9.98E-07	7.57E-08	5.48E-08	2.51E-08	4.95E-10	0.00E+00	1.67E-09	0.00E+00	0.00E+00
American Eel	Lake Ontario	3.20E-07	0.00E+00	1.63E-06	8.15E-06	1.11E-06	7.58E-07	1.21E-06	1.25E-07	2.91E-07	2.51E-08	2.10E-08	0.00E+00	5.87E-08	0.00E+00	0.00E+00
Round Whitefish	Lake Ontario	3.20E-07	0.00E+00	1.63E-06	8.15E-06	1.11E-06	7.58E-07	1.21E-06	1.26E-07	2.91E-07	2.51E-08	2.10E-08	0.00E+00	5.87E-08	0.00E+00	0.00E+00
White Sucker	Lake Ontario	3.20E-07	0.00E+00	1.63E-06	8.15E-06	1.11E-06	7.58E-07	1.21E-06	1.26E-07	2.91E-07	2.51E-08	2.10E-08	0.00E+00	5.87E-08	0.00E+00	0.00E+00
Bufflehead	Lake Ontario Shore	1.82E-07	0.00E+00	9.93E-07	4.74E-06	2.58E-07	1.92E-07	1.53E-07	1.52E-08	2.72E-07	1.39E-08	1.29E-08	0.00E+00	3.55E-08	0.00E+00	6.24E-12
Mallard	Lake Ontario	1.82E-07	0.00E+00	9.99E-07	4.77E-06	2.63E-07	1.96E-07	1.60E-07	1.57E-08	2.62E-07	1.39E-08	1.29E-08	0.00E+00	3.55E-08	0.00E+00	6.56E-12
Aquatic Plants	Coot's Pond	0.00E+00	5.38E-06	0.00E+00	7.21E-08	2.71E-09	0.00E+00	1.77E-09	0.00E+00	0.00E+00	3.31E-07	7.14E-08	3.01E-08	7.62E-08	3.37E-08	1.36E-07
Benthic Invertebrates	Coot's Pond	0.00E+00	5.05E-06	0.00E+00	2.79E-07	1.08E-08	0.00E+00	6.74E-09	0.00E+00	0.00E+00	3.32E-07	2.67E-07	1.35E-07	3.21E-07	1.38E-07	5.18E-07
Dace	Coot's Pond	0.00E+00	5.20E-06	0.00E+00	6.46E-08	6.71E-09	0.00E+00	7.35E-09	0.00E+00	0.00E+00	3.31E-07	5.43E-08	2.64E-08	5.40E-08	2.67E-08	1.01E-07
Frogs	Coot's Pond	0.00E+00	5.20E-06	0.00E+00	7.06E-08	4.74E-09	0.00E+00	5.93E-09	0.00E+00	0.00E+00	3.31E-07	6.33E-08	3.11E-08	6.78E-08	2.97E-08	1.11E-07
Turtles	Coot's Pond	0.00E+00	5.20E-06	0.00E+00	7.06E-08	4.74E-09	0.00E+00	5.93E-09	0.00E+00	0.00E+00	3.31E-07	6.33E-08	3.11E-08	6.78E-08	2.67E-08	1.01E-07
Grass	AB	0.00E+00	4.26E-06	0.00E+00	5.18E-07	8.98E-09	0.00E+00	4.47E-08	0.00E+00	0.00E+00	2.18E-07	5.64E-07	1.17E-07	7.14E-07	6.62E-08	4.83E-07
Earthworm	AB	0.00E+00	3.58E-06	0.00E+00	1.42E-07	2.87E-09	0.00E+00	1.28E-08	0.00E+00	0.00E+00	2.27E-07	6.01E-08	1.27E-08	7.29E-08	5.88E-09	4.87E-08
American Robin	AB	0.00E+00	4.37E-06	0.00E+00	1.08E-07	2.81E-09	0.00E+00	1.03E-08	0.00E+00	0.00E+00	9.78E-08	2.11E-09	7.28E-10	1.63E-09	3.59E-10	1.32E-09
Bank Swallow	AB	0.00E+00	3.64E-06	0.00E+00	5.46E-08	2.42E-09	0.00E+00	6.96E-09	0.00E+00	0.00E+00	9.78E-08	1.23E-09	3.64E-10	9.24E-10	1.79E-10	6.82E-10
Bufflehead AB	AB	0.00E+00	5.25E-06	0.00E+00	3.76E-08	1.57E-09	0.00E+00	9.44E-10	0.00E+00	0.00E+00	1.36E-07	3.35E-08	1.60E-08	3.26E-08	7.88E-09	2.82E-08
Common Shrew	AB	0.00E+00	6.00E-06	0.00E+00	2.26E-07	4.83E-09	0.00E+00	2.05E-08	0.00E+00	0.00E+00	2.24E-07	2.89E-08	1.54E-09	1.90E-08	7.30E-10	6.95E-09
Eastern Cottontail	AB	0.00E+00	8.57E-06	0.00E+00	2.26E-07	4.39E-09	0.00E+00	1.93E-08	0.00E+00	0.00E+00	2.24E-07	1.76E-07	1.58E-09	1.12E-07	7.36E-10	3.01E-08
Green Heron	AB	0.00E+00	5.21E-06	0.00E+00	3.76E-08	4.49E-09	0.00E+00	4.77E-09	0.00E+00	0.00E+00	1.36E-07	3.35E-08	1.60E-08	3.26E-08	7.88E-09	2.82E-08
Mallard AB	AB	0.00E+00	5.25E-06	0.00E+00	3.80E-08	1.61E-09	0.00E+00	1.00E-09	0.00E+00	0.00E+00	1.36E-07	3.35E-08	1.60E-08	3.27E-08	7.88E-09	2.82E-08
Meadow Vole	AB	0.00E+00	8.57E-06	0.00E+00	2.26E-07	3.83E-09	0.00E+00	1.83E-08	0.00E+00	0.00E+00	2.24E-07	7.26E-08	1.56E-09	4.68E-08	7.33E-10	1.40E-08
Muskrat	AB	0.00E+00	8.66E-06	0.00E+00	1.58E-07	6.10E-09	0.00E+00	3.77E-09	0.00E+00	0.00E+00	2.82E-07	1.48E-07	6.76E-08	1.42E-07	3.21E-08	1.22E-07
Raccoon Poly AB	AB	0.00E+00	8.57E-06	0.00E+00	2.26E-07	4.28E-09	0.00E+00	1.93E-08	0.00E+00	0.00E+00	2.82E-07	6.53E-08	1.54E-09	4.22E-08	7.30E-10	1.30E-08
Red Fox AB	AB	0.00E+00	8.57E-06	0.00E+00	1.84E-07	3.02E-09	0.00E+00	1.57E-08	0.00E+00	0.00E+00	2.24E-07	1.93E-08	1.30E-09	1.30E-08	7.66E-10	5.90E-09
Short-tailed Weasel	AB	0.00E+00	8.57E-06	0.00E+00	2.26E-07	3.67E-09	0.00E+00	1.81E-08	0.00E+00	0.00E+00	2.40E-07	1.54E-08	1.54E-09	1.05E-08	7.30E-10	5.05E-09
Song Sparrow	AB	0.00E+00	7.93E-06	0.00E+00	1.72E-07	4.09E-09	0.00E+00	1.56E-08	0.00E+00	0.00E+00	1.56E-07	3.29E-09	1.16E-09	2.55E-09	5.74E-10	2.10E-09
White-tailed Deer	AB	0.00E+00	8.57E-06	0.00E+00	1.17E-07	6.38E-09	0.00E+00	1.28E-08	0.00E+00	0.00E+00	2.12E-07	4.61E-07	9.06E-10	2.65E-07	4.89E-10	3.97E-08
Yellow Warbler	AB	0.00E+00	3.73E-06	0.00E+00	5.46E-08	2.43E-09	0.00E+00	6.97E-09	0.00E+00	0.00E+00	9.78E-08	1.23E-09	3.64E-10	9.23E-10	1.79E-10	6.82E-10
Grass	C	0.00E+00	4.35E-06	0.00E+00	4.62E-07	8.04E-09	0.00E+00	3.99E-08	0.00E+00	0.00E+00	2.23E-07	5.70E-07	1.21E-07	7.24E-07	7.15E-08	4.93E-07
Earthworm	C	0.00E+00	3.65E-06	0.00E+00	1.27E-07	2.59E-09	0.00E+00	1.14E-08	0.00E+00	0.00E+00	2.31E-07	6.08E-08	1.32E-08	7.39E-08	6.35E-09	4.97E-08
American Robin	C	0.00E+00	4.46E-06	0.00E+00	9.61E-08	2.56E-09	0.00E+00	9.29E-09	0.00E+00	0.00E+00	8.08E-08	2.14E-09	7.57E-10	1.66E-09	3.88E-10	1.35E-09
Common Shrew	C	0.00E+00	6.12E-06	0.00E+00	2.01E-07	4.37E-09	0.00E+00	1.84E-08	0.00E+00	0.00E+00	1.58E-07	2.93E-08	1.60E-09	1.93E-08	7.90E-10	7.10E-09
Eastern Cottontail	C	0.00E+00	8.74E-06	0.00E+00	2.01E-07	3.96E-09	0.00E+00	1.72E-08	0.00E+00	0.00E+00	1.58E-07	1.78E-07	1.64E-09	1.14E-07	7.94E-10	3.07E-08
Meadow Vole	C	0.00E+00	8.74E-06	0.00E+00	2.01E-07	3.44E-09	0.00E+00	1.64E-08	0.00E+00	0.00E+00	1.58E-07	7.34E-08	1.62E-09	4.75E-08	7.91E-10	1.43E-08
Raccoon	C	0.00E+00	8.74E-06	0.00E+00	2.01E-07	4.01E-09	0.00E+00	1.76E-08	0.00E+00	0.00E+00	1.58E-07	7.21E-08	1.60E-09	4.66E-08	7.90E-10	1.41E-08
Red Fox	C	0.00E+00	8.74E-06	0.00E+00	1.64E-07	2.75E-09	0.00E+00	1.41E-08	0.00E+00	0.00E+00	1.58E-07	2.27E-08	1.35E-09	1.52E-08	8.29E-10	6.54E-09
Short-tailed Weasel	C	0.00E+00	8.74E-06	0.00E+00	2.01E-07	3.28E-09	0.00E+00	1.62E-08	0.00E+00	0.00E+00	1.40E-07	1.56E-08	1.60E-09	1.06E-08	7.90E-10	5.16E-09
Song Sparrow	C	0.00E+00	8.08E-06	0.00E+00	1.53E-07	3.72E-09	0.00E+00	1.40E-08	0.00E+00	0.00E+00	1.29E-07	3.33E-09	1.21E-09	2.59E-09	6.21E-10	2.14E-09
White-tailed Deer	C	0.00E+00	8.74E-06	0.00E+00	1.05E-07	5.94E-09	0.00E+00	1.16E-08	0.00E+00	0.00E+00	1.59E-07	4.66E-07	9.31E-10	2.69E-07	5.23E-10	4.05E-08
Yellow Warbler	C	0.00E+00	3.81E-06	0.00E+00	4.87E-08	2.25E-09	0.00E+00	6.32E-09	0.00E+00	0.00E+00	8.08E-08	1.24E-09	3.78E-10	9.38E-10	1.94E-10	6.97E-10
Aquatic Plants	Dragonfly Pond	0.00E+00	6.73E-06	0.00E+00	4.62E-08	1.74E-09	0.00E+00	1.13E-09	0.00E+00	0.00E+00	4.14E-07	8.70E-08	3.92E-08	9.34E-08	4.86E-08	1.70E-07
Frogs	Dragonfly Pond	0.00E+00	6.50E-06	0.00E+00	4.52E-08	3.04E-09	0.00E+00	3.80E-09	0.00E+00	0.00E+00	4.14E-07	7.71E-08	4.04E-08	8.31E-08	4.28E-08	1.39E-07
Turtles	Dragonfly Pond	0.00E+00	6.50E-06	0.00E+00	4.52E-08	3.04E-09	0.00E+00	3.80E-09	0.00E+00	0.00E+00	4.14E-07	7.71E-08	4.04E-08	8.31E-08	3.85E-08	1.26E-07
Aquatic Plants	Polliwog Pond	0.00E+00	6.73E-06	0.00E+00	4.62E-08	1.74E-09	0.00E+00	1.13E-09	0.00E+00	0.00E+00	4.14E-07	8.70E-08	3.92E-08	9.34E-08	4.86E-08	1.70E-07
Frogs	Polliwog Pond	0.00E+00	6.50E-06	0.00E+00	4.52E-08	3.04E-09	0.00E+00	3.80E-09	0.00E+00	0.00E+00	4.14E-07	7.71E-08	4.04E-08	8.31E-08	4.28E-08	1.39E-07
Turtles	Polliwog Pond	0.00E+00	6.50E-06	0.00E+00	4.52E-08	3.04E-09	0.00E+00	3.80E-09	0.00E+00	0.00E+00	4.14E-07	7.71E-08	4.04E-08	8.31E-08	3.85E-08	1.26E-07
Aquatic Plants	Treefrog Pond	0.00E+00	6.73E-06	0.00E+00	4.62E-08	1.74E-09	0.00E+00	1.13E-09	0.00E+00	0.00E+00	4.14E-07	8.70E-08	3.92E-08	9.34E-08	4.86E-08	1.70E-07
Frogs	Treefrog Pond	0.00E+00	6.50E-06	0.00E+00	4.52E-08	3.04E-09	0.00E+00	3.80E-09	0.00E+00	0.00E+00	4.14E-07	7.71E-08	4.04E-08	8.31E-08	4.28E-08	1.39E-07
Turtles	Treefrog Pond	0.00E+00	6.50E-06	0.00E+00	4.52E-08	3.04E-09	0.00E+00	3.80E-09	0.00E+00	0.00E+00	4.14E-07	7.71E-08	4.04E-08	8.31E-08	3.85E-08	1.26E-07
Grass	D	0.00E+00	5.33E-06	0.00E+00	3.34E-07	5.91E-09	0.00E+00	2.89E-08	0.00E+00	0.00E+00	2.73E-07	6.82E-07	1.51E-07	8.70E-07	9.48E-08	5.98E-07
Sugar Maple	D	0.00E+00	5.33E-06	0.00E+00	1.06E-07	4.60E-09	0.00E+00	1.05E-08	0.00E+00	0.00E+00	2.73E-07	1.56E-07	5.73E-08	1.68E-07	1.02E-08	6.20E-08
Earthworm	D	0.00E+00	4.47E-06	0.00E+00	9.15E-08	2.00E-09	0.00E+00	8.51E-09	0.00E+00	0.00E+00	2.83E-07	7.27E-08	1.64E-08	8.88E-08	8.43E-09	6.03E-08
American Robin	D	0.00E+00	5.47E-06	0.00E+00	6.93E-08	2.07E-09	0.00E+00	6.97E-09	0.00E+00	0.00E+00	1.22E-07	2.57E-09	9.46E-10	2.00E-09	5.17E-10	1.64E-09
Common Shrew	D	0.00E+00	7.49E-06	0.00E+00	1.45E-07	3.43E-09	0.00E+00	1.37E-08	0.00E+00	0.00E+00	2.80E-07	3.50E-08	2.00E-09	2.32E-08	1.05E-09	8.64E-09
Eastern Cottontail	D	0.00E+00	1.07E-05	0.00E+00	1.45E-07	3.04E-09	0.00E+00	1.27E-08	0.00E+00	0.00E+00	2.80E-07	2.13E-07	2.05E-09	1.37E-07	1.06E-09	3.73E-08
Meadow Vole	D	0.00E+00	1.07E-05	0.00E+00	1.45E-07	2.55E-09	0.00E+00	1.19E-08	0.00E+00	0.00E+00	2.80E-07	8.78E-08	2.02E-09	5.70E-08	1.06E-09	1.74E-08
Raccoon	D	0.00E+00	1.07E-05	0.00E+00	1.45E-07	3.09E-09	0.00E+00	1.30E-08	0.00E+00	0.00E+00	3.00E-07	5.74E-08	2.00E-09	3.75E-08	1.05E-09	1.26E-08
Red Fox	D	0.00E+00	1.07E-05	0.00E+00	1.18E-07	2.02E-09	0.00E+00	1.02E-08	0.00E+00	0.00E+00	3.00E-07	2.72E-08	1.68E-09	1.83E-08	1.11E-09	7.99E-09
Short-tailed Weasel	D	0.00E+00	1.07E-05	0.00E+00	1.45E-07	2.40E-09	0.00E+00	1.17E-08	0.00E+00	0.00E+00	3.00E-07	1.87E-08	2.00E-09	1.28E-08	1.05E-09	6.30E-09
Song Sparrow	D	0.00E+00	9.90E-06	0.00E+00	1.11E-07	2.96E-09	0.00E+00	1.04E-08	0.00E+00	0.00E+00	1.95E-07	4.00E-09	1.51E-09	3.13E-09	8.27E-10	2.61E-09
White-tailed Deer	D	0.00E+00	1.07E-05	0.00E+00	7.48E-08	5.28E-09	0.00E+00	9.17E-09	0.00E+00	0.00E+00	2.65E-07	3.08E-07	1.10E-09	1.79E-07	7.05E-10	2.85E-08
Yellow Warbler	D	0.00E+00	4.67E-06	0.00E+00	3.52E-08	1.94E-09	0.00E+00	4.97E-09	0.00E+00	0.00E+00	1.22E-07	1.49E-09	4.73E-10	1.13E-09	2.59E-10	8.49E-10
Grass	E	0.00E+00	1.25E-05	0.00E+00	8.13E-07	1.44E-08	0.00E+00	7.05E-08	0.00E+00	0.00E+00	6.40E-07	1.60E-06	3.64E-07	2.05E-06	2.37E-07	1.42E-06
Sugar Maple	E	0.00E+00	1.25E-05	0.00E+00	2.58E-07	1.11E-08	0.00E+00	2.54E-08	0.00E+00	0.00E+00	6.40E-07	3.66E-07	1.38E-07	3.97E-07	2.54E-08	1.47E-07
Earthworm	E	0.00E+00	1.05E-05	0.00E+00	2.23E-07	4.84E-09	0.00E+00	2.07E-08	0.00E+00	0.00E+00	6.64E-07	1.71E-07	3.95E-08	2.09E-07	2.11E-08	1.43E-07
American Robin	E	1.95E-12	1.28E-05	9.25E-12	1.69E-07	5.03E-09	2.46E-11	1.70E-08	1.12E-11	2.13E-11	1.90E-07	6.03E-09	2.28E-09	4.70E-09	1.29E-09	3.89E-09
Bank Swallow	E	2.42E-12	1.07E-05	1.15E-11	8.58E-08	4.69E-09	3.05E-11	1.21E-08	1.39E-11	2.65E-11	1.90E-07	3.50E-09	1.14E-09	2.66E-09	6.47E-10	2.01E-09
Common Shrew	E	1.06E-12	1.76E-05	2.40E-13	3.53E-07	8.32E-09	1.24E-11	3.32E-08	1.64E-11	2.27E-11	2.93E-07	8.23E-08	4.82E-09	5.46E-08	2.63E-09	2.05E-08
Eastern Cottontail	E	2.50E-12	2.51E-05	5.67E-13	3.53E-07	7.42E-09	2.93E-11	3.10E-08	3.90E-11	5.35E-11	2.93E-07	5.00E-07	4.93E-09	3.22E-07	2.64E-09	8.83E-08
Meadow Vole	E	1.46E-12	2.51E-05	3.32E-13	3.53E-07	6.22E-09	1.72E-11	2.90E-08	4.02E-12	3.13E-11	2.93E-07	2.06E-07	4.87E-09	1.34E-07	2.64E-09	4.11E-08
Raccoon	E	3.12E-12	2.51E-05	7.10E-13	3.53E-07	7.54E-09	3.87E-11	3.16E-08	4.85E-11	6.92E-11	2.93E-07	1.35E-07	4.82E-09	8.84E-08	2.63E-09	2.97E-08
Red Fox	E	3.04E-12	2.51E-05	6.93E-13	2.88E-07	4.98E-09	4.10E-11	2.49E-08	4.95E-11	7.12E-11	2.93E-07	6.39E-08	4.05E-09	4.31E-08	2.77E-09	1.88E-08
Short-tailed Weasel	E	1.88E-12	2.51E-05	4.30E-13	3.52E-07	5.89E-09	3.13E-11	2.85E-08	3.00E-11	5.09E-11	1.62E-07	4.39E-08	4.82E-09	3.02E-08	2.63E-09	1.49E-08
Song Sparrow	E	3.33E-12	2.32E-05	1.58E-11	2.69E-07	7.21E-09	4.20E-11	2.55E-08	1.91E-11	3.64E-11	3.03E-07	9.40E-09	3.65E-09	7.37E-09	2.07E-09	6.18E-09
White-tailed Deer	E	1.07E-11	2.51E-05	5.57E-12	1.82E-07	1.30E-08	2.56E-10	2.24E-08	7.58E-11	1.05E-10	3.30E-07	7.24E-07	2.60E-09	4.21E-07	1.73E-09	6.75E-08
Yellow Warbler	E	2.21E-12	1.09E-05	1.05E-11	8.59E-08	4.71E-09	2.79E-11	1.21E-08	1.27E-11	2.42E-11	1.90E-07	3.50E-09	1.14E-09	2.66E-09	6.47E-10	2.01E-09
Grass	F (SMR)	0.00E+00	5.49E-05	0.00E+00	1.20E-06	2.29E-08	0.00E+00	1.06E-07	0.00E+00	0.00E+00	2.81E-06	6.87E-06	1.58E-06	8.80E-06	1.05E-06	6.10E-06
Sugar Maple	F (SMR)	0.00E+00	5.49E-05	0.00E+00	3.97E-07	2.82E-08	0.00E+00	4.70E-08	0.00E+00	0.00E+00	2.81E-06	1.57E-06	5.98E-07	1.70E-06	1.13E-07	6.32E-07
Earthworm	F (SMR)	0.00E+00	4.61E-05	0.00E+00	3.23E-07	9.25E-09	0.00E+00	3.43E-08	0.00E+00	0.00E+00	2.92E-06	7.33E-07	1.71E-07	8.98E-07	9.34E-08	6.15E-07
American Robin	F (SMR)	1.95E-12	5.63E-05	9.25E-12	2.45E-07	1.10E-08	2.46E-11	2.94E-08	1.12E-11	2.13E-11	8.24E-07	2.60E-08	9.93E-09	2.03E-08	5.75E-09	1.68E-08
Bank Swallow	F (SMR)	2.42E-12	4.69E-05	1.15E-11	1.27E-07	1.22E-08	3.05E-11	2.44E-08	1.39E-11	2.65E-11	8.24E-07	1.51E-08	4.97E-09	1.15E-08	2.88E-09	8.70E-09
Common Shrew	F (SMR)	1.06E-12	7.73E-05	2.40E-13	5.07E-07	1.68E-08	1.24E-11	5.52E-08	1.64E-11	2.27E-11	1.25E-06	3.53E-07	2.10E-08	2.35E-07	1.17E-08	8.83E-08
Eastern Cottontail	F (SMR)	2.50E-12	1.10E-04	5.67E-13	5.09E-07	1.40E-08	2.93E-11	4.97E-08	3.90E-11	5.35E-11	1.25E-06	2.14E-06	2.15E-08	1.38E-06	1.17E-08	3.80E-07
Meadow Vole	F (SMR)	1.46E-12	1.10E-04	3.32E-13	5.08E-07	1.03E-08	1.72E-11	4.37E-08	4.02E-12	3.13E-11	1.25E-06	8.85E-07	2.12E-08	5.77E-07	1.17E-08	1.77E-07
Raccoon	F (SMR)	3.12E-12	1.10E-04	7.10E-13	5.08E-07	1.43E-08	3.87E-11	5.08E-08	4.85E-11	6.92E-11	1.26E-06	5.78E-07	2.10E-08	3.80E-07	1.17E-08	1.28E-07
Red Fox	F (SMR)	3.04E-12	1.10E-04	6.93E-13	4.14E-07	7.88E-09	4.10E-11	3.70E-08	4.95E-11	7.12E-11	1.25E-06	2.74E-07	1.77E-08	1.85E-07	1.23E-08	8.15E-08
Short-tailed Weasel	F (SMR)	1.88E-12	1.10E-04	4.30E-13	5.07E-07	9.18E-09	3.13E-11	4.21E-08	3.00E-11	5.09E-11	6.64E-07	1.88E-07	2.10E-08	1.30E-07	1.17E-08	6.44E-08
Song Sparrow	F (SMR)	3.33E-12	1.02E-04	1.58E-11	3.91E-07	1.51E-08	4.20E-11	4.28E-08	1.91E-11	3.64E-11	1.32E-06	4.05E-08	1.59E-08	3.18E-08	9.21E-09	2.67E-08
White-tailed Deer	F (SMR)	1.07E-11	1.10E-04	5.57E-12	2.66E-07	3.55E-08	2.56E-10	4.64E-08	7.58E-11	1.05E-10	1.42E-06	3.10E-06	1.13E-08	1.81E-06	7.70E-09	2.91E-07
Yellow Warbler	F (SMR)	2.21E-12	4.81E-05	1.05E-11	1.27E-07	1.23E-08	2.79E-11	2.45E-08	1.27E-11	2.42E-11	8.24E-07	1.51E-08	4.97E-09	1.15E-08	2.88E-09	8.70E-09

Ecological Receptors	Location	Kr-85	Kr-85m	Kr-87	Kr-88	Mn-54	OBT	Sr-91	Xe-131md	Xe-133	Xe-133dd	Xe-133md	Xe-135	Xe-135d	Xe-135dd	Xe-135m	Xe-135md	Xe-138	Zn-65	Zn-69m	Total Dose
Benthic Invertebrates	Lake Ontario	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.60E-05	4.69E-09	5.54E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.07E-08	4.68E-07	8.76E-05
Alewife	Lake Ontario	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.45E-08	4.68E-09	1.27E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.74E-07	2.12E-06	4.84E-06
Lake Trout	Lake Ontario	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.45E-08	4.68E-09	1.27E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.74E-07	2.12E-06	4.84E-06
American Eel	Lake Ontario	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.85E-06	4.68E-09	5.66E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.83E-07	2.13E-06	2.40E-05
Round Whitefish	Lake Ontario	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.85E-06	4.68E-09	5.61E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.83E-07	2.15E-06	2.40E-05
White Sucker	Lake Ontario	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.85E-06	4.68E-09	5.61E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.83E-07	2.15E-06	2.40E-05
Bufflehead	Lake Ontario Shore	8.71E-08	2.04E-09	4.71E-08	1.26E-07	4.84E-06	1.10E-09	1.59E-09	7.68E-16	1.35E-08	7.33E-17	2.04E-14	8.72E-08	1.15E-09	5.92E-12	8.21E-08	5.07E-11	1.39E-06	1.59E-08	7.99E-08	1.36E-05
Mallard	Lake Ontario	8.71E-08	2.04E-09	4.71E-08	1.26E-07	4.84E-06	1.10E-09	1.57E-09	7.68E-16	1.35E-08	7.33E-17	2.04E-14	8.72E-08	1.15E-09	5.92E-12	8.21E-08	5.07E-11	1.39E-06	1.53E-08	7.54E-08	1.37E-05
Aquatic Plants	Coot's Pond	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.86E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.18E-06
Benthic Invertebrates	Coot's Pond	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.20E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.12E-06
Dace	Coot's Pond	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.18E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.93E-06
Frogs	Coot's Pond	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.18E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.98E-06
Turtles	Coot's Pond	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.18E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.96E-06
Grass	AB	4.73E-08	1.56E-09	4.07E-08	1.23E-07	0.00E+00	2.14E-12	0.00E+00	9.30E-16	6.50E-09	5.87E-17	2.50E-14	4.86E-08	7.65E-10	4.41E-12	5.49E-08	5.04E-11	1.05E-06	0.00E+00	0.00E+00	8.37E-06
Earthworm	AB	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.27E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.19E-06
American Robin	AB	9.72E-08	2.24E-09	5.00E-08	1.37E-07	0.00E+00	6.85E-09	0.00E+00	1.13E-15	1.51E-08	1.36E-16	3.00E-14	9.66E-08	1.52E-09	8.75E-12	7.32E-08	6.72E-11	1.22E-06	0.00E+00	0.00E+00	6.29E-06
Bank Swallow	AB	9.72E-08	2.24E-09	5.00E-08	1.37E-07	0.00E+00	6.85E-09	0.00E+00	1.13E-15	1.51E-08	1.36E-16	3.00E-14	9.66E-08	1.52E-09	8.75E-12	7.32E-08	6.72E-11	1.22E-06	0.00E+00	0.00E+00	5.50E-06
Bufflehead AB	AB	4.86E-08	1.12E-09	2.50E-08	6.87E-08	0.00E+00	9.29E-09	0.00E+00	5.66E-16	7.53E-09	6.79E-17	1.50E-14	4.83E-08	7.60E-10	4.38E-12	3.66E-08	3.36E-11	6.07E-07	0.00E+00	0.00E+00	6.40E-06
Common Shrew	AB	1.15E-08	1.03E-09	1.18E-08	6.91E-08	0.00E+00	1.99E-08	0.00E+00	4.31E-16	1.49E-09	1.34E-17	1.18E-14	1.11E-08	1.74E-10	1.00E-12	3.88E-08	3.56E-11	6.72E-07	0.00E+00	0.00E+00	7.37E-06
Eastern Cottontail	AB	1.15E-08	1.03E-09	1.18E-08	6.91E-08	0.00E+00	1.99E-08	0.00E+00	4.31E-16	1.49E-09	1.34E-17	1.18E-14	1.11E-08	1.74E-10	1.00E-12	3.88E-08	3.56E-11	6.72E-07	0.00E+00	0.00E+00	1.02E-05
Green Heron	AB	4.86E-08	1.12E-09	2.50E-08	6.87E-08	0.00E+00	3.97E-09	0.00E+00	5.66E-16	7.53E-09	6.79E-17	1.50E-14	4.83E-08	7.60E-10	4.38E-12	3.66E-08	3.36E-11	6.07E-07	0.00E+00	0.00E+00	6.36E-06
Mallard AB	AB	4.86E-08	1.12E-09	2.50E-08	6.87E-08	0.00E+00	9.29E-09	0.00E+00	5.66E-16	7.53E-09	6.79E-17	1.50E-14	4.83E-08	7.60E-10	4.38E-12	3.66E-08	3.36E-11	6.07E-07	0.00E+00	0.00E+00	6.40E-06
Meadow Vole	AB	1.15E-08	1.03E-09	1.18E-08	6.91E-08	0.00E+00	1.99E-08	0.00E+00	4.31E-16	1.49E-09	1.34E-17	1.18E-14	1.11E-08	1.74E-10	1.00E-12	3.88E-08	3.56E-11	6.72E-07	0.00E+00	0.00E+00	1.00E-05
Muskrat	AB	1.15E-08	1.03E-09	1.18E-08	6.91E-08	0.00E+00	1.57E-08	0.00E+00	4.31E-16	1.49E-09	1.34E-17	1.18E-14	1.11E-08	1.74E-10	1.00E-12	3.88E-08	3.56E-11	6.72E-07	0.00E+00	0.00E+00	1.04E-05
Raccoon Poly AB	AB	1.15E-08	1.03E-09	1.18E-08	6.91E-08	0.00E+00	2.35E-08	0.00E+00	4.31E-16	1.49E-09	1.34E-17	1.18E-14	1.11E-08	1.74E-10	1.00E-12	3.88E-08	3.56E-11	6.72E-07	0.00E+00	0.00E+00	1.01E-05
Red Fox AB	AB	1.15E-08	1.03E-09	1.18E-08	6.91E-08	0.00E+00	1.99E-08	0.00E+00	4.31E-16	1.49E-09	1.34E-17	1.18E-14	1.11E-08	1.74E-10	1.00E-12	3.88E-08	3.56E-11	6.72E-07	0.00E+00	0.00E+00	9.87E-06
Short-tailed Weasel	AB	1.15E-08	1.03E-09	1.18E-08	6.91E-08	0.00E+00	1.75E-08	0.00E+00	4.31E-16	1.49E-09	1.34E-17	1.18E-14	1.11E-08	1.74E-10	1.00E-12	3.88E-08	3.56E-11	6.72E-07	0.00E+00	0.00E+00	9.93E-06
Song Sparrow	AB	1.55E-07	3.58E-09	8.00E-08	2.20E-07	0.00E+00	1.10E-08	0.00E+00	1.81E-15	2.41E-08	2.17E-16	4.79E-14	1.55E-07	2.43E-09	1.40E-11	1.17E-07	1.07E-10	1.94E-06	0.00E+00	0.00E+00	1.10E-05
White-tailed Deer	AB	1.03E-09	3.96E-10	1.20E-09	2.64E-08	0.00E+00	1.74E-08	0.00E+00	5.51E-17	0.00E+00	0.00E+00	1.50E-15	1.61E-09	2.53E-11	1.46E-13	1.75E-08	1.60E-11	3.35E-07	0.00E+00	0.00E+00	1.01E-05
Yellow Warbler	AB	1.66E-11	3.95E-13	6.08E-12	7.57E-12	0.00E+00	6.85E-09	0.00E+00	2.31E-18	4.40E-12	3.97E-20	8.13E-17	2.14E-11	3.36E-13	1.94E-15	7.47E-12	6.86E-15	4.60E-11	0.00E+00	0.00E+00	3.90E-06
Grass	C	4.83E-08	1.61E-09	4.34E-08	1.28E-07	0.00E+00	2.18E-12	0.00E+00	7.27E-16	6.64E-09	3.41E-17	1.96E-14	4.99E-08	6.78E-10	3.43E-12	6.77E-08	4.48E-11	1.30E-06	0.00E+00	0.00E+00	8.71E-06
Earthworm	C	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.32E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.25E-06
American Robin	C	9.91E-08	2.31E-09	5.34E-08	1.43E-07	0.00E+00	4.90E-09	0.00E+00	8.84E-16	1.54E-08	7.89E-17	2.35E-14	9.92E-08	1.35E-09	6.82E-12	9.02E-08	5.97E-11	1.51E-06	0.00E+00	0.00E+00	6.67E-06
Common Shrew	C	1.17E-08	1.06E-09	1.26E-08	7.20E-08	0.00E+00	1.18E-08	0.00E+00	3.37E-16	1.52E-09	7.78E-18	9.25E-15	1.14E-08	1.54E-10	7.81E-13	4.78E-08	3.17E-11	8.37E-07	0.00E+00	0.00E+00	7.57E-06
Eastern Cottontail	C	1.17E-08	1.06E-09	1.26E-08	7.20E-08	0.00E+00	1.18E-08	0.00E+00	3.37E-16	1.52E-09	7.78E-18	9.25E-15	1.14E-08	1.54E-10	7.81E-13	4.78E-08	3.17E-11	8.37E-07	0.00E+00	0.00E+00	1.05E-05
Meadow Vole	C	1.17E-08	1.06E-09	1.26E-08	7.20E-08	0.00E+00	1.18E-08	0.00E+00	3.37E-16	1.52E-09	7.78E-18	9.25E-15	1.14E-08	1.54E-10	7.81E-13	4.78E-08	3.17E-11	8.37E-07	0.00E+00	0.00E+00	1.03E-05
Raccoon	C	1.17E-08	1.06E-09	1.26E-08	7.20E-08	0.00E+00	1.18E-08	0.00E+00	3.37E-16	1.52E-09	7.78E-18	9.25E-15	1.14E-08	1.54E-10	7.81E-13	4.78E-08	3.17E-11	8.37E-07	0.00E+00	0.00E+00	1.03E-05
Red Fox	C	1.17E-08	1.06E-09	1.26E-08	7.20E-08	0.00E+00	1.18E-08	0.00E+00	3.37E-16	1.52E-09	7.78E-18	9.25E-15	1.14E-08	1.54E-10	7.81E-13	4.78E-08	3.17E-11	8.37E-07	0.00E+00	0.00E+00	1.01E-05
Short-tailed Weasel	C	1.17E-08	1.06E-09	1.26E-08	7.20E-08	0.00E+00	8.58E-09	0.00E+00	3.37E-16	1.52E-09	7.78E-18	9.25E-15	1.14E-08	1.54E-10	7.81E-13	4.78E-08	3.17E-11	8.37E-07	0.00E+00	0.00E+00	1.01E-05
Song Sparrow	C	1.59E-07	3.70E-09	8.55E-08	2.29E-07	0.00E+00	7.85E-09	0.00E+00	1.41E-15	2.46E-08	1.26E-16	3.75E-14	1.59E-07	2.16E-09	1.09E-11	1.44E-07	9.55E-11	2.42E-06	0.00E+00	0.00E+00	1.16E-05
White-tailed Deer	C	1.06E-09	4.10E-10	1.28E-09	2.75E-08	0.00E+00	1.10E-08	0.00E+00	4.31E-17	0.00E+00	0.00E+00	1.18E-15	1.65E-09	2.24E-11	1.14E-13	2.15E-08	1.42E-11	4.17E-07	0.00E+00	0.00E+00	1.03E-05
Yellow Warbler	C	1.69E-11	4.09E-13	6.50E-12	7.89E-12	0.00E+00	4.90E-09	0.00E+00	1.80E-18	4.49E-12	2.31E-20	6.36E-17	2.19E-11	2.98E-13	1.51E-15	9.21E-12	6.09E-15	5.73E-11	0.00E+00	0.00E+00	3.96E-06
Aquatic Plants	Dragonfly Pond	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.07E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.69E-06
Frogs	Dragonfly Pond	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.72E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.43E-06
Turtles	Dragonfly Pond	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.72E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.41E-06
Aquatic Plants	Polliwog Pond	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.07E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.69E-06
Frogs	Polliwog Pond	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.72E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.43E-06
Turtles	Polliwog Pond	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.72E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.41E-06
Aquatic Plants	Treefrog Pond	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.07E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.69E-06
Frogs	Treefrog Pond	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.72E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.43E-06
Turtles	Treefrog Pond	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.72E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.41E-06
Grass	D	5.91E-08	2.01E-09	5.72E-08	1.62E-07	0.00E+00	2.67E-12	0.00E+00	4.76E-16	8.13E-09	1.27E-17	1.29E-14	6.18E-08	5.28E-10	2.23E-12	1.16E-07	3.50E-11	2.30E-06	0.00E+00	0.00E+00	1.11E-05
Sugar Maple	D	1.29E-09	5.12E-10	1.68E-09	3.48E-08	0.00E+00	2.67E-08	0.00E+00	2.82E-17	0.00E+00	0.00E+00	7.72E-16	2.04E-09	1.75E-11	7.36E-14	3.70E-08	1.11E-11	7.37E-07	0.00E+00	0.00E+00	7.02E-06
Earthworm	D	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.84E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.13E-06
American Robin	D	1.21E-07	2.89E-09	7.04E-08	1.81E-07	0.00E+00	8.56E-09	0.00E+00	5.79E-16	1.88E-08	2.94E-17	1.54E-14	1.23E-07	1.05E-09	4.42E-12	1.55E-07	4.66E-11	2.68E-06	0.00E+00	0.00E+00	9.04E-06
Common Shrew	D	1.44E-08	1.33E-09	1.66E-08	9.11E-08	0.00E+00	2.49E-08	0.00E+00	2.21E-16	1.86E-09	2.90E-18	6.07E-15	1.41E-08	1.20E-10	5.06E-13	8.23E-08	2.47E-11	1.48E-06	0.00E+00	0.00E+00	9.73E-06
Eastern Cottontail	D	1.44E-08	1.33E-09	1.66E-08	9.11E-08	0.00E+00	2.49E-08	0.00E+00	2.21E-16	1.86E-09	2.90E-18	6.07E-15	1.41E-08	1.20E-10	5.06E-13	8.23E-08	2.47E-11	1.48E-06	0.00E+00	0.00E+00	1.33E-05
Meadow Vole	D	1.44E-08	1.33E-09	1.66E-08	9.11E-08	0.00E+00	2.49E-08	0.00E+00	2.21E-16	1.86E-09	2.90E-18	6.07E-15	1.41E-08	1.20E-10	5.06E-13	8.23E-08	2.47E-11	1.48E-06	0.00E+00	0.00E+00	1.30E-05
Raccoon	D	1.44E-08	1.33E-09	1.66E-08	9.11E-08	0.00E+00	2.49E-08	0.00E+00	2.21E-16	1.86E-09	2.90E-18	6.07E-15	1.41E-08	1.20E-10	5.06E-13	8.23E-08	2.47E-11	1.48E-06	0.00E+00	0.00E+00	1.30E-05
Red Fox	D	1.44E-08	1.33E-09	1.66E-08	9.11E-08	0.00E+00	2.49E-08	0.00E+00	2.21E-16	1.86E-09	2.90E-18	6.07E-15	1.41E-08	1.20E-10	5.06E-13	8.23E-08	2.47E-11	1.48E-06	0.00E+00	0.00E+00	1.29E-05
Short-tailed Weasel	D	1.44E-08	1.33E-09	1.66E-08	9.11E-08	0.00E+00	2.19E-08	0.00E+00	2.21E-16	1.86E-09	2.90E-18	6.07E-15	1.41E-08	1.20E-10	5.06E-13	8.23E-08	2.47E-11	1.48E-06	0.00E+00	0.00E+00	1.29E-05
Song Sparrow	D	1.94E-07	4.63E-09	1.13E-07	2.90E-07	0.00E+00	1.37E-08	0.00E+00	9.27E-16	3.01E-08	4.70E-17	2.47E-14	1.96E-07	1.68E-09	7.07E-12	2.48E-07	7.46E-11	4.28E-06	0.00E+00	0.00E+00	1.56E-05
White-tailed Deer	D	1.29E-09	5.12E-10	1.68E-09	3.48E-08	0.00E+00	2.18E-08	0.00E+00	2.82E-17	0.00E+00	0.00E+00	7.72E-16	2.04E-09	1.75E-11	7.36E-14	3.70E-08	1.11E-11	7.37E-07	0.00E+00	0.00E+00	1.24E-05
Yellow Warbler	D	2.07E-11	5.11E-13	8.56E-12	9.98E-12	0.00E+00	8.56E-09	0.00E+00	1.18E-18	5.51E-12	8.60E-21	4.18E-17	2.71E-11	2.32E-13	9.77E-16	1.59E-11	4.76E-15	1.01E-10	0.00E+00	0.00E+00	4.85E-06
Grass	E	1.39E-07	4.78E-09	1.40E-07	3.87E-07	0.00E+00	6.27E-12	0.00E+00	5.27E-16	1.91E-08	6.65E-18	1.43E-14	1.46E-07	6.64E-10	2.44E-12	3.36E-07	4.40E-11	6.77E-06	0.00E+00	0.00E+00	2.77E-05
Sugar Maple	E	3.03E-09	1.22E-09	4.13E-09	8.33E-08	0.00E+00	6.27E-08	0.00E+00	3.12E-17	0.00E+00	0.00E+00	8.57E-16	4.83E-09	2.20E-11	8.07E-14	1.07E-07	1.40E-11	2.16E-06	0.00E+00	0.00E+00	1.69E-05
Earthworm	E	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.66E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.21E-05
American Robin	E	2.85E-07	6.88E-09	1.72E-07	4.33E-07	2.46E-14	9.40E-09	5.14E-13	6.42E-16	4.42E-08	1.54E-17	1.71E-14	2.90E-07	1.32E-09	4.85E-12	4.48E-07	5.86E-11	7.86E-06	1.78E-12	1.28E-11	2.27E-05
Bank Swallow	E	2.85E-07	6.88E-09	1.72E-07	4.33E-07	3.05E-14	9.40E-09	6.38E-13	6.42E-16	4.42E-08	1.54E-17	1.71E-14	2.90E-07	1.32E-09	4.85E-12	4.48E-07	5.86E-11	7.86E-06	2.20E-12	1.59E-11	2.06E-05
Common Shrew	E	3.37E-08	3.16E-09	4.06E-08	2.18E-07	4.15E-13	1.46E-08	3.04E-12	2.45E-16	4.36E-09	1.52E-18	6.74E-15	3.32E-08	1.51E-10	5.55E-13	2.38E-07	3.11E-11	4.34E-06	3.30E-11	3.91E-10	2.34E-05
Eastern Cottontail	E	3.37E-08	3.16E-09	4.06E-08	2.18E-07	9.79E-13	1.46E-08	7.17E-12	2.45E-16	4.36E-09	1.52E-18	6.74E-15	3.32E-08	1.51E-10	5.55E-13	2.38E-07	3.11E-11	4.34E-06	7.78E-11	9.21E-10	3.16E-05
Meadow Vole	E	3.37E-08	3.16E-09	4.06E-08	2.18E-07	5.73E-13	1.46E-08	4.19E-12	2.45E-16	4.36E-09	1.52E-18	6.74E-15	3.32E-08	1.51E-10	5.55E-13	2.38E-07	3.11E-11	4.34E-06	4.55E-11	5.39E-10	3.11E-05
Raccoon	E	3.37E-08	3.16E-09	4.06E-08	2.18E-07	1.23E-12	1.46E-08	8.99E-12	2.45E-16	4.36E-09	1.52E-18	6.74E-15	3.32E-08	1.51E-10	5.55E-13	2.38E-07	3.11E-11	4.34E-06	1.36E-10	1.61E-09	3.10E-05
Red Fox	E	3.37E-08	3.16E-09	4.06E-08	2.18E-07	1.20E-12	1.46E-08	8.81E-12	2.45E-16	4.36E-09	1.52E-18	6.74E-15	3.32E-08	1.51E-10	5.55E-13	2.38E-07	3.11E-11	4.34E-06	1.96E-10	2.32E-09	3.08E-05
Short-tailed Weasel	E	3.37E-08	3.16E-09	4.06E-08	2.18E-07	7.44E-13	3.65E-09	5.52E-12	2.45E-16	4.36E-09	1.52E-18	6.74E-15	3.32E-08	1.51E-10	5.55E-13	2.38E-07	3.11E-11	4.34E-06	2.37E-10	2.81E-09	3.07E-05
Song Sparrow	E	4.56E-07	1.10E-08	2.76E-07	6.94E-07	4.19E-14	1.50E-08	8.78E-13	1.03E-15	7.07E-08	2.46E-17	2.74E-14	4.64E-07	2.11E-09	7.75E-12	7.17E-07	9.38E-11	1.26E-05	3.04E-12	2.19E-11	3.91E-05
White-tailed Deer	E	3.03E-09	1.22E-09	4.13E-09	8.33E-08	1.21E-11	1.61E-08	1.41E-11	3.12E-17	0.00E+00	0.00E+00	8.57E-16	4.83E-09	2.20E-11	8.07E-14	1.07E-07	1.40E-11	2.16E-06	9.09E-10	1.81E-09	2.92E-05
Yellow Warbler	E	4.87E-11	1.21E-12	2.10E-11	2.39E-11	2.79E-14	9.40E-09	5.84E-13	1.31E-18	1.29E-11	4.50E-21	4.64E-17	6.41E-11	2.92E-13	1.07E-15	4.58E-11	5.99E-15	2.97E-10	2.02E-12	1.45E-11	1.12E-05
Grass	F (SMR)	6.10E-07	2.11E-08	6.30E-07	1.72E-06	0.00E+00	2.76E-11	0.00E+00	1.03E-15	8.39E-08	6.66E-18	2.80E-14	6.43E-07	1.38E-09	4.75E-12	1.65E-06	9.14E-11	3.34E-05	0.00E+00	0.00E+00	1.22E-04
Sugar Maple	F (SMR)	1.33E-08	5.38E-09	1.85E-08	3.69E-07	0.00E+00	2.76E-07	0.00E+00	6.12E-17	0.00E+00	0.00E+00	1.68E-15	2.13E-08	4.56E-11	1.57E-13	5.23E-07	2.91E-11	1.07E-05	0.00E+00	0.00E+00	7.47E-05
Earthworm	F (SMR)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.93E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.22E-05
American Robin	F (SMR)	1.25E-06	3.04E-08	7.75E-07	1.92E-06	2.46E-14	4.03E-08	5.14E-13	1.26E-15	1.94E-07	1.54E-17	3.36E-14	1.28E-06	2.74E-09	9.44E-12	2.19E-06	1.22E-10	3.88E-05	1.78E-12	1.28E-11	1.04E-04
Bank Swallow	F (SMR)	1.25E-06	3.04E-08	7.75E-07	1.92E-06	3.05E-14	4.03E-08	6.38E-13	1.26E-15	1.94E-07	1.54E-17	3.36E-14	1.28E-06	2.74E-09	9.44E-12	2.19E-06	1.22E-10	3.88E-05	2.20E-12	1.59E-11	9.44E-05
Common Shrew	F (SMR)	1.48E-07	1.40E-08	1.82E-07	9.68E-07	4.15E-13	6.03E-08	3.04E-12	4.79E-16	1.92E-08	1.52E-18	1.32E-14	1.46E-07	3.14E-10	1.08E-12	1.16E-06	6.46E-11	2.14E-05	3.30E-11	3.91E-10	1.04E-04
Eastern Cottontail	F (SMR)	1.48E-07	1.40E-08	1.82E-07	9.68E-07	9.79E-13	6.03E-08	7.17E-12	4.79E-16	1.92E-08	1.52E-18	1.32E-14	1.46E-07	3.14E-10	1.08E-12	1.16E-06	6.46E-11	2.14E-05	7.78E-11	9.21E-10	1.40E-04
Meadow Vole	F (SMR)	1.48E-07	1.40E-08	1.82E-07	9.68E-07	5.73E-13	6.03E-08	4.19E-12	4.79E-16	1.92E-08	1.52E-18	1.32E-14	1.46E-07	3.14E-10	1.08E-12	1.16E-06	6.46E-11	2.14E-05	4.55E-11	5.39E-10	1.38E-04
Raccoon	F (SMR)	1.48E-07	1.40E-08	1.82E-07	9.68E-07	1.23E-12	6.03E-08	8.99E-12	4.79E-16	1.92E-08	1.52E-18	1.32E-14	1.46E-07	3.14E-10	1.08E-12	1.16E-06	6.46E-11	2.14E-05	1.36E-10	1.61E-09	1.37E-04
Red Fox	F (SMR)	1.48E-07	1.40E-08	1.82E-07	9.68E-07	1.20E-12	6.03E-08	8.81E-12	4.79E-16	1.92E-08	1.52E-18	1.32E-14	1.46E-07	3.14E-10	1.08E-12	1.16E-06	6.46E-11	2.14E-05	1.96E-10	2.32E-09	1.36E-04
Short-tailed Weasel	F (SMR)	1.48E-07	1.40E-08	1.82E-07	9.68E-07	7.44E-13	1.17E-08	5.52E-12	4.79E-16	1.92E-08	1.52E-18	1.32E-14	1.46E-07	3.14E-10	1.08E-12	1.16E-06	6.46E-11	2.14E-05	2.37E-10	2.81E-09	1.36E-04
Song Sparrow	F (SMR)	2.00E-06	4.86E-08	1.24E-06	3.08E-06	4.19E-14	6.45E-08	8.78E-13	2.01E-15	3.11E-07	2.47E-17	5.37E-14	2.04E-06	4.38E-09	1.51E-11	3.51E-06	1.95E-10	6.20E-05	3.04E-12	2.19E-11	1.78E-04
White-tailed Deer	F (SMR)	1.33E-08	5.38E-09	1.85E-08	3.69E-07	1.21E-11	6.77E-08	1.41E-11	6.12E-17	0.00E+00	0.00E+00	1.68E-15	2.13E-08	4.56E-11	1.57E-13	5.23E-07	2.91E-11	1.07E-05	9.09E-10	1.81E-09	1.29E-04
Yellow Warbler	F (SMR)	2.14E-10	5.37E-12	9.42E-11	1.06E-10	2.79E-14	4.03E-08	5.84E-13	2.56E-18	5.68E-11	4.51E-21	9.10E-17	2.82E-10	6.05E-13	2.09E-15	2.24E-10	1.24E-14	1.47E-09	2.02E-12	1.45E-11	4.92E-05

Appendix E Ecological Receptor Profiles

One of the key considerations, which defines the scope of a risk assessment, is the selection of ecological receptors. In selecting ecological receptors, it is important to identify plants and animals that are likely to be most exposed to the effects of the project. As it is not possible to evaluate all ecological species at a site, representative ecological receptors are generally selected based on several criteria as discussed in **Section 4.1.1** of the main report.

This appendix details the aquatic and terrestrial ecological receptors (groups or species) selected for the assessment.

E.1 Aquatic Biota

E.1.1 Fish

E.1.1.1 Northern Redbelly Dace

The Northern Redbelly Dace (*Chrosomus eos*) is a cool water forage fish that inhibits lakes, bogs, ponds, and creeks across Canada and the northern areas of the St. Lawrence (Ontario Freshwater Fishes Life History Database, n.d; Stasiak, 2006). Spawning events typically take place in the late spring (May) and early summer (July) with five to 30 fertilized eggs being produced per event (Ontario Freshwater Fishes Life History Database, n.d; Stasiak, 2006). Eggs hatch about eight to 10 days later (Stasiak, 2006). The Northern Redbelly Dace is an invertivore and planktivore fish that primarily feeds on plant material (detritus, macrophytes and filamentous algae) (Stasiak, 2006). Predators of the Northern Redbelly Dace include fish such as trout, birds such as the kingfishers and mergansers, and aquatic invertebrates such as beetles and giant water bugs (Scott and Crossman, 1973; Stasiak, 2006).

E.1.1.2 Round Whitefish

The Round Whitefish (*Prosopium cylindraceum*) is a cold water lake fish. Spawning migrations may be undertaken by some Round Whitefish populations. Adults typically weigh between 454 g and 1360 g. Spawning occurs along lake and stream shorelines in late fall or early winter in southern Canada over gravel shoals or river mouths. Round whitefish are shallow water bottom feeders. Females lay an average of 5,000 to 12,000 eggs. Round whitefish hatch as sac fry in March to May and remain on the bottom, seeking shelter in rubble and boulders. Older juveniles, age 1 and 2, live in the same areas as adults but in shallower water and tend to move into deeper and faster water as they grow. Round whitefish eat a variety of invertebrates including mayfly larvae, chironomid larvae, small mollusks, crustaceans, fish, and fish eggs. Fish in lakes may eat more molluscs and small crustaceans than those in rivers (DFO, 2007; IF&W, 2001).

E.1.1.3 White Sucker

White Sucker (*Catostomus commersonni*) is a freshwater fish found in lakes and streams across North America. It is a bottom feeding fish that resides mainly in shallow, warm waters. The White Sucker spawns in spring, April or May, in moderate to swift riffles, in gravelly and stony areas, when the water temperature is above 4°C. Spawning may also take place in the shallow water of lakes. Females randomly scatter 30,000 to 130,000 eggs over the spawning grounds. Fry (1.2 cm in length) feed primarily on plankton and other small free-floating invertebrates. When the White Sucker reaches a length of about 1.6 to 1.8 cm, it begins bottom feeding. White suckers are preyed upon by birds, fishes, lamprey and mammals. In this assessment, White Suckers are assumed to spend half of their time at the sediment surface and the other half immersed in the water (Ontario Fish Species, n.d.).

E.1.1.4 Alewife

Alewife (*Alosa pseudoharengus*) is a member of the herring family. Alewife are found in Lake Ontario, although there is debate as to whether the Alewife population found in Lake Ontario is native or introduced. In its native range, alewives are anadromous, they are quite capable of completing its life cycle in freshwater environments. Adult Alewife average about 6 to 7 inches in length in the freshwater variety. Alewives live for about 6 to 7 years and usually begin to reproduce around two years of age. Alewife spawn once a year from late April to early June. Females randomly deposit 10,000 to 12,000 eggs. In less than a week, the young alewives hatch and begin feeding primarily on zooplankton. In the fall, the young alewives make their way back to the sea or into the deep waters of freshwater lakes or rivers. Adult alewives feed on zooplankton, aquatic insects, and small fish (Indiana DNR, n.d.).

E.1.1.5 Lake Trout

Lake Trout (*Salvelinus namaycush*) is a freshwater char. Lake trout mainly reside in deep lakes in northern North America where the water is cold and oxygen-rich. In spring, Lake Trout are widely dispersed in the shallow waters of their habitat but, as soon as the water warms they migrate to deeper and colder water. Adults are generally 38 to 52 cm in length and have an average weight of 4.5 kg. In general, Lake Trout spawn on rocky reefs or shoals in the fall. Spawning takes place at night during which the eggs are scattered over the rocky bottom. The eggs remain among the rocks for weeks and hatch the following spring. Within a month or so after hatching, the young Lake Trout usually seek deeper water and are thought to be reclusive, plankton feeders during their first few years of life. The Lake Trout’s diet varies depending on the season; in the summer months they become more planktivorous and during the cooler months, they become piscivorous (DFO, 2013).

E.1.1.6 American Eel

The American Eel (*Anguilla rostrata*) is a freshwater species found on the eastern coast of North America, and enter Ontario through the St. Lawrence River and Lake Ontario. The eel has a snake-like body and a dorsal fin that extends from half-way down the length of its back to the underside of its body. At maturity, eel range from 75 to 100 centimetres (cm) in length and weigh one to three kilograms. American Eel have a complex life cycle, which begins with breeding in the Sargasso Sea in the Atlantic Ocean (OMNR, 2007). Young eels migrate to inland streams where they proceed to feed and mature in freshwater bodies for 10 to 25 years, before returning to the Sargasso Sea to spawn (OMNR, 2007). The majority of American Eel found in Ontario are large, highly fecund (egg-laden) females. The eel is an important indicator of ecosystem health, and is a top predator. The American Eel is designated an endangered species and is protected under the Provincial *Endangered Species Act,* 2007. The American Eel is designated as "threatened" under COSEWIC and "endangered" under SARO.

E.1.2 Reptiles and Amphibians

Reptiles (class: Reptilia) are cold blooded animals with scales or scutes rather than fur and feathers like mammals and birds. Common animals within the class include turtles, snakes and lizards. Most reptiles are oviparous (egg-laying) but do not require water bodies in which to breed.

Amphibians (class: Amphibia) typically inhabit a wide variety of habitats with most species bridging terrestrial and aquatic ecosystems during their life cycle. Common animals within the class include frogs and salamanders. Amphibians rely on surface water for reproduction as larvae are typically born in water. The young generally undergo metamorphosis from larva with gills to an adult air-breathing form with lungs. With their complex reproductive needs and permeable skins, amphibians are often used as ecological indicators.

Reptiles represented by turtles and amphibians represented by frogs are being model for Treefrog Pond, Polliwog Pond and Dragonfly Pond because these ponds provide a habitat for reptiles and amphibians.

E.1.3 Aquatic Plants

E.1.3.1 Macrophytes

Macrophytes are aquatic plants growing in or near water and can be either emergent, submergent or floating. Macrophytes are primary producers that provide food, cover and shelter for wildlife, such as spawning and nursey habitats for fish and nesting habitats for waterfowl, improve water quality and clarity, and help to stabilize shorelines and bottom sediments. Emergent aquatic plants such as cattails and bur-reed are found along the edges of on-site ponds at DN (Golder and SENES, 2009). Macrophytes such as cattails provide food for Muskrats.

Because of the waves and/or unsuitable substrates along the nearshores of Lake Ontario, rooted aquatic plants are not found along the shores of Lake Ontario near the DN. Photosynthetic organisms are limited to attach algae.

Macrophytes are aquatic plants in the ecological model for Coot's Pond and Treefrog Pond, which includes Dragonfly and Polliwog ponds.

E.1.4 Benthic Invertebrates

Benthic invertebrates or "benthos" live and feed within sediments. Benthic invertebrates include, among others, amphipods, bivalves, shrimps, crabs, snails, worms, and aquatic insects. They play an integral role in the integrity of the freshwater ecosystem through their role in nutrient cycling and function as an important food source for wildlife such as the diving (e.g. Bufflehead) and dabbling (e.g. Mallard) ducks and fish (e.g. White Sucker). Benthic invertebrates provide a sediment to fish pathway link and a link between aquatic and terrestrial ecosystems. Many species feed on decaying organic matter and thereby form an important link between the decomposer and primary consumer levels.

The Lake Ontario nearshore benthic community is limited to species such as the zebra mussels and quagga mussels, which can withstand the abrasive wave actions and coarse substrates of the nearshore environment, whereas the habitat of Coot's Pond is favourable to support a diverse benthic community (Golder and SENES, 2009).

Benthic invertebrates are being model for Lake Ontario and Coot's Pond.

E.2 Riparian Birds

Birds are mobile receptors that will forage from a large home range. During breeding and rearing of young, the home range is often reduced.

E.2.1 Bufflehead

The Bufflehead (*Bucephala albeola*) is Canada's smallest diving duck. Males average 450 g in weight and females about 340 g. During migration they may carry up to an additional 115 g of fat. Their breeding habitat is small ponds, usually in wooded areas. They are not gregarious and typically occur in groups of 10 birds or fewer. Their summer breeding range is north and west of the Great Lakes. Their Canadian overwinter range includes the west coast and favoured spots around Lake Ontario and the southern coasts of New Brunswick and Nova Scotia. Buffleheads nest in tree cavities. The female lays a clutch of 7 to 11 eggs. Hatching occurs about 30 days later and ducklings remain in the nest only 24 to 36 hours before being led to the nearest waterbody. The young may be eaten by pike or other predators. The Buffleheads' main foods are arthropods, mostly insect larvae in freshwater and small crustaceans, such as shrimps, crabs, amphipods, in salt water. In fall they eat many seeds of aquatic plants, and in winter they take small marine snails or freshwater clams in their respective habitats (EC & CWF, 2013).

The average territory size of the Bufflehead in ponds in British Columbia was measured to be 0.56 hectares (Gauthier, 1993).

For the ecological model it is assumed that the Bufflehead diet consists of benthic invertebrates (90%) and aquatic plants (10%). It is also assumed that the Bufflehead spends 50% of its time at DN.

E.2.2 Mallard

The Mallard (*Anas platyrhynchos*) is an omnivorous migratory duck that may breed over winter in Canada (U.S. EPA, 1993; FCSAP, 2012). Males average 1.1 kg in weight and females about 1.2 kg in weight (FCSAP, 2012). The general habitat of the Mallard is wetlands. Mallard typically nest on the ground in thick vegetation away from a waterbody. The female lays a clutch of 1 to 13 eggs with hatching occurring about 23 to 30 days later (Drilling, et al., 2002). Ducklings remain in the nest only 13 to 16 hours before leaving the nest (Drilling, et al., 2002).

The bulk of the Mallard`s diet is plant material (mostly aquatic plants and seeds) with the remaining portions of the diet consisting of aquatic invertebrates, especially in the breeding season (FCSAP, 2012). The Mallard forages by dabbling and filtering though sediment (U.S. EPA, 1993).

The mean home range of a Mallard is between 111 and 620 hectares in spring (U.S. EPA, 1993).

For the ecological model it is assumed that the Mallard diet, based on breeding, consists of benthic invertebrates (75%) and aquatic plants (25%). It is also assumed that the Mallard spends 50% of its time at DN.

E.2.3 Green Heron

The Green Heron (*Butorides virescens*) is a riparian piscivore that breeds in southern Ontario, southwestern BC, and southern Quebec, and migrates for winter to the southern US and northern South America (David and Kushlan, 1994). Green Heron is a small member of the Heron family, with an average weight of 175 g (Animal Diversity Web. Accessed on Oct 25, 2020). Green Heron generally prefers wetland habitats, and nests in forest and swamp patches. It breeds once annually, and the female Green Heron lays a clutch of 2-4 eggs per breeding season. Incubation usually lasts for 19-21 days. Fledging occurs when chicks are 16-17 days old, and independence is gained between 30-35 days (Hancock, 1999).

At the DN Site, Green Heron is known to breed at the Coot's Pond area (Beacon 2019). For the ecological model it is assumed that the diet of Green Heron consists of 100% fish from Coot's Pond. It is also assumed that the Green Heron spends 50% of its time at DN.

E.3 Riparian Mammals

E.3.1 Muskrat

The Muskrat (*Ondatra zibethicus*) is a large rodent, measuring approximately 50 cm from tip of the nose to tail, and weighing on average 1 kg. Muskrats exist all over North America, from the Arctic Ocean in the north to the Gulf of Mexico in the south, from the Pacific Ocean in the west to the Atlantic Ocean in the east. Muskrats prefer freshwater marshes, marshy areas of lakes, and slow-moving streams. The preferred water depth in these areas is 1 to 2 m, deep enough not to freeze fully during the winter but shallow enough to allow aquatic vegetation to grow. Muskrats nest in compact mounds of partially dried and decayed plant material such as cattails and bulrushes. In winter, Muskrats generally occupy lodges that they build through burrowing underneath their mounds (EC & CWF, 2013).

Muskrats mainly feed on aquatic plants such as cattails, bulrushes, horsetails, or pondweeds; however, they prefer cattails. When aquatic plants are unavailable, Muskrats are also known to feed on fish, frogs, and clams. Breeding generally occurs in March, April, or May. Birth of the litter usually occurs within 1 month of mating and usually contains 5 to 10 young. Breeding can occur multiple times throughout the season (EC & CWF, 2013).

The mean home range size of a Muskrat in the summer ranges between 0.048 to 0.17 hectares (U.S. EPA, 1993).

For the ecological model it is assumed that the Muskrat's diet consists of aquatic plants (100%) and that it spends 100% of its time at DN.

E.4 Terrestrial Biota

E.4.1 Earthworms

Earthworms live in soil, and depending on the species they either move vertically or horizontally in different soil layers. Earthworms acquire their nutrition through the organic matter in soil as well as the decomposing remains of other animals. They can devour one third of their own body weight per day.

E.4.2 Terrestrial Birds

Birds are mobile receptors that will forage from a large home range. During breeding and rearing of young, the home range is often reduced.

E.4.2.1 American Robin

The American Robin (*Turdus migratorius*) is a migratory thrush that may breed and over winter in Canada (FCSAP, 2012). During the breeding season, the American Robin is found across the continental United States and Canada (U.S., 1993). The average breeding male weight is 77.4 g and the average breeding female weight is 80.6 g (Wheelright, 1986 as cited in U.S. EPA, 1993). American Robins make use of a wide variety of habitats with open areas. American Robins typically nest in trees, but may also nest in gutters, eaves, external light fixtures and structures (Sallabanks and James, 1999). Females lay a clutch of 3 to 5 eggs. Eggs hatch within 12 to 14 days and the nestling period lasts approximately 13 days (Sallabanks and James, 1999). The American Robin forages on the ground for invertebrates and in shrubs and low tree branches for fruit and foliage-dwelling insects (U.S. EPA, 1993). Earthworms and insects account for most (71%) of the nestlings and fledglings diet with the reminder of the diet consisting of vegetation, seeds and fruit (29%). Before and during the breeding season, robins predominately feed on invertebrates (between 80 to 90% volume), with fruits making up the bulk of the robin's diet for the reminder of the year (between 60 to 90% volume) (Wheelright, 1986 as cited in U.S. EPA, 1993).

The mean territory size of the American Robin ranges between 0.11 and 0.42 hectares in the spring with a mean foraging home range between 0.15 and 0.81 in the summer (U.S. EPA, 1993).

For the ecological model it is assumed that the American Robin's diet consists of 60% fruits represented by berries and 40% invertebrates, represented as Earthworms (FCSAP, 2012). It is also assumed that the American Robin spends 50% of its time at DN.

E.4.2.2 Bank Swallow

The Bank Swallow (*Riparia riparia*) nest in colonies along cliffs and the banks of streams and rivers, but can also be found in anthropogenic habitats such as gravel pits and roadcuts across much of North America (COSEWIC, 2013). The Bank Swallow weighs between10 and 19 g. In Ontario, the breeding season spans between early May to mid- August (MNRF, 2016). Females lay a clutch of 3 to 6 eggs. Eggs hatch within 13 to 16 days and the nestling period lasts between 18 to 24 days (Garrison, 1999). Young are tended by both parents. Bank Swallows are aerial insectivores, feeding primarily while flying above clearings or open water (COSEWIC, 2013). Predators of the Bank Swallow include raptors, snakes, rats, chipmunks, Raccoons, badgers, skunks, weasels, foxes, and coyotes, among others (COSEWIC, 2013). The Bank Swallow is designated threatened and is protected under the Provincial *Endangered Species Act,* 2007. The Bank Swallow is also designated as "threatened" federally (SARA Schedule 1, as well as COSEWIC).

In the United Kingdom, mean foraging ranges from Bank Swallow colonies have been reported to be within 0.26 km when adults were providing for nestlings and within 0.69 km when building nests (MNRF, 2016).

For the ecological model it is assumed that the Bank Swallow's diet consists of 100% insects represented by the caterpillar. It is also assumed that the Bank Swallow spends 50% of its time at DN.

E.4.2.3 Song Sparrow

The Song Sparrow (*Melospiza melodia*) is the most widespread sparrow found throughout most of North America with most of the populations of the Song Sparrow being migratory. The Song Sparrow weighs between 12 and 53 g. They breed in brushy areas along streamside thickets or the edges of marshes. Nests sites may include the ground under grass or shrubs or in shrubs and low lying trees. Song Sparrows typically lay two or more clutches of eggs per breeding season with clutch size ranging between 1 and 6 eggs. Eggs hatch within 12 to 15 days and the nestling period lasts between 9 to 12 days. The Song Sparrow forages on the ground feeding primarily on fruits and seeds, with insects being eaten mostly in the summer (Arcese et al., 2002).

The breeding territory of the Song Sparrow is typically less than 0.4 hectares (NatureServe 2015).

For the ecological model it is assumed that the Song Sparrow's diet consists of 90% grains and seeds represented by berries and 10% insects represented by the caterpillar. It is also assumed that the Song Sparrow spends 80% of its time at DN.

E.4.2.4 Yellow Warbler

The migratory Yellow Warbler (*Dendroica petechia*) is widespread throughout North America. They weigh between 9 and 11 g. They breed in streamside thickets and early successional areas typically dominated by willows. Nests are usually placed in the vertical fork of a bush or small tree. Females lay a clutch of 1 to 7 eggs. Incubation by the female lasts within 10 to 13 days and the nestling period lasts between 9 to 12 days. Young are tended by both parents. Yellow Warbler forages along the branches of shrubs, small trees and foliage gleaning off insects (Lowther et al., 1999). The Yellow Warbler may eat fruit and probe in flowers (NatureServe, 2015).

The breeding territory of the Yellow Warbler can be as small as 0.16 hectares (NatureServe, 2015).

For the ecological model it is assumed that the Yellow Warbler's diet consists of 90% insects represented by caterpillar and 10% fruits represented by berries. It is also assumed that the Yellow Warbler spends 50% of its time at DN.

E.4.3 Terrestrial Plants

E.4.3.1 Grass

Cultural meadow and thicket ecosystems make up a large portion of the terrestrial environment at DN. For the ecological model, grasses were used as a food source for the American Robin, Song Sparrow, Yellow Warbler, Eastern cottontail, Meadow Vole, White-tailed Deer, Raccoon, and Red Fox.

E.4.3.2 Sugar Maple

Four primary ecosystems have been identified for the DN: cultural meadow and thickets, shrub bluff, wetland and woodlands (Beacon, 2009). The Sugar Maple, which is found at the DN, has been identified as an indicator species for the woodland ecosystems because it is used by wildlife. For the ecological model, the Sugar Maple is used as a food source for the White-tailed Deer and Raccoon.

E.4.4 Terrestrial Mammals

E.4.4.1 Eastern Cottontail

The Eastern cottontail (*Sylvilagus floridanus*) is a medium sized rabbit, measuring 35 to 43 cm in length, and weighing between 0.7 to 1.8 kg (U.S. EPA, 1993). Females are typically 1 to 2% larger than males (Naughton, 2012). The Eastern cottontail is found in southern Canada and the eastern and western United States (U.S. EPA, 1993). Although the Eastern cottontail may be found in swamps, woodlands and grasslands, they prefer mixed farmland and hedgerow habitats (Naughton, 2012). The mean home range of the Eastern cottontail is between 0.8 and 7.8 hectares (U.S. EPA, 1993).

The Eastern Cottontail breeds throughout the year, with peak mating between January and April. Gestation lasts approximately 28 days, with females producing five to seven litters per year and 25 to 35 young per year. Although not fully weaned, young leave the litter after 14 to 16 days (U.S. EPA, 1993; Naughton, 2012).

The Eastern cottontail forages throughout the night and feeds on herbaceous vegetation such as grasses and forbs in the summer and woody vegetation such as twigs and bark in the winter (U.S. EPA, 1993). Predators of the Eastern cottontail include raptors, owls, Red Foxes and coyotes (U.S. EPA, 1993; Naughton, 2012).

For the ecological model it is assumed that the Eastern cottontail's diet consists of 100% grass and that the Eastern cottontail spends 100% of its time at DN.

E.4.4.2 Meadow Vole

The Meadow Vole (*Microtus pennsylvanicus*) is a small herbivorous rodent, measuring 8.9 to 13 cm from head to tail, and weighing between 0.02 to 0.04 kg. The Meadow Vole is found across Canada, Alaska and the northern United States. They can be found mainly in meadows, lowland fields, grassy marshes, and along rivers and lakes. They are also occasionally found in flooded marshes, high grasslands near water, and orchards or open woodland if grassy (US EPA, 1993). The Meadow Vole has a small home range size with a mean home range between 0.0069 and 0.083 hectares in the summer (U.S. EPA, 1993).

The Meadow Vole breeds throughout the year, but breeding peaks from April to October. Gestation lasts approximately 21 days, with litter sizes ranging from 1 to 9 (NatureServe, 2012). Meadow voles mainly feed on shoots, grass, and bark. Voles are prey for hawks and owls as well as several mammalian predators such as short-tailed shrews, badgers, and foxes (US EPA, 1993).

For the ecological model it is assumed that the Meadow Vole’s diet consists of 100% grass and spends 100% of its time at DN.

E.4.4.3 White-tailed Deer

The White-tailed Deer (*Odocoileus virginianus*) is the smallest of the native Canadian deer, measuring 151 to 240 cm in total length, and weighing between 50 to 135 kg (adult). Males are typically 20 to 55% larger than females (Naughton, 2012).

The White-tailed Deer is widespread throughout North America. They prefer open forests intermixed with “*meadows, clearings, grasslands, and riparian flatlands*”. The White-tailed Deer home range size ranges between 60 to 500 hectares (Naughton, 2012).

The White-tailed Deer diet consists mainly of terrestrial vegetation such as fresh grasses, forbs, fruits, nuts, browse, as well as mushrooms. In areas near the Great Lakes, White-tailed Deer are known to consume alewives that have washed ashore after spawning. Predators of the white-tail deer include wolves, coyotes, cougars, and black bears (Naughton, 2012).

If a female White-tailed Deer is well nourished, it breeds yearly. Mating season for Canadian deer typically take place between late October and mid-December, with a breeding peak in mid-November. Gestation lasts approximately 200 days with first time mothers typically producing one off-spring and repeat, larger, well-nourished mothers producing two or three off-springs. Fawns are fully weaned by four months (Naughton, 2012).

For the ecological model it is assumed that the White-tailed Deer’s diet consists of 100% terrestrial vegetation (e.g. grass and/or Sugar Maple) and that the White-tailed Deer spends 100% of its time at DN.

E.4.4.4 Common (Masked) Shrew

The common (masked) shrew (*Sorex cinereus*) is the most widespread and adaptable of the North American shrews with reproductive age Canadian shrews measuring 7.5 to 12.5 cm in total length, and weighing on average between 0.0036 and 0.0046 kg. Although the Common

Shrew may occupy a wide variety of habitats they are most abundant in damp and mossy woodlands. Shrews build hollow nests of grass and leaves in stumps, logs, debris or burrows, and forage under leaf litter in tunnels or runways created by other animals (Naughton, 2012).

The Common Shrew is an insectivore that eats a variety of invertebrates. During the winter, the diet of the shrew consists mostly of dormant insects and pupae with truffles and seeds being consumed when food is limited. Shrews may also eat carrion, salamanders and bird eggs. Shrews are prey for hawks and owls, herons, shrikes, snakes as well as several carnivorous mammals such as weasels, foxes, and larger shrews (Naughton, 2012). The average foraging range size of the shrew is 0.6 hectares (Nagorsen, 1996 as cited in FSCAP, 2012).

Shrews typically breed between May and September, with most females producing one to three litters annually and an average litter size of five to seven. The gestation period of the Common Shrew is not known. Young shrews leave the nest after approximately 27 days (Naughton, 2012).

For the ecological model it is assumed that the Common Shrew's diet consists of 100% insects (e.g., Caterpillars or Earthworms) and that they spend 100% of its time at DN.

E.4.4.5 Raccoon

The Raccoon (*Procyon lotor*) is a medium sized generalist nocturnal omnivore. An adult Raccoon measures 74 to 105 cm in total length and weighs between 3.9 and 13.5 kg. Adult male Raccoons are on average 10 to 15% heavier than female Raccoons (Naughton, 2012).

The Raccoon is very adaptable and widespread throughout southern Canada. They are abundant in urban, riparian, and wetland areas (Naughton, 2012). Tree cavities, spaces in rocks, caves, brush, uninhibited fox dens, Muskrat houses, squirrel and bird nests, buildings such as attics, basements and barns are used as Raccoon dens. The Raccoon has a mean home range between 39 and 2560 hectares, with male Raccoons occupying larger home ranges than female Raccoons (U.S. EPA, 1993; Naughton, 2012).

The Raccoon eats masts, grains, insects, aquatic invertebrates, fish, reptiles and amphibians, reptile eggs, small mammals, small birds and eggs, carrion, and human garbage. Animal matter makes up a good portion of the Raccoon's diet in the spring and early summer, while fruits make up the bulk of the Raccoon's diet in the late summer and fall. In the winter, acorns are typically consumed, however if available, grains and masts may also be consumed. Predators of the Raccoon include owls, coyotes, wolves, cougars, fishers, and foxes (U.S. EPA, 1993; Naughton, 2012).

Breeding season for the Raccoon typically begins in early February and ends in June, with peak breeding taking place in March. Gestation lasts approximately 63 days, with a mean litter size between 2 and 4 cubs. A female typically produces one litter per year. Cubs begin to forage on their own at approximately 18 months of age (U.S. EPA, 1993; Naughton, 2012).

For the ecological model it is assumed that the Raccoon's diet consists of 10% benthic invertebrates (for location AB); 15% fruits; 25% terrestrial vegetation (represented by grass for location AB and C, and grass and Sugar Maple in equal portion for locations D and E); 10% small mammals (represented by the Meadow Vole), and 40 or 50% invertebrates (represented by caterpillars for locations AB, C and D, and represented by Earthworms for location E). The Raccoon is assumed to spend 100% of its time at DN.

E.4.4.6 Red Fox

The Red Fox (*Vulpes vulpes*) is a small mammal that ranges in length between 90 and 112 cm, and weighs approximately 4.54 kg (US EPA, 1993). Red foxes are found throughout Canada in all provinces and territories. They generally occupy a home range between 4 to 8 km^2 and reside in a main underground den and one or more other burrows within their home range. The tunnels are up to 10 m long and lead to a chamber 1 to 3 m below surface. Foxes breed between late December and mid-March, and pups are born from March through May, with litter sizes ranging from 1 to 10. Pup-rearing is the primary focus of the Red Fox during spring and early summer. Their diet is predominantly small mammals such as mice and voles, but they also eat insects, fruits, berries, seeds and nuts. Their diet varies with the seasons, eating mainly small mammals in fall and winter, nesting waterfowl in the spring, and insects and berries in the summer (EC & CWF, 2013).

For the ecological model it is assumed that the Red Fox's diet consists of 70% small mammals (48% Eastern cottontails and 32% Meadow Voles) and 30% terrestrial plants represented by grass for locations C, D and E, and 50% small mammals (30% Eastern cottontails and 20% Meadow Voles), 30% aquatic birds (15% Bufflehead and 15% Mallard), and 20% terrestrial plants represented by grass for location AB. The Red Fox is assumed to spend 100% of its time at DN.

E.4.4.7 Short-tailed Weasel

The Short-tailed Weasel (*Mustela erminea*) or the ermine is a small mammal. A Canadian adult weasel ranges in total length between 22 and 36 cm, and weighs between 0.05 and 0.24 kg, with males being up to 80% heavier than female weasels (Naughton, 2012).

The Short-tailed Weasel is found throughout Canada in all provinces and territories. They inhabit successional forests, woodlands, parklands, edges of forests, wetlands such as marshes, riverbanks, and farmlands. The weasel uses trees cavities, rock openings, prey burrows, and subnivean runways or areas as their dens, while the fur and feathers of their prey are used to line their nests. The home range of a Canadian male weasel ranges between 1 and 205 hectares, whereas the home range of a Canadian female weasel ranges between 4 and 95 hectares. Weasels found in western Canada occupying larger home ranges than weasels found in eastern Canada (Naughton, 2012).

The diet of the Short-tailed Weasel is predominantly small mammals such as mice and voles, but they also eat lemmings, rabbits and hares, squirrels, shrews, chipmunks, birds, bird eggs, reptiles, amphibians, fish, and invertebrates. Short-tailed weasels are prey for raptors and owls, foxes, coyotes, snakes and larger weasels. Because of their high metabolism, starvation is the primarily cause of death for the Short-tailed Weasel. Missing two or three consecutive meals is enough to cause death (Naughton, 2012).

Breeding season for the Short-tailed Weasel takes place between April and June. Gestation lasts approximately 11 to 12 months, with females producing a mean litter size of 4 and 8 kits. Young are weaned after approximately 12 weeks of age (Naughton, 2012).

For the ecological model it is assumed that the Short-tailed Weasel's diet consists of 100% Meadow Voles. It is also assumed that the Short-tailed Weasel spends 100% of its time at DN.

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Appendix F Sample Calculations

Table F-1: Location AB Mallard Radiological Dose for Cobalt-60

Parameter	Variable / Calculation	Cobalt-60		
		Value	Units	Source
Environmental Media Concentrations (Coot's Pond)				
Coot's Pond Water Concentration	A	9.64E-07	Bq/L	Table D-1
Coot's Pond Sediment Concentration (dry weight)	B	4.15E-02	Bq/kg_{dw}	Table D-1
Sediment Dry Bulk Density	C	4.00E-01	kg_{dw}/L	CSA N288.1:20
Mixing Depth	D	5.00E-02	m	Assumption
Coot's Pond Sediment Surface Concentration (dry weight)	E = B * C * D * 1000 L/m^3	8.29E-01	Bq_{dw}/m^2	Calculated
Aquatic Plant Concentration (Coot's Pond)				
Bioaccumulation Factor (Aquatic Plant)	F	7.90E+02	L/kg_{fw}	Table C-1
Aquatic Plant Tissue Concentration	G = A * F	7.62E-04	Bq/kg_{fw}	Calculated
Benthic Invertebrate Concentration (Coot's Pond)				
Bioaccumulation Factor (Benthic Invertebrates)	H	1.10E+02	L/kg_{fw}	Table C-1
Benthic Invertebrate Tissue Concentration	I = A * H	1.06E-04	Bq/kg_{fw}	Calculated
Mallard Exposure Factors				
Intake Rate, Water	J	6.22E-02	L/d	Table 4-7
Intake Rate, Sediment	K	2.06E-03	kg_{dw}/d	Table 4-7
Intake Rate, Aquatic Plant	L	6.25E-02	kg/d_{fw}	Table 4-7
Intake Rate, Benthic Invertebrate	M	1.88E-01	kg/d_{fw}	Table 4-7
Fraction of Time Spent on Site	N	5.00E-01	unitless	Table 4-8
Mallard Internal Dose (Radiological)				
Ingestion Transfer Factor - Mallard	O	1.54E+00	d/kg_{fw}	Table C-4
Mallard Tissue Concentration	P = N * O * (A * J + B * K + H * M + F * L)	1.18E-04	Bq/kg_{fw}	Calculated
Dose Conversion Factor (Internal)	Q	2.38E-04	$(\mu Gy/hr)/(Bq/kg_{fw})$	Table C-11
Internal Dose	R = Q * P	2.79E-08	µGy/hr	Calculated
Internal Dose (converted units)	R' = R * 24 hr/day / 1000 µGy/mGy	6.71E-10	mGy/d	Calculated
Mallard External Dose (Radiological)				
Occupancy Factor, Sediment - Mallard	S	0.00E+00	unitless	Table 4-8
Occupancy Factor, Sediment Surface - Mallard	T	5.00E-01	unitless	Table 4-8
Dose Conversion Factor (External, in soil)	U	0.00E+00	(µGy/hr)/(Bq/kg)	--
Dose Conversion Factor (External, on soil)	V	7.50E-06	$(\mu Gy/hr)/(Bq/m^2)$	Table C-12
External Dose	W = N * (U * S * E + V * T * E)	1.55E-06	µGy/hr	Calculated
External Dose (converted units)	W' = W * 24 hr/day / 1000 µGy/mGy	3.73E-08	mGy/d	Calculated
Mallard Total Dose (Radiological)				
Total Dose	X = R + W	1.58E-06	µGy/hr	Calculated
Total Dose (converted units)	X' = X * 24 hr/day / 1000 µGy/mGy	3.80E-08	mGy/d	Calculated

Table F-2: Dairy Farm Infant Radiological Risk for Cesium-137

Parameter	Symbol	Calculation	Cesium-137		
			Value	Units	Source
Environmental Media Concentrations					
Water Concentration (Deep Well)	$C_{w(D)}$	-	0.00E+00	Bq/L	Table B-1
Water Concentration (Shallow Well)	$C_{w(S)}$	-	5.55E-07	Bq/L	Table B-1
Soil Concentration (dry weight)	$C_{s(dw)}$	-	2.05E-04	Bq/kg_{dw}	Table B-1
Outdoor Air Concentration	C_a	-	4.92E-09	Bq/m^3	Table B-1
Soil Dry Bulk Density (Loam)	ρ_s	-	1.30E+00	kg_{dw}/L	CSA N288.1:20
Mixing Depth	d	-	2.00E-01	m	Assumption
Soil Surface Concentration	C_{ss}	$C_{ss} = C_{s(dw)} * \rho_s * d * 1000\ L/m^3$	5.34E-02	Bq_{dw}/m^2	Calculated
Polygon Fraction Outdoor Air	Pf_a	-	1.00E+00	Unitless	Assumed
Polygon Fraction Soil	PF_s	-	1.00E+00	Unitless	Assumed
Polygon Fraction Water	PF_w	-	1.00E+00	Unitless	Assumed
Air Immersion Dose					
Fraction of Time at Location	f_o	-	1.00E+00	Unitless	Assumed
Outdoor Occupancy Factor	f_u	-	2.00E-01	Unitless	Table 3-5
Building Shielding Factor	S_b	-	5.00E-01	Unitless	Table 3-5
Dose Conversion Factor (Immersion)	DCF_a	-	1.05E-06	$(Sv/a)/(Bq/m^3)$	Table A-5
Air Immersion Dose	D_a	$D_a = C_a * f_o * (f_u + (1 - f_u) * S_b) * DCF_a * PF_a$	3.10E-15	Sv/a	Calculated
Unit conversion	$D_{a'}$	$D_{a'} = D_a * 1000\ mSv / Sv$	3.10E-12	mSv/a	Calculated
Air Inhalation Dose					
Inhalation Rate	IR_i	-	1.83E+03	m^3/a	Table 3-5
Dose Conversion Factor (Inhalation)	DCF_i	-	5.40E-09	Sv/Bq	Table A-5
Air Inhalation Dose	D_i	$D_i = C_a * IR_i * DCF_i * PF_a$	4.86E-14	Sv/a	Calculated
Unit conversion	$D_{i'}$	$D_{i'} = D_i * 1000\ mSv / Sv$	4.86E-11	mSv/a	Calculated
Water Immersion Dose					
Bathtub Correction Factor	D_C	-	7.00E-01	Unitless	CSA N288.1:20
Occupancy Factor - Swimming Surface Water	OF_w	-	0.00E+00	Unitless	Table 3-5
Occupancy Factor - Bath Water	$OF_{w'}$	-	1.40E-02	Unitless	Table 3-5
Occupancy Factor - Pool Water	$OF_{w''}$	-	0.00E+00	Unitless	Table 3-5
Removal factor (sedimentation)	ρ	-	1.00E+00	Unitless	CSA N288.1:20
Fraction from Water Source	F_w	-	6.10E-02	Unitless	Assumed
Dose Conversion Factor (External water)	DCF_w	-	2.28E-06	(Sv/a)/(Bq/L)	Table A-5
Water Immersion Dose	D_w	$D_w = C_{w(S)} * (OF_w + D_C * \rho * OF_{w'} + \rho * OF_{w''}) * DCF_w * F_w$	7.54E-16	Sv/a	Calculated
Unit Conversion	$D_{w'}$	$D_{w'} = D_w * 1000\ mSv / Sv$	7.54E-13	mSv/a	Calculated
Water Ingestion Dose					
Ingestion Rate	IR_w	-	9.89E+01	L/a	CSA N288.1:20
Fraction from Water Source	F_{ing}	-	4.50E-02	Unitless	Assumed
Dose Conversion Factor (Ingestion)	DCF_f	-	1.20E-08	Sv/Bq	Table A-5
Water Ingestion Dose	D_{ing}	$D_{ing} = C_{w(S)} * IR_w * DCF_f * PF_w * F_{ing}$	2.96E-14	Sv/a	Calculated
Unit Conversion	$D_{ing'}$	$D_{ing'} = D_w * 1000\ mSv / Sv$	2.96E-11	mSv/a	Calculated
Soil External Dose					
Dose reduction factor from surface roughness	f_r	-	6.80E-01	Unitless	CSA N288.1:20 (cl. 6.4.6.3)
Groundshine Shielding Factor	S_g	-	2.00E-01	Unitless	CSA N288.1:20 (cl. 6.14.3)
Dose Conversion Factor (Soil)	DCF_g	-	2.28E-08	(Sv/a)/(Bq/m2)	Assumed
Soil External Dose	D_g	$D_g = C_{ss} * f_o * f_r * (f_u + (1 - f_u) * S_g) * DCF_g * PF_s$	2.98E-10	Sv/a	Calculated

Table F-2: Dairy Farm Infant Radiological Risk for Cesium-137

Unit conversion	$D_{g'}$	$D_{g'} = D_g$ * 1000 mSv / Sv	2.98E-07	mSv/a	Calculated
Soil Ingestion Dose					
Soil Intake Rate	IR_s	-	6.10E-05	kg(dw)/d	CSA N288.1:20 (Table 20)
Soil Exposure Frequency	t_d	-	1.35E+02	d/y	Assumed
Dose Conversion Factor (Ingestion)	DCF_f	-	1.20E-08	Sv/Bq	Table A-5
Internal Soil Dose	D_s	$D_s = C_{s(dw)} * IR_s * t_d * DCF_f * PF_s$	2.03E-14	Sv/a	Calculated
Unit conversion	$D_{s'}$	$D_{s'} = D_s$ * 1000 mSv / Sv	2.03E-11	mSv/a	Calculated
Terrestrial Plants Dose					
Terrestrial Plants Dose from Dairy Farm (DF)					
Fruits Concentration	$C_{F(DF)}$	-	1.57E-05	Bq/kg fw	Table B-2
Garden Vegetables Concentration	$C_{GV(DF)}$	-	1.57E-05	Bq/kg fw	Table B-2
Potatoes Concentration	$C_{P(DF)}$	-	9.23E-06	Bq/kg fw	Table B-2
Food Intake (Terrestrial Plants)	IR_{TP}	-	1.45E+02	kg/a fw	Table 3-5
Local Intake Fraction of Fruits	$IF_{F(DF)}$	-	7.50E-03	Unitless	Assumed
Local Intake Fraction of Garden Vegetables	$IF_{GV(DF)}$	-	3.80E-02	Unitless	Assumed
Local Intake Fraction of Potatoes	$IF_{P(DF)}$	-	3.80E-02	Unitless	Assumed
Dose Conversion Factor (Food)	DCF_f	-	1.20E-08	Sv/Bq	Table A-5
Ingestion Dose (Terrestrial Plants)	$D_{TP(DF)}$	$D_{TP(DF)} = (C_{F(DF)} * IF_{F(DF)} + C_{GV(DF)} * IF_{GV(DF)} + C_{P(DF)} * IF_{P(DF)}) * IR_{TP} * DCF_f$	1.85E-12	Sv/a	Calculated
Unit conversion	$D_{TP(DF)'}$	$D_{TP(DF)'} = D_{TP(DF)}$ * 1000 mSv / Sv	1.85E-09	mSv/a	Calculated
Terrestrial Plants Dose from Farm (F)					
Fruits Concentration	$C_{F(F)}$	-	1.19E-04	Bq/kg fw	Table B-2
Garden Vegetables Concentration	$C_{GV(F)}$	-	1.19E-04	Bq/kg fw	Table B-2
Potatoes Concentration	$C_{P(F)}$	-	7.00E-05	Bq/kg fw	Table B-2
Food Intake (Terrestrial Plants)	IR_{TP}	-	1.45E+02	kg/a fw	Table 3-5
Local Intake Fraction of Fruits	$IF_{F(F)}$	-	5.15E-02	Unitless	Assumed
Local Intake Fraction of Garden Vegetables	$IF_{GV(F)}$	-	2.87E-02	Unitless	Assumed
Local Intake Fraction of Potatoes	$IF_{P(F)}$	-	2.87E-02	Unitless	Assumed
Dose Conversion Factor (Food)	DCF_f	-	1.20E-08	Sv/Bq	Table A-5
Ingestion Dose (Terrestrial Plants)	$D_{TP(F)}$	$D_{TP(F)} = (C_{F(F)} * IF_{F(F)} + C_{GV(F)} * IF_{GV(F)} + C_{P(F)} * IF_{P(F)}) * IR_{TP} * DCF_f$	2.00E-11	Sv/a	Calculated
Unit conversion	$D_{TP(F)'}$	$D_{TP(F)'} = D_{TP(F)}$ * 1000 mSv / Sv	2.00E-08	mSv/a	Calculated
Total Terrestrial Plant Dose					
Total Ingestion Dose from Terrestrial Plants	D_{TP}	$D_{TP} = D_{TP(DF)} + D_{TP(F)}$	2.19E-11	Sv/a	Calculated
Unit conversion	$D_{TP'}$	$D_{TP'} = D_{TP}$ * 1000 mSv / Sv	2.19E-08	mSv/a	Calculated
Terrestrial Animals Dose					
Terrestrial Animals Dose from Dairy Farm (DF)					
Beef (meat) Concentration	$C_{B(DF)}$	-	4.69E-05	Bq/kg fw	Table B-2
Cow (milk) Concentration	$C_{M(DF)}$	-	1.48E-05	Bq/kg fw	Table B-2
Poultry (meat) Concentration	$C_{Po(DF)}$	-	2.83E-06	Bq/kg fw	Table B-2
Poultry (egg) Concentration	$C_{Po-e(DF)}$	-	4.20E-07	Bq/kg fw	Table B-2
Food Intake (Terrestrial Animals)	IR_{TA}	-	2.62E+02	kg/a fw	Table 3-5
Local Intake Fraction Beef (meat)	$IF_{B(DF)}$	-	2.06E-02	Unitless	Assumed
Local Intake Fraction Cow (milk)	$IF_{M(DF)}$	-	8.76E-01	Unitless	Assumed
Local Intake Fraction Poultry (meat)	$IF_{Po(DF)}$	-	2.10E-03	Unitless	Assumed
Local Intake Fraction Poultry (egg)	$IF_{Po-e(DF)}$	-	7.00E-03	Unitless	Assumed
Dose Conversion Factor (Food)	DCF_f	-	1.20E-08	Sv/Bq	Table A-5
Ingestion Dose (Terrestrial Animals)	D_{TA}	$D_{TA(DF)} = (C_{B(DF)} * IF_{B(DF)} + C_{M(DF)} * IF_{M(DF)} + C_{Po(DF)} * IF_{Po(DF)} + C_{Po-e(DF)} * IF_{Po-e(DF)}) * IR_{TA} * DCF_f$	4.38E-11	Sv/a	Calculated

Table F-2: Dairy Farm Infant Radiological Risk for Cesium-137

Unit conversion	$D_{TA'}$	$D_{TA(DF)'} = D_{TA(DF)}$ * 1000 mSv / Sv	4.38E-08	mSv/a	Calculated
Terrestrial Animals Dose from Farm (F)					
Beef (meat) Concentration	$C_{B(F)}$	-	2.24E-04	Bq/kg fw	Table B-2
Pig (meat) Concentration	$C_{P(F)}$	-	3.90E-04	Bq/kg fw	Table B-2
Poultry (meat) Concentration	$C_{Po(F)}$	-	2.38E-05	Bq/kg fw	Table B-2
Food Intake (Terrestrial Animals)	IR_{TA}	-	2.62E+02	kg/a fw	Table 3-5
Local Intake Fraction Beef (meat)	$IF_{B(DF)}$	-	1.60E-03	Unitless	Assumed
Local Intake Fraction Pig (meat)	$IF_{M(DF)}$	-	0.00E+00	Unitless	Assumed
Local Intake Fraction Poultry (meat)	$IF_{Po(DF)}$	-	1.00E-04	Unitless	Assumed
Dose Conversion Factor (Food)	DCF_f	-	1.20E-08	Sv/Bq	Table A-5
Ingestion Dose (Terrestrial Animals)	D_{TA}	$D_{TA(F)} = (C_{B(F)} * IF_{B(F)} + C_{P(F)} * IF_{P(F)} + C_{Po(F)} * IF_{Po(F)}) * IR_{TA} * DCF_f$	1.14E-12	Sv/a	Calculated
Unit conversion	$D_{TA'}$	$D_{TA(F)'} = D_{TA(F)}$ * 1000 mSv / Sv	1.14E-09	mSv/a	Calculated
Terrestrial Animals Dose from Apiary (Ap)					
Honey bee (honey) Concentration	$C_{H(Ap)}$	-	2.95455E-05	Bq/kg fw	Table B-2
Food Intake (Terrestrial Animals)	IR_{TA}	-	2.62E+02	kg/a fw	Table 3-5
Local Intake Fraction Honey bee (honey)	$IF_{H(Ap)}$	-	0.0005	Unitless	Assumed
Dose Conversion Factor (Food)	DCF_f	-	1.20E-08	Sv/Bq	Table A-5
Ingestion Dose (Terrestrial Animals)	$D_{TA(Ap)}$	$D_{TA(Ap)} = (C_{H(Ap)} * IF_{H(Ap)}) * IR_{TA} * DCF_f$	4.65E-14	Sv/a	Calculated
Unit conversion	$D_{TA(Ap)'}$	$D_{TA(Ap)'} = D_{TA(Ap)}$ * 1000 mSv / Sv	4.65E-11	mSv/a	Calculated
Total Terrestrial Plant Dose					
Total Ingestion Dose from Terrestrial Animals	D_{TA}	$D_{TA} = D_{TA(DF)} + D_{TA(F)} + D_{TA(Ap)}$	4.50E-11	Sv/a	Calculated
Unit conversion	$D_{TA'}$	$D_{TA'} = D_{TA}$ * 1000 mSv / Sv	4.50E-08	mSv/a	Calculated
Dairy Farm Infant Total Dose					
Total Dose	D_{total}	$D_{total} = D_a + D_i + D_w + D_{ing} + D_g + D_s + D_{TP} + D_{TA}$	3.65E-10	Sv/a	Calculated
Unit conversion	$D_{total'}$	$D_{total'} = D_{total}$ * 1000 mSv / Sv	3.65E-07	mSv/a	Calculated

Table F-3: Farm Receptor Non-cancer Risk for Benzo(a)pyrene

Parameter	Symbol	Calculation	Benzo(a)pyrene		
			Value	Units	Source
Environmental Media Concentrations					
Outdoor Air Concentration - Existing Conditions	$C_{A(EC)}$	-	3.01E-05	$\mu g/m^3$	Table 2-16
Outdoor Air Concentration - Site Preparation (Increment)	$C_{A(SP\text{-}Inc)}$	-	2.14E-05	$\mu g/m^3$	Table 2-16
Outdoor Air Concentration - Site Preparation (Total)	$C_{A(SP\text{-}Tot)}$	$C_{A(SP\text{-}Tot)} = C_{A(EC)} + C_{A(SP\text{-}Inc)}$	5.15E-05	$\mu g/m^3$	Table 2-16
Outdoor Air Concentration - Construction (Increment)	$C_{A(C\text{-}Inc)}$	-	4.14E-08	$\mu g/m^3$	Table 2-16
Outdoor Air Concentration - Construction (Total)	$C_{A(C\text{-}Tot)}$	$C_{A(C\text{-}Tot)} = C_{A(EC)} + C_{A(C\text{-}Inc)}$	3.01E-05	$\mu g/m^3$	Table 2-16
Outdoor Air Concentration - Operation (Increment)	$C_{A(O\text{-}Inc)}$	-	5.58E-07	$\mu g/m^3$	Table 2-16
Outdoor Air Concentration - Operation (Total)	$C_{A(O\text{-}Tot)}$	$C_{A(O\text{-}Tot)} = C_{A(EC)} + C_{A(O\text{-}Inc)}$	3.07E-05	$\mu g/m^3$	Table 2-16
Hazard Quotient - Site Preparation					
Fraction of Time at Receptor Location (Residency Time)	RT	-	1	%	Assumed 100%
Benzo(a)pyrene Toxicological Reference Value (Non-cancer)	TRV_{HQ}	-	2.00E-03	$\mu g/m^3$	Table 3-9
Hazard Quotient - Site Preparation	HQ_{SP}	$HQ_{SP} = C_{A(SP\text{-}Tot)} * RT / TRV_{HQ}$	2.58E-02	unitless	Calculated
Hazard Quotient - Construction					
Fraction of Time at Receptor Location (Residency Time)	RT	-	1	%	Assumed 100%
Benzo(a)pyrene Toxicological Reference Value (Non-cancer)	TRV_{HQ}	-	2.00E-03	$\mu g/m^3$	Table 3-9
Hazard Quotient - Construction	HQ_C	$HQ_C = C_{A(C\text{-}Tot)} * RT / TRV_{HQ}$	1.51E-02	unitless	Calculated
Hazard Quotient - Operation					
Fraction of Time at Receptor Location (Residency Time)	RT	-	1	%	Assumed 100%
Benzo(a)pyrene Toxicological Reference Value (Non-cancer)	TRV_{HQ}	-	2.00E-03	$\mu g/m^3$	Table 3-9
Hazard Quotient - Operation	HQ_O	$HQ_O = C_{A(O\text{-}Tot)} * RT / TRV_{HQ}$	1.53E-02	unitless	Calculated

Table F-4: Farm Composite Receptor Cancer Risk for Benzo(a)pyrene

Parameter	Symbol	Calculation	Benzo(a)pyrene		
			Value	Units	Source
Environmental Media Concentrations					
Outdoor Air Concentration - Site Preparation (Increment)	$C_{A(SP\text{-}Inc)}$	-	2.14E-05	$\mu g/m^3$	Table 2-16
Outdoor Air Concentration - Construction (Increment)	$C_{A(C\text{-}Inc)}$	-	4.14E-08	$\mu g/m^3$	Table 2-16
Outdoor Air Concentration - Operation (Increment)	$C_{A(O\text{-}Inc)}$	-	5.58E-07	$\mu g/m^3$	Table 2-16
Human Exposure Factors					
Age-Dependent Adjustment Factor for Lifestage (i)	$ADAF_{(i)}$	-	-	unitless	Health Canada, 2021b
Infant	$ADAF_{In}$	-	1.00E+01	unitless	Table 3-10
Toddler	$ADAF_{To}$	-	5.00E+00	unitless	Table 3-10
Child	$ADAF_{Ch}$	-	3.00E+00	unitless	Table 3-10
Teenager	$ADAF_{Te}$	-	2.00E+00	unitless	Table 3-10
Adult	$ADAF_{Ad}$	-	1.00E+00	unitless	Table 3-10
Exposure Duration for Lifestage (i)	$ED_{(i)}$	-	-	yr	Health Canada, 2021b
Infant	ED_{In}	-	5.00E-01	yr	Table 3-10
Toddler	ED_{To}	-	4.50E+00	yr	Table 3-10
Child	ED_{Ch}	-	7.00E+00	yr	Table 3-10
Teenager	ED_{Te}	-	8.00E+00	yr	Table 3-10
Adult	ED_{Ad}	-	6.00E+01	yr	Table 3-10
Total Human Life Expectancy	LE	-	8.00E+01	yr	Table 3-10
Fraction of Time Exposed for Lifestage (i)	$TR_{(i)}$	$TR_{(i)} = ED_{(i)} / LE$	-	unitless	Health Canada, 2021b
Infant	TR_{In}	$TR_I = ED_I / LE$	6.25E-03	unitless	Table 3-10
Toddler	TR_{To}	$TR_{To} = ED_{To} / LE$	5.63E-02	unitless	Table 3-10
Child	TR_{Ch}	$TR_C = ED_C / LE$	8.75E-02	unitless	Table 3-10
Teenager	TR_{Te}	$TR_{Te} = ED_{Te} / LE$	1.00E-01	unitless	Table 3-10
Adult	TR_{Ad}	$TR_A = ED_A / LE$	7.50E-01	unitless	Table 3-10
Adult Inhalation Cancer Unit Risk	UR	-	6.00E-04	$(\mu g/m^3)^{-1}$	Table 3-9
Incremental Lifetime Cancer Risk					
Incremental Lifetime Cancer Risk - Site Preparation	$ILCR_{SP}$	$ILCR_{SP} = \Sigma(C_{A(SP\text{-}Inc)} * TR_{(i)} * UR * ADAF_{(i)})$	2.00E-08	unitless	Calculated
Incremental Lifetime Cancer Risk - Construction	$ILCR_C$	$ILCR_C = \Sigma(C_{A(C\text{-}Inc)} * TR_{(i)} * UR * ADAF_{(i)})$	3.87E-11	unitless	Calculated
Incremental Lifetime Cancer Risk - Operation	$ILCR_O$	$ILCR_O = \Sigma(C_{A(O\text{-}Inc)} * TR_{(i)} * UR * ADAF_{(i)})$	5.21E-10	unitless	Calculated